The Watershed Hub Work Group 2024 Annual Monitoring Report

APRIL 2025

Water & Sewerage Department

Working together, restoring the river

SEMCOG

Southeast Michigan Council of Governments

Public Services

Environmental Services Division

GLWA

Great Lakes Water Authority

Introduction

This is the second iteration of the Watershed Hub Work Group's annual report, reflecting the ongoing progression of multiple regional water quality initiatives. These efforts address both immediate challenges such as compliance with Illicit Discharge Elimination Program (IDEP) requirements and managing combined sewer overflows (CSOs) as well as long-term objectives like establishing a comprehensive baseline understanding of regional water quality. This baseline is critical for assessing the outcomes of past investments and guiding future decisions. Beyond the specific goals of the Great Lakes Water Authority (GLWA) and other Work Group members, we expect that the data collected and compiled across the Rouge, Clinton, and Detroit River watersheds will be valuable to municipal managers, researchers, modelers, NPDES and MS4 permit holders, watershed groups, and beyond. The Watershed Hub's vision is to empower regional stakeholders to better understand and address the complex impacts of changing natural conditions and human activities on southeast Michigan's watersheds. Key deliverables detailed in this report include:

- Expansion and continued development of the Investigational *E. coli* Water Quality Sampling Program (Investigational Sampling Program) for Southeast Michigan, including the use of Microbial Source Tracking (MST) for advanced follow-up analysis at priority outfalls;
- Progress in advancing GLWA's Regional Water Quality Monitoring Plan (RWQMP) in collaboration with the United States Geological Survey (USGS) including the establishment of 13 new long-term water quality monitoring sites in the Rouge, Clinton, and Detroit Rivers; and
- Continued buildup of the Watershed Hub GIS Mapper with regional monitoring data

By establishing a regional baseline for watershed-scale water quality, conducting consistent monitoring over the years, and housing this data in an easily accessible format, GLWA aims to provide a clearer and more comprehensive view of water quality in Southeast Michigan. Our long-term goal is for resource managers to use this data to assess the success of past investments (e.g., green and grey infrastructure, policy changes, operational improvements, capital projects, maintenance activities) and inform future decision-making. This effort is critical to shaping policies and decisions that will ensure the region's waterways remain healthy in the future.

GLWA invites stakeholders to engage with us to ensure that our efforts align with the needs of the community, and to utilize these resources in advancing local water quality goals and fostering the stewardship of our region's water resources.

Watershed Hub Work Group Background

In 2020, GLWA published the Wastewater Master Plan (WWMP), outlining a 40-year vision for regional wastewater operations that embraces a holistic, collaborative, and adaptive management approach to water quality protection and improvement. The Watershed Hub Work Group was formed as a direct outcome of the WWMP to bring together stakeholders dedicated to improving regional water quality by identifying and prioritizing shared goals that integrate stormwater and wastewater management. The group includes water quality subject matter experts from GLWA, local counties, municipalities, governmental councils, and watershed groups. For the past five years the Watershed Hub Work Group has met regularly to exchange best practices and collaboratively investigate regional water issues. The group also hosts public webinars, inviting diverse voices to engage in shaping the ongoing work.

Regional Water Quality Monitoring Program

Background

Originally scoped as part of the WWMP, the Regional Water Quality Monitoring Program (RWQMP) was launched in the spring of 2022 in partnership with the USGS. Since that time GLWA has funded the establishment of 21 long-term monitoring locations with varied parameters including stage and discharge, monthly grab samples, and/or continuous monitoring. These sites are in the Clinton (x7), Rouge (x9), and Detroit River (x5) watersheds, and were chosen following a multi-year collaborative process that included Work Group members and other regional stakeholders. All data collected through this program is publicly available through USGS's online portal.

Data collected from this program will improve the understanding of long-term surface water quality and flow and be used to guide GLWA and member community decision-making and efforts around capital projects, inspections, operations and maintenance, capacity management, and rehabilitation of combined and separated sanitary sewers and storm drainage systems.

2024 Sampling Overview

See the map and tables below with additional information, including links to data collected at each monitoring site.

Table 1: GLWA-funded long-term monitoring sites managed by USGS as part of the Regional Water Quality Monitoring Program

Watershed	GLWA WWMP Site Name	USGS Site Name	USGS Site Number & Link to Data
Clinton River	CR3	Clinton River at Moravian Drive at Mt. Clemens	USGS 04165500
	CR4	Clinton River at Sterling Heights	USGS 04161820
	CR5	Clinton River at Auburn Hills	USGS 04161000
	CR6	Red Run at Ryan Road Near Warren	USGS 04162010
	CR7	North Branch Clinton River Near Mt. Clemens	USGS 04164500
	CR8	N Branch Clinton R at 26 Mile NR Meade	USGS 04164151
	CR9	Red Run at 15 Mile Road at Sterling Heights	USGS 04163060
Rouge River	RR1	River Rouge at Allen Park	USGS 04168530
	RR2	Middle River Rouge at Dearborn Heights	USGS 04167150
	RR3	River Rouge at Detroit	USGS 04166500
	RR4	Bell Branch at Beech-Daly Road at Redford	USGS 04166450
	RR5	River Rouge at Southfield	USGS 04166100
	RR6	Upper River Rouge at Farmington	USGS 04166300
	RR7	Lower River Rouge at Dearborn	USGS 04168400

	RR8	Lower River Rouge at Wayne	USGS 04167625
	RR9	Middle River Rouge at Plymouth	USGS 04166750
Detroit River	DR1	Detroit River 1,250' DS R. River at River Rouge	USGS 04168557
	DR2	Detroit River at Fort Wayne at Detroit	USGS 04165710
	DR3	Detroit River at Ralph Wilson Park	USGS 04165705
	DR4	Detroit River at Water Works Park at Detroit	USGS 04165701
	DR5	Detroit River at Grosse Point Park	USGS 04165690

Table 2: Monitoring parameters at each GLWA-USGS long-term monitoring site

GLWA WWMP Site Name	Flow	In situ water quality	In situ nitrate and phosphate	Discrete water quality	CBOD	Field Readings
CR3	X	X	X	X		X
CR4	X	X		X		X
CR5	X			X		X
CR6	X	X		X		X
CR7	X			X		X
CR8	X			X		X
CR9	X	X	X	X		X
RR1				X	X	X
RR2	X	X	X	X	X	X
RR3	X	X	X	X	X	X
RR4	X	X	X	X	X	X
RR5	X	X		X	X	X
RR6	X			X	X	X
RR7	X	X	X	X	X	X
RR8	X	X		X	X	X
RR9				X	X	X
DR1				X		X
DR2	X			X		X
DR3				X		X
DR4				X		X
DR5				X		X

Table 3: Description of monitoring parameters at each GLWA-USGS long-term monitoring site

Parameter	Description
In situ water quality	temperature, dissolved oxygen, specific conductance and turbidity
Discrete water quality	total phosphorus, orthophosphate, total nitrogen, total ammonia, nitrate plus nitrite, chloride, suspended sediment, and *E. coli*
CBOD	Carbonaceous Biological Oxygen Demand
Field Readings	flow, temperature, dissolved oxygen, specific conductance and turbidity

In addition to the 21 monitoring sites funded by GLWA detailed above, an additional eight USGS monitoring sites that are funded by other parties are currently established in the Clinton (x5), Rouge (x1), Ecorse (x1) and Detroit (x1) River watersheds. Details of these sites are listed in the table below.

Table 4: Additional USGS water quality monitoring sites funded by other regional stakeholders.

Watershed	GLWA MAP ID	USGS Site Name	USGS Site Number & Link to Data	Funder
Clinton River	CR10	East Pond Creek at Romeo	USGS 04164100	Macomb County
	CR11	East Branch Coon Creek at Armada	USGS 04164300	Macomb County
	CR12	Plum Brook at Utica	USGS 04163400	Macomb County
	CR13	Middle Branch Clinton River at Macomb	USGS 04164800	Macomb County
	CR14	Clinton River at Fraser	USGS 04164000	Macomb County
Rouge River	RR10	Middle Rouge/Garden City	USGS 04167000	MDOT
Ecorse Creek	RR11	Ecorse Creek at Dearborn Heights	USGS 04168580	Dearborn Heights
Detroit River	DR6	Frank and Poet Drain at King Rd at Trenton	USGS 04168660	EGLE

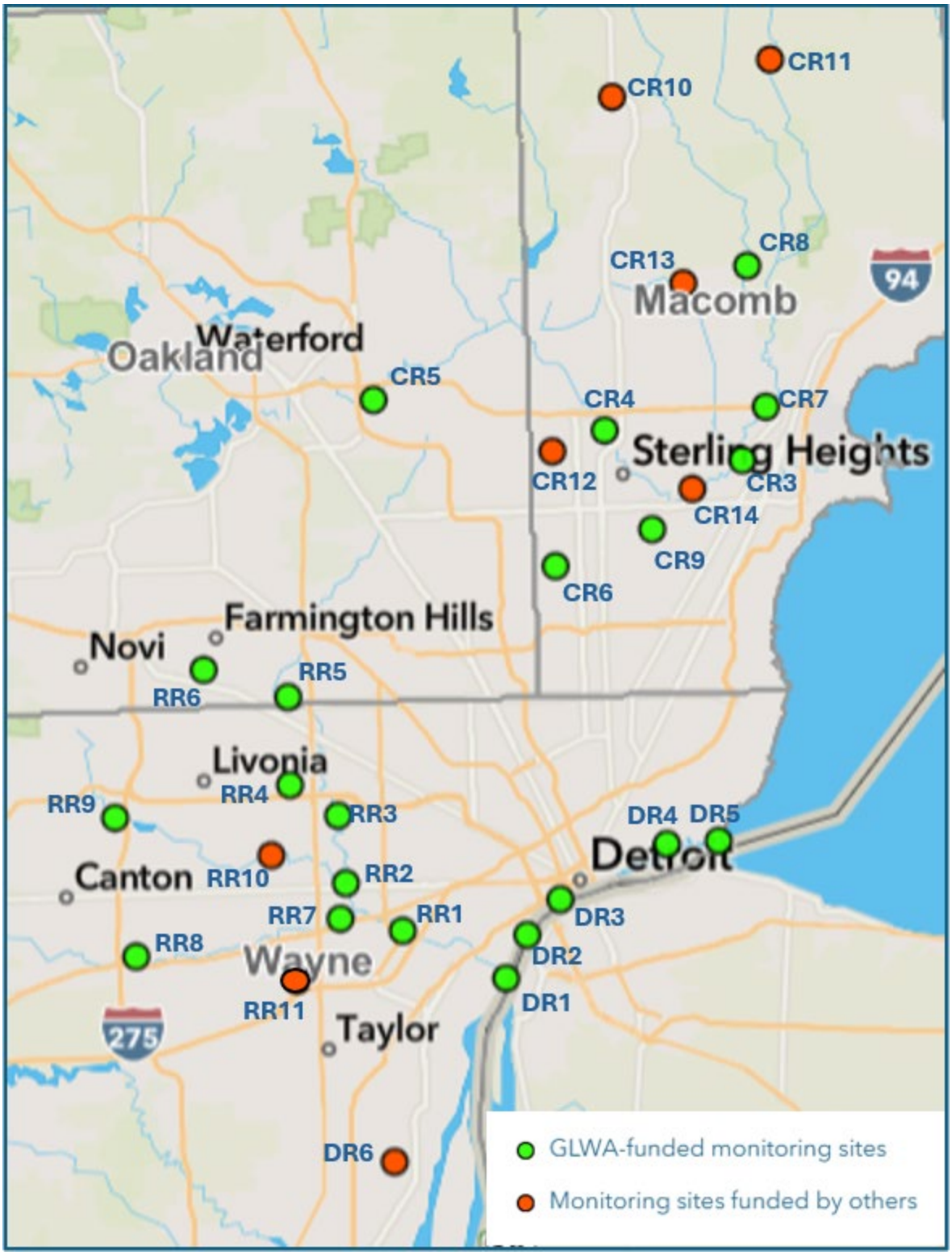


Figure 1: USGS water quality monitoring stations in the Rouge, Clinton, and Detroit River watersheds

2024 RWQMP Conclusions and Next Steps

The analysis of data collected from large stream gages, along with fish and benthic macroinvertebrate data gathered from the project's inception to the present by the Michigan Department of Environment, Great Lakes, and Energy (EGLE), Friends of the River Rouge, Clinton River Watershed Council, and Michigan Clean Water Corps (MiCorps), revealed a significantly positive relationship between fish abundance and dissolved oxygen (DO). Conversely, negative relationships were identified between fish abundance and both turbidity and discharge. Additionally, benthic macroinvertebrate abundance demonstrated a significant negative relationship with nitrate and nitrite levels.

USGS is currently looking at whether CSO events can be detected with continuous nutrient monitors (Green Eyes NuLAB Phosphate analyzer and Seabird Scientific SUNA V2 Nitrate sensor) at two sites in the Rouge River and one in the Clinton River between 2021 and 2023. Storm events that do not lead to CSO discharges and low-flow hydrologic periods are also being examined. This analysis also allows us to assess the accuracy of continuous water quality monitors by comparing values to discrete water quality samples. Nutrient loading computations from the high-frequency nitrate and orthophosphate concentration data that has been collected over the course of this project are under way. USGS expects the load data to be finalized by the end of May 2025.

In addition, USGS is on track to secure all necessary permits and complete the installation of permanent monitoring equipment at three sites this spring, which will conclude the full build-up of all sites in the RWQMP. These remaining sites should be relatively easy to build out since they will use solar power, can be attached to the bridges, and two of them are in locations that previously had USGS discharge equipment, negating the need for new permits. To date, only monthly grab samples had been collected at these locations which include River Rouge at Southfield (RR5), Lower River Rouge at Wayne (RR8), and Red Run at Ryan Road (CR6).

Investigational *E. coli* Water Quality Sampling Program for Southeast Michigan

Year 2 Implementation Retrospective

As with the first year of the pilot, sampling activities were carried out independently by multiple parties in the spring and summer of 2024. The purpose of these activities is to investigate the presence of *E. coli* in the Clinton and Rouge River watersheds, with the resulting data then compiled on the Watershed Hub GIS Mapper. These activities all generally followed the 5-year schedule (Table 5) detailed in the work plan that was collaboratively developed by the Watershed Hub Work Group. The plan describes routine instream sampling at strategic locations partnered with targeted outfall sampling to locate sources of illicit sanitary discharges into waters of the state. Participants include the Oakland Country Water Resources Commission (OCWRC), Macomb County Public Works Office (MCPWO), Macomb County Health Department (MCHD), Wayne County Department of Public Services (WCDPS), and Alliance of Rouge Communities (ARC).

Table 5: Five-year cycle for regional investigational grab sampling to identify illicit discharges.

Year	Activity	Details
1	Weekly sampling and analysis for *E. coli*	Grab samples collected from hundreds of locations in the Rouge and Clinton River watersheds, during the May-to-October recreational season.
2	Sampling outfalls within priority stream segments	Identifying potential illicit discharges from sanitary sources using MST.
3-5	Investigating upstream of priority outfalls	Working with communities to investigate areas upstream based on data from the first two years of the cycle.

Per the work plan, priority outfalls identified in Oakland and Macomb Counties during year-1 sampling activities were tested for *E. coli*, and in the case of repeatedly elevated results, further investigated for human markers using MST. The ARC and Wayne County used a grant from the Erb Family Foundation to expand instream baseline grab sampling activities in the Lower Branch into the Middle, Upper and Main Branches and will use this data to identify high priority outfalls for dry weather screening. They are poised to carry out follow-up investigations using MST beginning in 2025.

Between April and October 2024, a total of over 1,800 samples were collected and analyzed for *E. coli* from almost 500 locations in the Clinton and Rouge River watersheds. Over 1,000 of the samples were collected from approximately 200 locations in the Rouge River and nearly 800 of the samples were collected from just under 300 locations in the Clinton River.

Table 6: Number of samples collected in each watershed[1]

Year	Clinton River	Rouge River	Total
2023	712	251	963
2024	791	1026	1,817
Total	1503	1277	2,780

Table 7: Number of unique sampling locations in each watershed

Year	Clinton River	Rouge River	Total
2023	282	15	297
2024	298	199	497

[1] The values in tables 6 and 7 are approximations based on data submitted in multiple formats by siloed parties. Values may not be exact but provide a general sense of the scale of *E. coli* sampling by contributing entities.

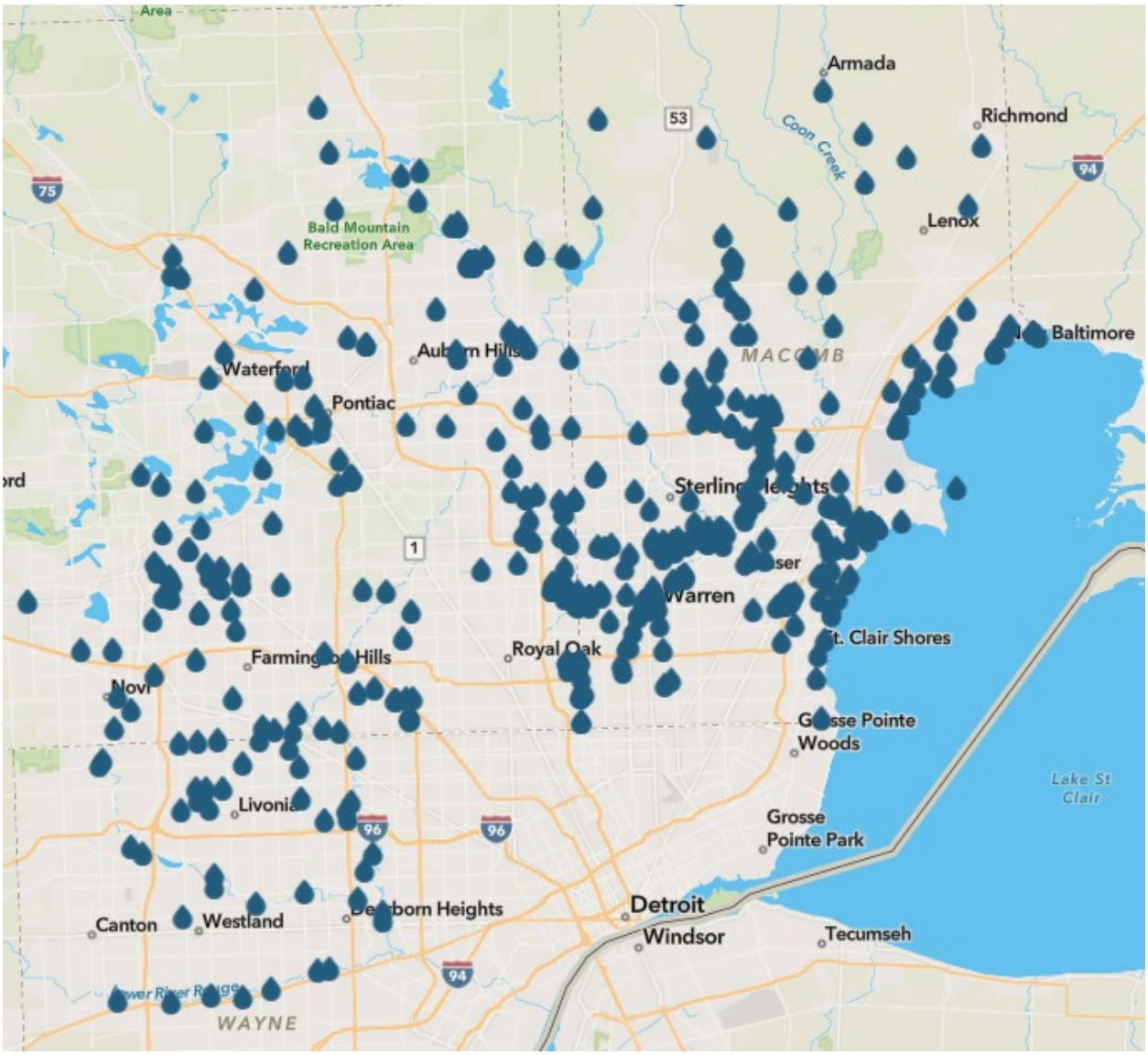


Figure 2: Investigational E. coli Water Quality Sampling Program 2023 and 2024 sampling locations

The following individual reports that further detail 2024 sampling activities carried out by OCWRC, ARC in collaboration with WCDPS, MCPWO, and MCPHD have been submitted and compiled for inclusion in this annual report:

OCWRC Water Quality Sampling Report 2024

Background

Oakland County Water Resources Commissioner's Office (WRC) is required to comply with the Michigan Department of Environment, Great Lakes and Energy's (EGLE) NPDES Municipal Separate Storm Sewer System (MS4) Phase II permit by implementing an Illicit Discharge Elimination Program (IDEP). WRC developed an alternative procedure for ongoing monitoring of all open and enclosed County drains for illicit discharges. This procedure covers all County drains in both MS4 and non-MS4 areas. All County drains and structures are currently inspected on a 5-year rotating cycle under WRC's Construction Drain

Maintenance (CDM) Program. The Environmental team follows this same cycle for sampling the outfalls of each County drain to confirm current *E. coli* levels within the system.

A process for prioritizing the drains for illicit discharge investigation was previously developed and approved. The criteria used for evaluating and prioritizing County drains is as follows:

Priority Level	Criteria	Response
Priority 1	Evidence of pollutants and/or *E. coli* values ≥ 10,000 cfu/100 ml	Immediate follow-up to verify illicit discharge. Initiate upstream IDEP investigation to identify pollutant source(s) and coordinate additional activities as needed.
Priority 2	No evidence of pollutants and *E. coli* values ≥ 1001 and < 10,000 cfu/100 ml	Schedule additional dry weather sampling with human marker screening within one (1) year for further evaluation. Schedule upstream dry weather sampling or initiate IDEP investigation to identify pollutant sources(s) as needed.
Priority 3	No evidence of pollutants and *E. coli* values ≤ 1,000 cfu/100 ml	Continue dry weather sampling of outfalls and discharge points per 5-year drain maintenance inspection cycle. Review results and re-prioritize as needed.

WRC contracts with Oakland University to perform MST sampling analysis. With MST, human-associated pollution markers are detected by looking for *Bacteroides* HF183. Consecutive results over 10,000 cfu/100 ml will trigger a lab test for HF183 to be conducted. HF183 markers are measured in GC (Gene Copies) / 100 ml with priority designation given to results of 1,000 GC/100ml in enclosed systems and 500 GC/100ml in open water courses or drains with regular flow. HF183 marker results at 95 GC / 100 ml are considered non detect.

Water quality samples for *E. coli* analysis were completed by either the Walled Lake-Novi Waste Water Treatment Plant or Paragon Laboratories Inc. Samples for HF183 analysis were completed by Oakland University.

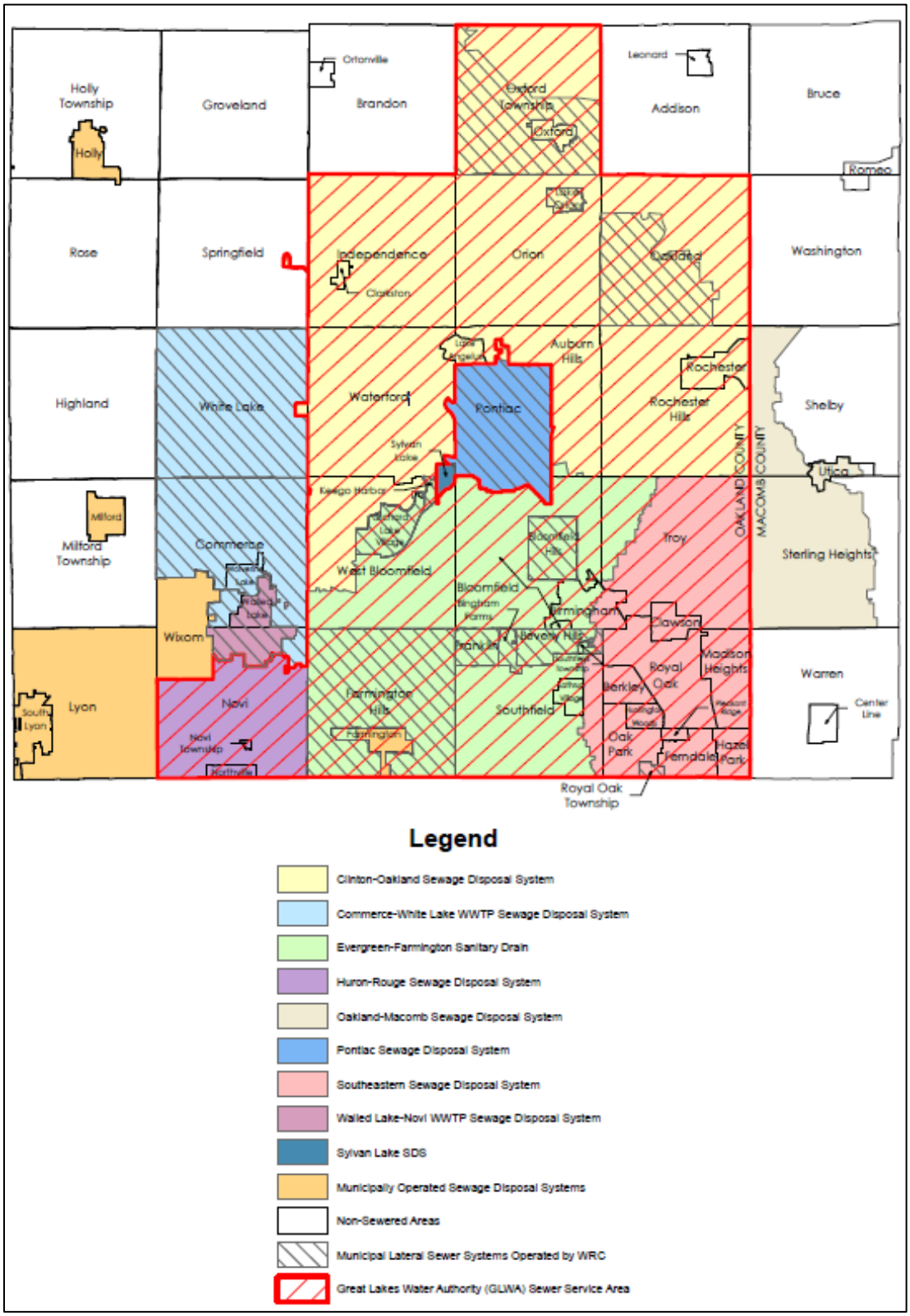
A total of 355 samples were taken and analyzed for *E. coli* from these initiatives as follows:

- 4.51% (16 samples) were Priority 1
- 28.17% (100 samples) were Priority 2
- 67.32% (239 samples) were Priority 3

Outfall Sampling Program Results

A new outfall sampling program was initiated in 2023. Drain outfalls will be sampled in accordance with CDM's five-year inspection cycle. This program will ensure that any possible new pollutant sources are

identified and investigated in a timely manner. Drains are sorted by sanitary disposal districts and non-sewered areas.



Clinton-Oakland Sanitary Disposal System

Drain Name	***E. coli* GEO MEAN cfu/100 ml**	Drain Name	***E. coli* GEO MEAN cfu/100 ml**
Axford Drain	108	Jensen Drain	4,692
Cornerstone Condos Drain 1	771	John E. Olson Drain	538
Cornerstone Condos Drain 2	2,433	Kelly Drain	247
Cornerstone Condos Drain 3	Dry	Levinson Drain	229
Crake Drain	241	Linden Drain	657
David L Moffett Drain	789	M15 Drain	58
Dennis Murphy Drain	719	Oaks Drain	80
Drayton Plain Drain	245	Osgood Drain	2,385
Fred Houghten Drain	286	Paint Creek (Rochester Park)	779
Goodison Place Drain 1	1,026	Pond Valee Drain 1	9
Goodison Place Drain 2	153	Pond Valee Drain 2	18
Goodison Place Drain 3	1,278	Pond Valee Drain 3	237
Guyer Drain	3,800	Pond Valee Drain 4	592
Hamilton Drain	1,405	Ramiro Drain	167
Ireland Drain	493	Robert J Evans Drain	179

Drain Name	**HF 183 Marker GC/100 ml**	Drain Name	**HF 183 Marker GC/100 ml**
Goodison Place Drain 1	54,652	Osgood Drain	95
Guyer Drain	240	Paint Creek –Rochester Park	95
Jensen Drain	277	Wrey Drain	325

Next Steps:

- **Goodison Place Drain** CCTV was inconclusive, dye testing will take place in 2025 along the identified elevated segments of drain to locate the illicit connection.
- All other drains will be resampled in 5 years.

George W. Kuhn Sanitary Disposal System

Drain Name	***E. coli* GEO MEAN cfu/100 ml**	**Drain Name**	***E. coli* GEO MEAN cfu/100 ml**
Dunleavy Drain (Tawas)	554	Kaczmar Drain	652
Dunleavy Drain (Wolverine)	1,919	King Drain	88
Fredericks Drain 1 (Page Drain)	697	McConnell Drain	262
Fredericks Drain 2	122	McCulloch Drain	1,866
Fredericks Drain 3	251	Moxley Drain 1	593

Halfpenny Drain	1,392	Moxley Drain 2	588
Hazel Park (Elza)	137	Nelson Drain	278
Hazel Park Local (Maple Ln)	31	Vogt Drain 1	538
Hazel Park Local (Tucker)	684	Vogt Drain 2	355
Henry Graham Drain (ROT005027)	12,915	Walker Drain	119
Hugh Dohnay Drain	719	Wilson Drain	147
Jackson Drain East	161	Wrey Drain	1,328
Jackson Drain West	165		

Drain Name	**HF 183 Marker GC/100 ml**	**Drain Name**	**HF 183 Marker GC/100 ml**
Dunleavy Drain (Wolverine)	95	Moxley Drain 2	95
Hazel Park Local (Tucker)	4,311	Wrey Drain	325
Henry Graham Drain (ROT0050027)	507	-	-

Next Steps:

- **Henry Graham Drain** Dye test for possible illicit connection on Henry Graham Drain, if dye testing shows proper connections, coordinate with Madison Heights on good housekeeping solution.
- **Dunleavy Drain** Continue investigating branches along Greig Ave with HF183 and CCTV if needed.
- **Hazel Park Local** Continued coordination with the City of Hazel Park to help identify elevated structures that may lead to illicit connections.
- All other drains will be resampled in 5 years.

Evergreen-Farmington Sanitary Disposal System

Drain Name	***E. coli* GEO MEAN cfu/100 ml**	**Drain Name**	***E. coli* GEO MEAN cfu/100 ml**
Apple Cove Drain	417	Owens Drain SOT137018	41
Arbors of West Bloomfield Drain 1	210	Owens Drain SOT137020	87
Arbors of West Bloomfield Drain 2	Dry	Owens Drain SOT137014	547
Arbors of West Bloomfield Drain 3	169	Owens Drain SOT137022	75
Arbors of West Bloomfield Drain 4	1,130	Palais Le Duc Drain	145
Arbors of West Bloomfield Drain 5	Dry	Park Ridge Drain	455
Blue Heron Drain	261	Peggy Drain	130
Brennan Drain	202	Peterson Drain	687
Case Drain	1,915	Robert Reid Drain	430

Chimney Hills Apartments Drain 1	491	Rouge River 9 and Inkster	931
Chimney Hills Apartments Drain 2	841	Rouge River Clarenceville Drain	610
Deconick Drain	639	Rouge River Tulane Drain	632
Donohue Drain 1	130	Rouge River Emily Drain	1,023
Donohue Drain 2	118	Rouge River Drake & Dewberry	468
Earlmoor Drain	109	Royal Pointe Drain 1	257
Edwards Drain	958	Royal Pointe Drain 2	430
Evans Drain	23,344	Silverbrook Villa Aprtmnt Drain 1	186
Gronkowski Drain	290	Silverbrook Villa Aprtmnt Drain 2	259
Hayes Drain	118	Silverbrook Villa Aprtmnt Drain 3	459
Hazel Drain	424	Snyder Drain	1,709
Hidden Creek Drain	114	Southwyck Drain 1	178
Keego Harbor Drain	53	Southwyck Drain 2	525
Law Drain 1	159	Southwyck Drain 3	134
Law Drain 2	513	Southwyck Drain 4	36
Law Drain 3	728	Stewart Drain 1	465
Law Drain 4	720	Stewart Drain 2	890
Law Drain 5	697	Townline Drain	208
Luz Drain	293	Village Square Drain 1	107
Martha Washington Drain 1	36	Village Square Drain 2	100
Martha Washington Drain 2	249	Wagner Drain	397
McDonnell Drain	1,516	West Bloomfield Oaks Drain 1	Dry
Owens Drain SOT137024	49	West Bloomfield Oaks Drain 2	51

Drain Name	**HF 183 Marker GC/100 ml**
Case Drain	95

Investigaions Completed:

Owens Drain - The illicit discharge at 19244 E. Nine Mile Road in Southfield has been resolved.

Next Steps:

- **Evans Drain** – Follow up required along the Evans Drain.
- All other Drains will be resampled in 5 years

Other Systems / Non-sewered Areas

Drain Name	***E. coli* GEO MEAN cfu/100 ml**
Patton Drain	86

Next Steps:

- **Patton Drain** will be resampled in 5 years

WCDPS + ARC Investigational Sampling Report 2024

Background

In the fall of 2023, the Alliance of Rouge Communities (ARC) received funding from the Erb Family Foundation to perform investigational *E. coli* sampling to identify where sanitary sewage is entering the Rouge River and provide training to municipal staff on how to comply with their stormwater permit. The grant project goals include:

- Increase understanding of water quality in Wayne County's portion of the Rouge River.
- Identify storm drains that are discharging sanitary sewage from unknown sources.
- Identify the next steps needed to investigate the sources of illicit discharges.
- Increase municipal staff and leadership's understanding of the requirements of the municipal stormwater permit.
- Provide networking opportunities and collaborate with Southeast Michigan Council of Governments (SEMCOG) to bring the training to the rest of southeast Michigan.

The investigational sampling component of the Erb grant is consistent with the regional investigational sampling work plan developed by the GLWA Watershed Hub. The investigational sampling performed by ARC staff in 2024 was performed in the Middle, Upper, and Main branches of the Rouge River, within the Rouge Valley Sewage Disposal System (RVSDS) service area. This sampling compliments and builds upon the sampling that was performed by WCDPS- Environmental Services Division (WCDPS-ESD) in the Lower branch of the Rouge River in support of the Lower Rouge Water Trail effort. WCDPS-ESD initiated the Lower Rouge Water Trail water quality monitoring effort in 2019, which continued in the 2024 season. The data collected is detailed below.

Sampling Program Results

The ARC prepared a sampling plan, secured lab services, recorded rainfall data and collected instream grab samples at 37 sites. Sampling was performed weekly for 20 consecutive weeks within the Middle, Upper, and Main branches of the Rouge River. The WCDPS collected instream grab samples at 7 sites within the Lower Branch. Sampling was performed for 17 weeks. The sampling began in May and was completed in mid-September. A total of 859 individual *E. coli* samples were taken regardless of weather conditions. The table on page 19 below presents the individual site and sampling event results. Red cells indicate samples above 1,000 Most Probable Number (MPN)/100ml. The Lower Rouge sample results are reported in Colony Forming Units (CFU)/100mL *E. coli*, which is a different analytical method and the results are similar. For the results discussed, the results are discussed in MPN/100mL.

Results indicate that the Rouge River has an *E. coli* challenge with all sites having at least one sample exceeding 1,000 MPN/100ml. Working collaboratively with WCDPS-ESD, geometric means were calculated from sampling data from each of the 44 sites and partitioned based on dry and wet-weather conditions. Dry-weather samples were defined as samples taken when there was ≤ 0.05 inches of rainfall over the previous 48 hours. Wet-weather samples were defined as samples taken when there was ≥ 0.25 inches of rainfall over 24 hours and preceded by a 48-hour dry period. Samples that did not meet these criteria were defined as "inter-weather" samples, where there was ≥ 0.05 inches of rainfall within 48 hours and ≤ 0.25 inches within 24 hours. The table on page 20 below presents the geometric mean results partitioned by weather type. Red cells indicate geometric means above 1,000 MPN/100ml.

In heavily impacted, urbanized areas like the RVSDS area of the Rouge River the potential sources of *E. coli* are numerous, diverse and sample results can be highly variable, particularly between weather events. Gathering a larger dataset and calculating the geometric mean for each site, partitioned by weather type is intended to aid in prioritizing limited resources to identify and eliminate sources of human sewage. The top priority is to find and eliminate the sources impacting when the water resource will be used most by humans, specifically during dry weather.

All sites sampled and analyzed in the Middle Rouge had geomeans below the 1,000 MPN/100ml threshold in both dry and inter weather conditions (at least in 2024) and two of the 16 sites even had geomeans below the threshold during wet weather.

Within the Upper, six of 16 sites during dry and nine of 16 sites during inter-weather had geomeans below the threshold. All sites, not surprisingly, had geomeans above the threshold during wet weather.

Within the Main four of the five sites and three of the five sites had geomeans below the threshold and all sites were above the threshold.

The Lower had six of the seven sites below the threshold during dry weather and three of the seven during inter-weather below the threshold and surprisingly one of the seven below the threshold during wet weather.

		Week	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	GeoMean	Min.	Max.
Middle Rouge		MD17	228	120	132	199	52	63	213	181	171	4611	85	1017	96	631	41	84	820	73	10	158	N/A	160	10	4611
		MD19	10462	211	110	1187	537	132	52	1664	530	8164	1918	24196	5172	4352	285	226	3448	86	75	30	N/A	671	30	24196
		MD16	1145	146	538	474	677	583	703	1119	350	7701	345	4352	882	1785	158	644	7270	246	262	201	N/A	700	146	7701
		MD18	3255	384	1439	771	1187	933	1333	3076	602	9208	880	8164	420	1725	573	565	15531	546	683	487	N/A	1291	384	15531
		MD15	2064	259	1169	1354	906	479	1050	3076	504	14136	645	4106	785	2142	259	226	6131	464	279	529	N/A	996	226	14136
		MD14	1274	228	292	985	591	410	241	1455	4106	8664	1076	11199	3873	4352	233	379	12997	556	1664	187	N/A	1123	187	12997
		D03	1014	275	644	563	331	733	683	1421	404	17329	399	691	857	7701	171	609		295	624	228	N/A	706	171	17329
		MD09	738	97	86	414	121	213	160	2247	275	5475	1565	691	683	6488	189	158	12997	173	134	122	N/A	461	86	12997
		US10	1046	292	364	504	197	134	313	1968	213	6131	1145	631	1126	4884	109	990	5172	185	173	158	N/A	571	109	6131
		MD04	146	241	448	4611	405	327	1376	3873	1467	1414	12997	4106	12033	19863	723	404	2755	933	231	1124	N/A	1322	146	19863
		MD07	216	52	110	63	98	110	272	233	309	2851	496	504	243	644	243	1126	771	52	145	173	N/A	243	52	2851
		MD03	336	187	185	4884	768	341	2247	6131	521	708	19863	5475	15531	24196	512	988	9208	860	175	1414	N/A	1494	175	24196
		Merriman Rd	331	175	556	1785	373	369	1467	1664	355	987	8664	2282	9208	5172	399	441	5475	341	305	355	N/A	928	175	9208
		US2	275	86	3076	3448	132	262	1860	1872	457	187	11199	2143	14136	9208	275	441	12033	331	309	341	N/A	956	86	14136
		Warrendale Md	262	389	9804	3654	359	488	2382	3654	422	432	8164	4611	11199	4611	369	426	6131	243	199	292	N/A	1179	199	11199
		D06	228	389	12997	2909	345	417	1274	5794	512	369	15531	2359	17329	4106	331	305	3076	199	246	181	N/A	1082	181	17329
Upper Rouge	Bell	Newburgh UP 2	5794	189	573	988	4106	546	2064	11199	1333	24196	3654	14136	4352	5172	1935	175	24196	1670	368	833	N/A	2164	175	24196
		8 Mile UP 1	1860	213	295	573	813	712	767	1169	537	12997	2014	5475	663	2481	1210	98	14136	301	727	305	N/A	965	98	14136
		6 Mile UP	1467	583	2282	933	1483	712	1396	1414	404	15531	697	1664	663	985	1467	473	3654	767	432	379	N/A	1091	379	15531
		UP05	842	327	909	520	1017	2489	1187	15531	520	24196	3255	4611	1785	9804	327	496	24196	960	504	1017	N/A	1696	327	24196
		U15	1259	546	4106	1354	842	1723	2382	2489	1106	17329	1334	6867	1376	1624	1223	932	17329	1565	1904	2723	N/A	2069	546	17329
		Newburgh UP 1	816	374	6867	1597	2481	1187	3076	1782	1145	24196	1022	988	1354	2187	1354	7270	9804	471	1223	880	N/A	1849	374	24196
		Levan UP	496	282	1664	292	8164	749	1396	586	529	24196	677	2014	906	754	749	327	2613	487	959	789	N/A	998	282	24196
		UP04	1850	546	1137	1723	2359	1450	2143	5475	1918	24196	1935	1396	1281	1989	1850	2723	8164	1198	4611	820	N/A	2156	546	24196
	Tarabus	8 Mile UP 2	3255	2987	860	1236	2014	1187	1439	2909	1497	15531	1956	10462	410	2382	1043	738	11199	697	565	471	N/A	1755	410	15531
		G19	677	1726	1664	2481	318	695	3873	9208	359	2187	17329	602	2247	12997	399	1046	11199	6867	15531	14136	N/A	2457	318	17329
		U17	288	1334	816	6488	581	1450	3609	15531	1467	7701	19863	1153	6131	9804	1039	1017	24196	624	683	1723	N/A	2357	288	24196
		U03	432	408	798	5172	959	749	5475	19863	1187	2613	24196	2382	9804	12033	906	1250	24196	990	933	1414	N/A	2408	408	24196
		U04	884	609	6488	8664	1291	987	5475	17329	1234	1259	24196	4611	8664	6867	81	1291	24196	1223	1553	9804	N/A	2901	81	24196
	Upper	G71	565	389	880	4884	1274	884	3255	15531	691	1789	19863	1081	24196	12033	845	1314	24196	152	988	836	N/A	2029	152	24196
		U02	384	10	3654	6488	1106	1071	5794	17329	1050	1414	12997	1421	12033	4884	813	697	24196	884	754	404	N/A	1740	10	24196
		U05	631	455	3255	7270	908	860	3873	17329	1223	1333	24196	2489	11199	8664	1664	650	24196	882	657	1333	N/A	2465	455	24196
Main Rouge		M15	275	2098	3654	6488	384	583	2187	24196	798	933	24196	1658	7270	12033	703	1162	19863	573	563	573	N/A	2019	275	24196
		G43	250	450	7270	4611	410	594	2481	5172	759	638	15531	717	6131	15531	627	960	24196	512	557	801	N/A	1641	250	24196
		US7	420	388	9804	3255	473	631	4106	12997	1050	743	24196	1658	15531	6131	717	882	24196	620	435	285	N/A	1876	285	24196
		Rouge Park Dr	7701	1723	24196	24196	1421	3448	9208	24196	3255	1553	24196	24196	1187	24196	2014						N/A	6468	1187	24196
		G42	379	233	5172	14136	428	676	3654	19863	717	364	24196	3873	6867	19863	684	393	985	487	368	386	N/A	1570	233	24196
Lower Rouge		LR-01	N/A	120	230	770	530	510	1400	540	430	420	550	4400	64	300	N/A	N/A	N/A	290	340	370	540	435	64	4400
		LR-02	N/A	400	320	840	1200	700	2000	750	470	780	860	4600	98	510	N/A	N/A	N/A	370	520	510	700	651	98	4600
		LR-03	N/A	450	420	840	880	2100	2900	1000	810	660	1100	5500	200	610	N/A	N/A	N/A	550	610	790	3100	927	200	5500
		LR-04	N/A	2400	3700	2400	1400	2400	6100	5200	1500	1700	930	7300	180	1400	N/A	N/A	N/A	700	540	540	3400	1682	180	7300
		LR-05	N/A	520	1500	1600	960	930	8200	5200	500	1400	1200	4400	160	1200	N/A	N/A	N/A	520	450	590	2400	1153	160	8200
		LR-06	N/A	420	700	2900	1100	910	2000	910	930	740	1100	1800	170	1000	N/A	N/A	N/A	350	570	510	4900	904	170	4900
		Beech Daly	N/A	540	810	3900	960	1100	3300	1000	820	1000	810	1500	140	1300	N/A	N/A	N/A	510	700	590	3300	983	140	3900

Criteria: > 1,000 MPN/100ml

N/A: No Sample

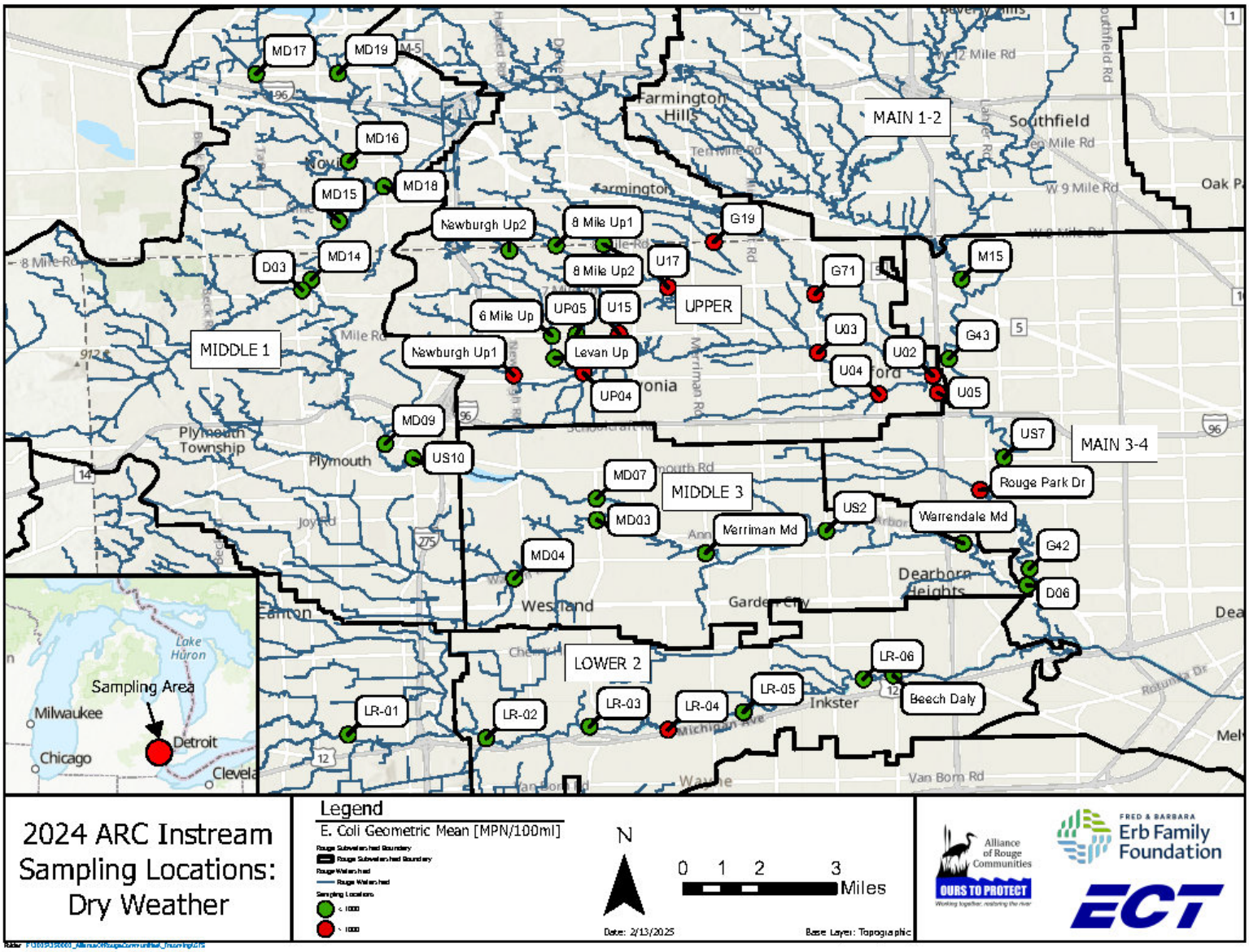
Geometric Means						
			Dry Weather	Inter Weather	Wet Weather	All Weather
Middle Rouge		MD17	62	134	450	160
		MD19	162	281	4303	671
		MD16	341	470	1758	700
		MD18	667	746	3289	1291
		MD15	415	707	2840	996
		MD14	593	499	3192	1123
		D03	379	567	1624	706
		MD09	167	174	2074	461
		US10	205	440	1812	571
		MD04	787	312	3624	1322
		MD07	182	139	428	243
		MD03	767	430	4694	1494
		Merriman Rd	538	278	2482	928
		US2	393	195	4332	956
		Warrendale Md	452	407	5097	1179
		D06	442	344	4414	1082
Upper Rouge	Bell	Newburgh UP 2	921	993	7501	2164
		8 Mile UP 1	472	423	2983	965
		6 Mile UP	663	1053	1829	1091
		UP05	755	891	5260	1696
		U15	1401	1646	3425	2069
		Newburgh UP 1	1423	1808	2430	1849
		Levan UP	857	878	1238	998
		UP04	1870	1143	3416	2156
	Tarabusi	8 Mile UP 2	919	1110	4213	1755
		G19	2036	1344	3612	2457
		U17	1452	1165	5154	2357
		U03	1393	714	6465	2408
		U04	1515	887	8783	2901
	Upper	G71	1052	715	5989	2029
		U02	1067	83	6843	1740
		U05	1380	544	7429	2465
Main Rouge		M15	824	1561	6603	2019
		G43	762	657	5388	1641
		US7	816	585	7107	1876
		Rouge Park Dr	3689	1723	13701	6468
		G42	710	303	6385	1570
Lower Rouge		LR-01	442	319	877	435
		LR-02	700	425	1311	651
		LR-03	911	738	1786	927
		LR-04	1456	1951	2382	1682
		LR-05	866	1368	3137	1153
		LR-06	745	1090	1483	904
		Beech Daly	848	1079	1635	983

Criteria: > 1,000 MPN/100ml

Dry Weather conditions = ≤0.05" of rainfall over the previous 48 hours
Wet Weather conditions = ≥0.25" of rainfall over the previous 24 hours
Inter Weather conditions = ≥0.05" within previous 48 hrs and ≤0.25" within previous 24 hrs

Sampling locations in the Middle, Upper, Main & Lower

Red sites indication geomeans above 1,000 MPN/100ml



Next Steps

In addition to increasing the understanding of water quality in Wayne County's RVSDS area, this analysis will be used to guide stormwater outfall dry weather screening. Screening of outfalls with the capacity to analyze for the human biomarker (HF183) began in the fall of 2024 and will be a major effort through 2025. Given the widespread nature of *E. coli* results, outfall screening will occur throughout the RVSDS

area but will be focused in the areas upstream of the sites exceeding the threshold during dry weather. During 2025, WDPS ESD plans to continue its Lower Rouge water quality monitoring efforts in support of the Lower Rouge Water Trail development. The data is also utilized to identify potential illicit discharge and investigative “hot spots” that may arise during the monitoring season.

MCPWO Investigational Sampling Report 2024

Background

Throughout the summer of 2024, our team worked to identify sources of illicit discharge and investigate potential cross-connections in Macomb County’s stormwater system. Our focus remained on high-priority locations identified in 2023, as well as key outfalls that feed into the Red Run watershed and waters of the state. By strategically sampling across these locations, we aimed to assess water quality and determine areas of concern for *E. coli* contamination. Over the course of the season, we collected samples during both dry and wet weather conditions. We also conducted 32 MST analyses.

Sampling Program Results

One of our main priorities was revisiting nine locations flagged in 2023 for having *E. coli* levels above 10,000. Our testing revealed that seven of these locations had much lower levels than in 2023, well below 1,000 MPN/ 100 ml. However, one site, Murdock Ballard, continued to show elevated E. coli concentrations, with a geomean of 3,256 MPN/100 ml even after additional upstream testing.

In our assessment of Red Run and Bear Creek, we tested all 24 county outfalls, uncovering six locations with concerning E. coli levels. Branch A stood out as a particularly problematic site, registering over 10,000 MPN/100 ml E. coli in dry weather. Additionally, approximately 75% of our wet-weather samples across this watershed exceeded 1,000 MPN/100 ml E. coli, indicating persistent contamination that warrants further investigation.

Testing of waters of the state outfalls, including those connecting to Big Beaver Creek and the Clinton River, showed that most locations had acceptable E. coli levels in dry weather. However, three locations—Busch Drain East, Georgian Manor, and Shanahan Improvement Drain—exceeded the 1,000 MPN/100 ml E. coli threshold. Wet-weather sampling in these areas was even more concerning, with approximately 75% of samples showing significantly elevated levels. Additionally, we identified a trash accumulation issue at Georgian Manor.

Beyond water quality testing, we documented the presence of wildlife at various locations, including geese, ducks, deer, and feral cats, all of which could be potential sources of bacterial contamination. These observations underscored the need to incorporate environmental factors into our assessments moving forward.

Next Steps

Looking ahead to next year, our work will focus on further investigating these contamination sources and implementing targeted strategies to address them. MST will be our top priority—we plan to conduct MST testing on dry and wet samples from Murdock Ballard, Red Run Branch A & E, and key outfalls such as Busch Drain East, Georgian Manor, and Shanahan Improvement Drain. Additionally, MST testing will be prioritized for wet-weather samples with the highest E. coli counts, starting with those exceeding 10,000 MPN/100 ml.

In conjunction with our water quality assessments, we will explore culvert maintenance at Murdock Ballard, where a blockage at Earl Street may be contributing to poor drainage and contamination. Further *E. coli* testing will also be conducted in locations where initial findings were incomplete or concerning.

We will also enhance our wildlife tracking efforts by integrating sightings into ArcGIS, helping us better assess whether animal populations are influencing bacterial contamination.

MCDPH Investigational Sampling Report 2024

Background

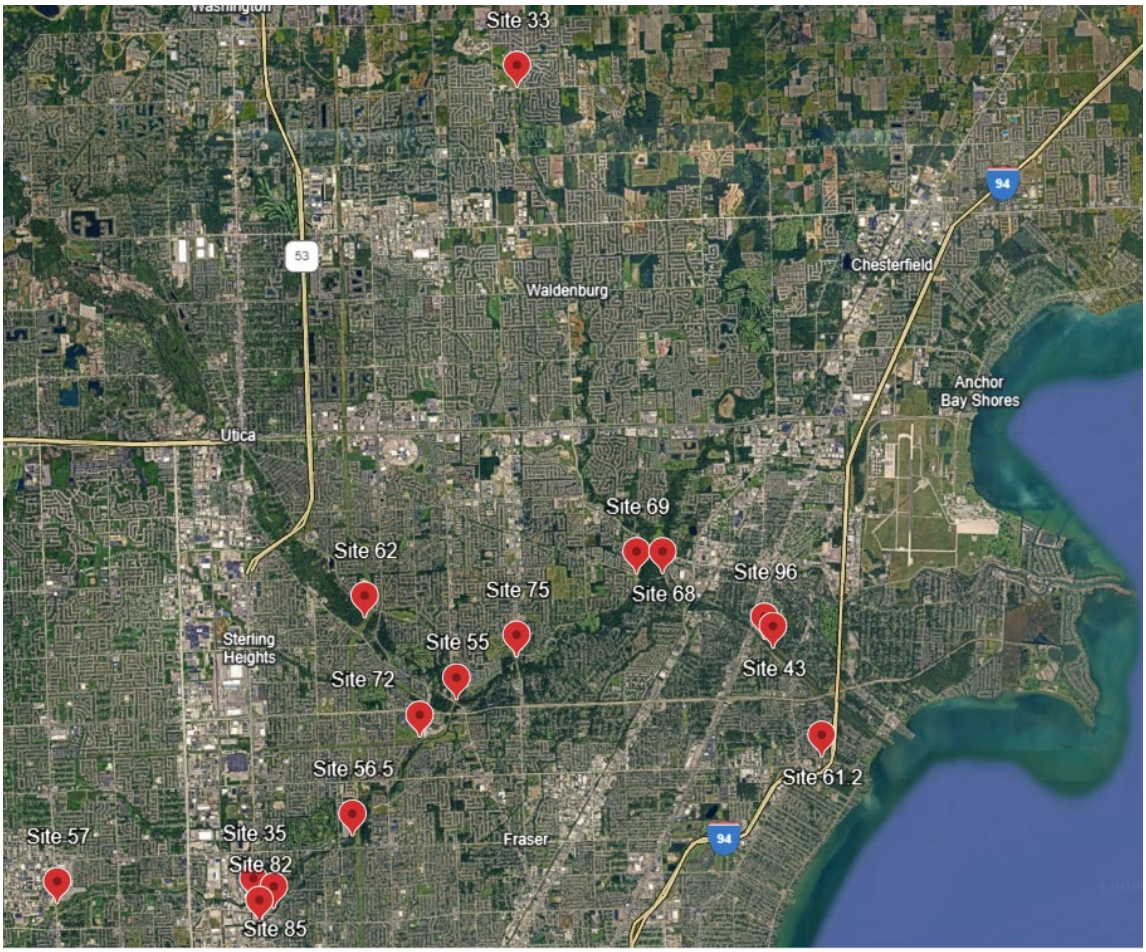
The Macomb County Health Department (MCHD) has been conducting surface water sampling throughout our watersheds since 1998 as part of the recommendations from the Blue-Ribbon Commission's report 1997. Over the years the number of monitoring locations and frequency has fluctuated based on findings, needs and funding. MCHD currently monitors approximately 54 sites monthly from March through October each year. Additional sampling events also occur during this time frame. In 2024, 8 primary monitoring events and 9 secondary monitoring events took place throughout Macomb County, resulting in 495 samples being collected and tested for *E. coli.*

Previous watershed MST monitoring was conducted in 2021 and 2022. Fourteen sites were selected based on land usage, septic system usage, and recreational usage. Sites ranged from roadside ditches, streams to the Clinton River. In 2021, samples were tested for the human, gull, and goose markers. In 2022 only the human marker was used since the bird markers were not observed in the 2021 testing and birds were not observed at or near the sampling locations. In 2021 the first MST monitoring event occurred after a wet weather event. The human marker was detected in each sample. The second monitoring event was during dry weather. Fifty-seven percent of the samples had detection of the human marker but at levels significantly less than those collected during the wet weather event.

Sampling Program Results

In the winter of 2024, 15 of the routine monitoring sites were selected for MST sampling. Sites were selected based on the site's geomean of the routine sample results for *E. coli* over the previous five years. The geomeans were calculated and ranked for the Clinton River East and Red Run Sub-watersheds. These two sub-watersheds are the primary watersheds for evaluation under the county's MS4 stormwater permit and were the focus for MST testing. Prioritization was given to:

- Priority 1: *E. coli* greater than 5,000 mpn/100ml (greatly exceeds partial body contact state standard)
- Priority 2: *E. coli* greater than 1,000 mpn/100ml (partial body contact State standard)
- Priority 3: *E. coli* greater than 300 mpn/100ml (full body contact State standard)



Between June and October, 85 samples collected for potential MST testing from these 15 sites. Additional volume was collected during 9 of these events for MST testing at a later date.

Samples were filtered and frozen for MST testing by Oakland University (OU). In December 2024, the *E. coli* results from the selected routine monitoring sites were reviewed and compared to rain events. Sampling events included both dry and wet weather events. OU processed 34 of the 85 frozen filters for the human marker, HF183. Of the 34 samples, 32 had detectable levels with highest being 13,200 gene copies/reaction.

33	**25 Mile/Romeo Plank - Middle Branch Clinton River**	
Date	*HF183GC/100mL*	*E. coli MPN/100mL*
6/4/2024	141	650
7/9/2024	265	638
8/6/2024	581	>24196.0
2024 Geomean		154

68	**Moravian Road Bridge - Clinton River**	
Date	*HF183GC/100mL*	*E. coli MPN/100mL*
6/18/2024	726	2481
8/6/2024	1232	2603
10/1/2024	145	583
2024 Geomean		400

35	Van Dyke/13 Mile - Red Run Drain	
Date	HF183GC/100mL	*E. coli* MPN/100mL
6/4/2024	8084	959
8/6/2024	3032	9804
2024 Geomean		363

43	Wellington Crescent/Harper - Clinton River & Sp	
Date	HF183GC/100mL	*E. coli* MPN/100mL
6/18/2024	337	2187
8/6/2024	979	2046
2024 Geomean		224

55	Utica Road & Red Run River	
Date	HF183GC/100mL	*E. coli* MPN/100mL
6/4/2024	1137	465
6/18/2024	13368	2143
8/6/2024	2526	6867
9/10/2024	884	1017
10/1/2024	587	1222
2024 Geomean		514

56.5	Schoenherr Relief Drain @ Red Run	
Date	HF183GC/100mL	*E. coli* MPN/100mL
8/6/2024	1926	24196

69	Clinton River Road - Canal Drain	
Date	HF183GC/100mL	*E. coli* MPN/100mL
8/6/2024	95	9804
2024 Geomean		385

72	Schoenherr - Sterling Relief	
Date	HF183GC/100mL	*E. coli* MPN/100mL
8/6/2024	98	>24196.0
9/10/2024	234	2098
2024 Geomean		806

75	Schoenherr - Sterling Relief	
Date	HF183GC/100mL	*E. coli* MPN/100mL
8/6/2024	5653	6867
2024 Geomean		511

82	Van Dyke Road - Bear Creek	
Date	HF183GC/100mL	*E. coli* MPN/100mL
6/4/2024	5621	1106
8/6/2024	3158	14136
9/10/2024	10800	2359
10/1/2024	1547	1483
2024 Geomean		1810

85	Van Dyke Road - Bear Creek

2024 Geomean		268

61.2	Harrison, Clinton Relief Drain	
Date	*HF183GC/100mL*	*E. coli MPN/100mL*
7/9/2024	139	1918
8/6/2024	1168	19863
10/1/2024	95	749
2024 Geomean		554

62	Kleino Road/Clinton River	
Date	*HF183GC/100mL*	*E. coli MPN/100mL*
6/4/2024	575	465
8/6/2024	101	8164
2024 Geomean		265
8/6/2024	2558	12997
9/10/2024	13200	2247
10/1/2024	10421	4352
2024 Geomean		746

96	Shadyside Park - Clinton River	
Date	*HF183GC/100mL*	*E. coli MPN/100mL*
6/18/2024	859	1414
8/6/2024	1642	5794
2024 Geomean		359

MCHD also has a robust beach monitoring program. Monitoring starts in April each year and continues through the September. Research indicates that most water quality issues (*E. coli* daily geomean exceedances) come from sources within three-quarters to one mile of the beach. *E. coli* levels fluctuate year-to-year, and it is important to determine sources to help mitigate poor water quality and protect public health. To assist in determining sources that may be impacting beach water quality, the MCHD is now employing Microbial Source Tracking (MST). During most beach sampling events, additional sample volume is collected. This additional volume is filtered and frozen for possible MST testing at the end of the recreational season. MST testing is expensive, and funding does not cover testing all samples collected. Water quality data (*E. coli*), weather, and AllBac data (if available) are examined, and samples are selected from each beach for MST testing at the end of the beach season. Both high- and low-level *E. coli* samples are tested for research purposes. MST testing is performed by Oakland University (OU). OU has been performing MST testing for MCHD's beach sampling program since 2019 for the human marker, HF183. In 2021, the gull and goose markers, Gull4 and ND2 respectively were added for testing. The canine (dog) marker, BacCan was added in 2023. These additional markers may be used in watershed sampling when human sources cannot be identified, and high *E. coli* levels exist. Beach MST testing has revealed that *E. coli* sources appear to be from bird and canine sources. The human marker is rarely observed in MST testing for the beach samples and does not correlate with high *E. coli* levels.

Next Steps

More work needs to be on how to interpret the MST results. Even though the samples are all collected from open surface waters, the water bodies have different morphology (flow, width, depth) that can contribute to differing loads and how to interpret both *E. coli* and MST sample results.

For 2025, the Macomb County Health Department will continue with its routine surface water program. Follow-up sampling along with other IDEP activities will also be conducted on sites where the human marker was found from the 2024 MST monitoring.

Watershed Hub GIS Mapper

The Watershed Hub GIS Mapper is a secure-access tool that compiles data from the work detailed in this report and other stakeholder efforts. It serves as a centralized resource for southeast Michigan water quality data that helps the user to see beyond political boundaries and explore watershed-scale solutions to shared challenges. It directly houses or links to multiple datasets sourced from USGS, EGLE, the Southeast Michigan Council of Governments, the City of Detroit, ARC, Macomb, Oakland, and Wayne Counties, and GLWA. These include current and historical data related to water quality, green infrastructure and stormwater investments, rain gauges, habitat restoration, and more. Data can be viewed within the mapper or downloaded by the user fur further exploration elsewhere. The Watershed Hub GIS Mapper continues to be a key planning tool for the Work Group, and we are continuously working to identify and add new relevant data into the mapper. Access is available to GLWA Member Partners upon request.

2024 Sampling Season Lessons Learned

The Watershed Hub Work Group made progress towards multiple goals in 2024. This includes refining and implementing the second phase of the RWQMP, continuing to pilot the Investigational Sampling Program, and further development of the Watershed Hub GIS Mapper. This work has yielded the following general conclusions:

- Lack of funding and jurisdiction issues continue to be major barriers to regional stormwater management goals. Storm drains have a multitude of overlapping jurisdictions including County, City, and Roads departments. This system is further complicated by designations of what qualifies as Waters of the State. It is very common for these elements to be intermingled throughout a single watershed. In Macomb, Oakland, and Wayne counties, new county-level post construction stormwater control standards have been established and adopted by many municipalities which is a step in the right direction, but large hurdles remain including funding for long-term monitoring and maintenance, old zoning and landscaping ordinances restricting green infrastructure, and a lack of workforce trained in green infrastructure construction and maintenance. While the Bolt Decision has in many cases prevented the formation of stormwater utilities, Senate Bill 660 is latest attempt to find an avenue for creating them.
- Challenges related to permitting, funding, electrical connection availability, capacity within USGS, and physical access to proposed sites have all impacted the rollout of the RWQMP. Through our collaborative efforts most of these challenges have been overcome, with the program on track to be fully implemented in the spring of 2025. While there are countless potential uses for the enormous amount of new water quality data that has been made publicly available through this initiative, the initial goal of building a long-term baseline understanding of regional water quality still stands. With that in mind, the benefits of this program will continue to grow each year.
- The majority of investigational grab sample sites returned elevated *E. coli* concentrations during wet weather sampling, yielding poor guidance for prioritizing sites for follow-up “end of pipe”

MS4 outfall screening to identify illicit discharges. Using the geometric mean *E. coli* concentrations from dry-weather sampling across the sampling season is a more useful measure for outfall screening prioritization. In addition, this insight may lend itself to the need or opportunity for identifying interim targets and milestones. For example, *E.coli* water quality goals could be to achieve low *E. coli* concentrations during dry weather, then interim weather, and then eventually during wet weather.

- Following extensive grab sampling at the "end of the pipe" confirming pervasive and/or inconsistent high *E. coli* concentrations in both the Clinton and Rouge Rivers, particularly during wet weather, it may make sense to consider allocating a greater portion of resources to a source control approach to improving water quality. This could include surveying up-system locations throughout the watershed to find and eliminate visible building and other code violations (e.g. improper waste/dumpster storage by businesses) that are impacting downstream water quality, or greater use of smoke and dye testing to identify illicit connections. Other examples of alternative in-depth investigative approaches include time of sale or building renovation inspections funded in part by sanitary sewer fees as a system integrity confirmation service. In general, allowing permit holders to employ a more flexible and varied programmatic approach to investigations based on individual circumstances may yield better outcomes for less cost.

- MST analysis is a relatively new tool for MS4 IDEP/TMDL investigations. As this group continues to explore this strategy, our work may inform future best practices. Several challenges remain to wider use of MST including:
    - Costs remain high (up to 4x the cost of *E. coli* analysis) and prohibitive to wider use of the practice.
    - Lab capacity is extremely limited. In 2024, only Michigan State University and Oakland University labs offered MST-(HF183) testing, and no local private laboratories offering the service.
    - The laboratory scarcity issue is exacerbated by the fact that EGLE MS4 guidance hold times are very short, making collection and timely delivery difficult if not impossible for most collection event opportunities.
    - Some labs can require an entire liter to conduct MST testing, which can be a difficult quantity to collect from a trickling outfall during dry weather conditions.
    - As a new testing frontier, more work needs to be done to properly interpret MST results, as they can be inconsistent. For example, a single site may yield a high *E. coli* count with a human marker one day, and a high *E. coli* count with a non-human marker another day. In addition, MST sampling does not necessarily confirm if the markers identified come from old deposits of sediment that have been stirred up in some way, or a current illicit connection.

Next Steps

In 2025 the Watershed Hub Work Group will continue to meet regularly to share information on local initiatives, discuss best practices and regulatory considerations, and generally encourage further regional partnerships and collaboration around data sharing, analysis, and water quality investigations. Members will build on previous efforts by advancing county-level IDEP programs, further exploring MST sampling as a tool for follow-up investigations, working with the USGS to carry out the RWQMP, and adding data into the Watershed Hub GIS mapper as it becomes available. The Group will also seek opportunities through webinars or other platforms to share lessons learned with a wider audience and continue to advocate for flexible and effective approaches to satisfying water quality permit requirements.

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