

# Milwaukee River Basin Bacteria TMDL Study Drainage Memo

## Map and Inventory of Possible Sources

Prepared for:



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# Study Overview

The Wisconsin Department of Transportation (WisDOT) is required by WDNR WPDES General Permit No. WI-S066800-2, Transportation Separate Storm Sewer System (TS4) Permit Section 3.5.1 (see **Appendix 1**), to create a map and inventory of possible bacteria (fecal coliform and E. coli) sources in the Milwaukee River Total Maximum Daily Load (TMDL) watershed that drain to or are adjacent to WisDOT owned highways, excluding connecting highways. Further, the TS4 requires WisDOT to develop a bacteria elimination plan if sources are found.

WisDOT is using a step-by-step approach to meet these requirements. WisDOT's first step was to direct AECOM, using MC 0697-03-34, WO 02, to develop a process and tools to identify possible bacteria sources in the Milwaukee River watershed as a pilot to study. The pilot study area included 80 miles of the 265 miles (approximately one-quarter) of WisDOT owned highways within the watershed area. The pilot included tracking the time and effort to perform the work.

## Pilot Study Steps:

1. Develop a GIS map of the Milwaukee River TMDL watershed showing WisDOT roadways and select approximately 80 miles of representative rural, suburban and urban roadways to study.
2. Perform a desktop analysis to locate possible bacteria sources.
3. Develop a spreadsheet inventory of these possible bacteria sources.
4. Perform a field investigation of the selected possible bacteria sources using the investigation form to document findings.
5. List the level of effort and costs to do the work.
6. Summarize the lessons learned from the pilot study.

The pilot study was started in September 2024 and 80 miles were completed by January of 2025. The remaining 185 miles of state-owned highway in the Milwaukee River TMDL watershed is planned to be completed later in 2025 and the results appended to this memo.

## 1. GIS Map Development

The GIS maps included in this study were created using ArcGIS Pro version 3.2.0. The maps show the Milwaukee River TMDL watershed limits, WisDOT highways, some location elements, portions of highways classified into rural, suburban and urban studied in the pilot, and potential bacteria sources needing field investigation.

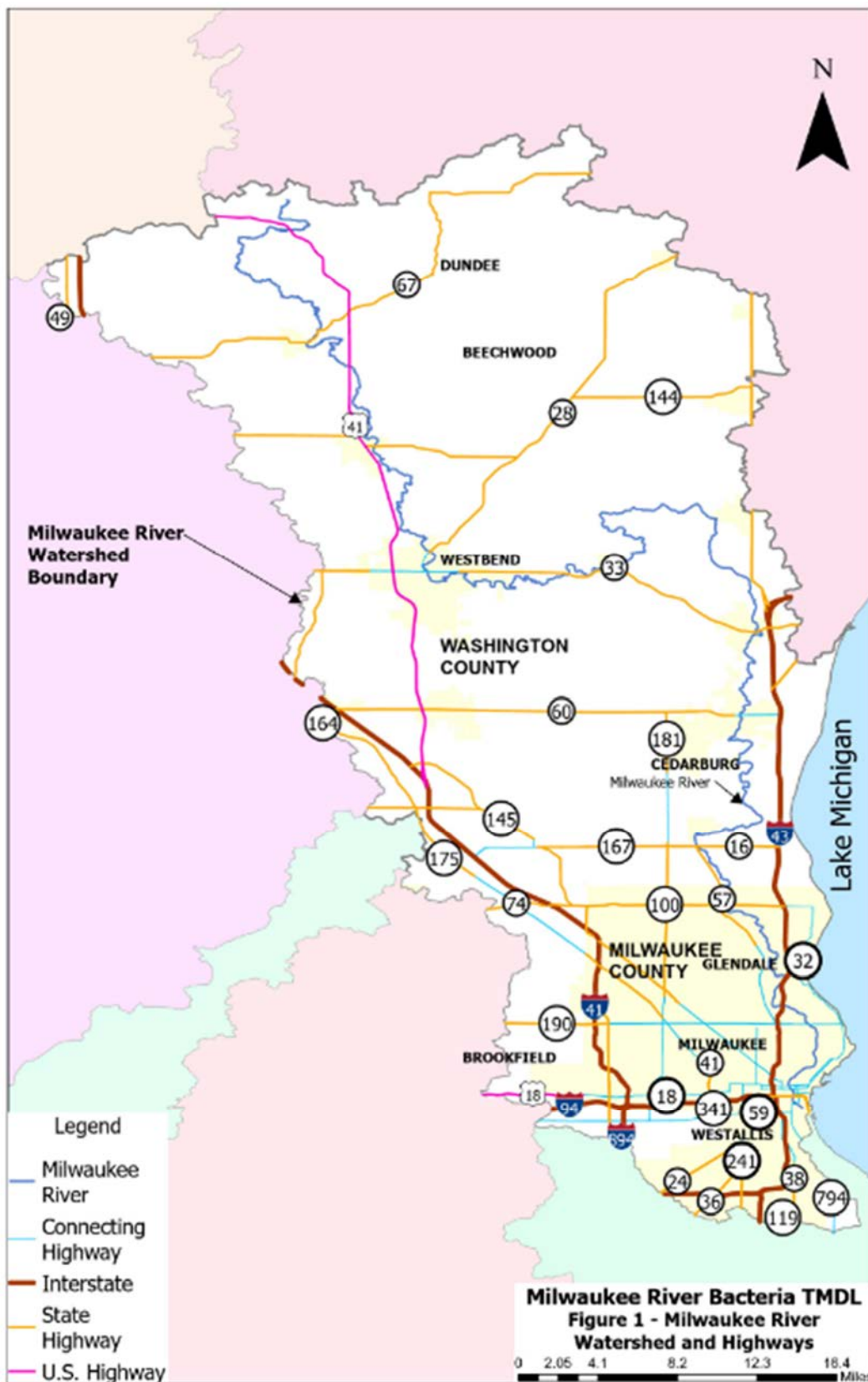
Eighty miles of highway were selected for the pilot study. The process of selecting the 80 miles of highway was as follows:

1. Select highway segments in rural, suburban and urban areas.
2. Keep as many segments as possible contiguous to make the desktop analysis and site selection process more efficient and reduce travel time for field investigations.
3. Add unique highway sections such as those through small towns and by any Concentrated Animal Feeding Operations (CAFOs)

The 80 miles of highway selected include:

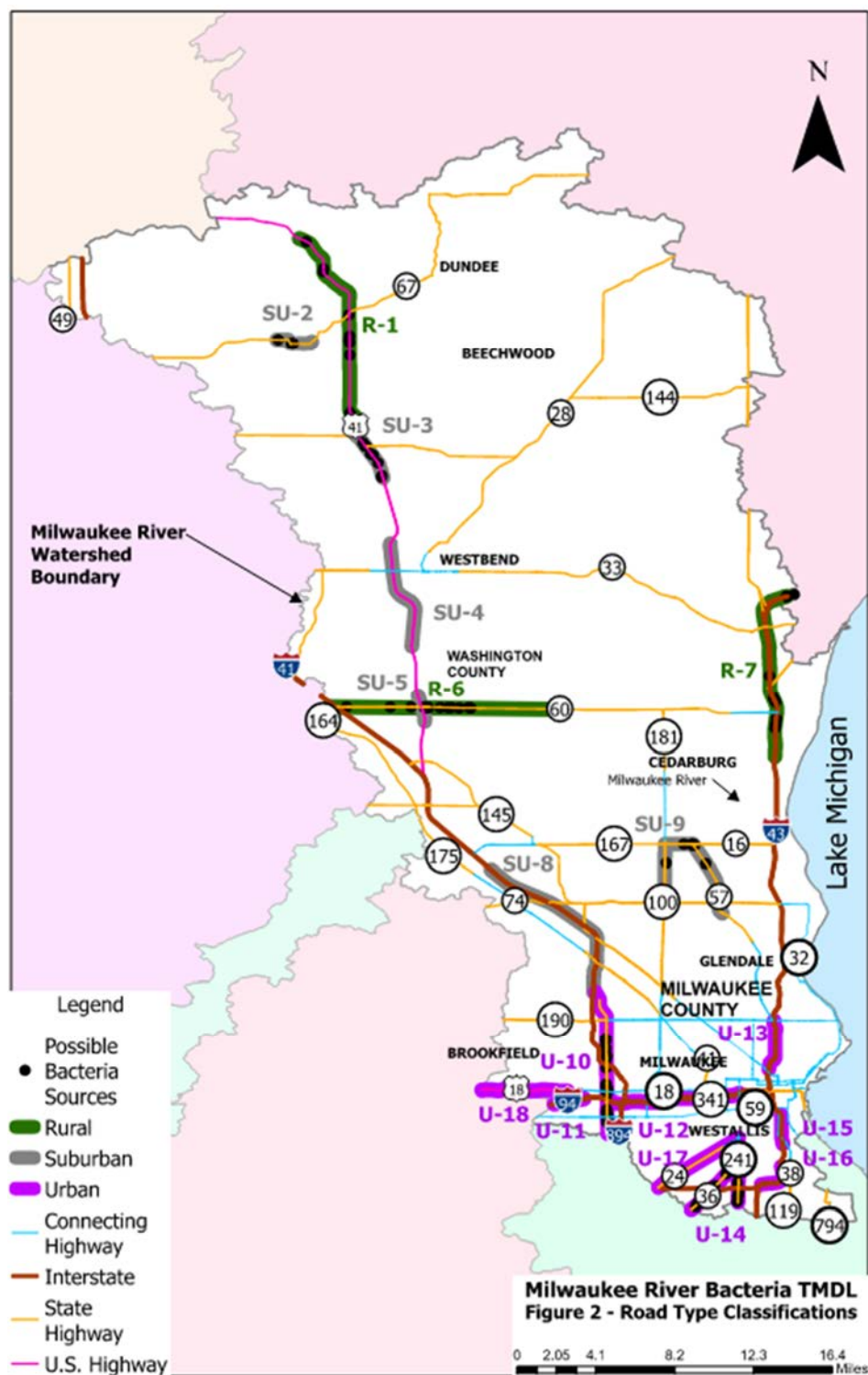
1. 28.6 miles of highway in rural areas (3 segments).
2. 26.9 miles of highway in suburban areas (6 segments).
3. 24.1 miles of highway in urban areas (9 segments).

**Figure 1.** Milwaukee River TMDL watershed drainage basin showing the Interstates, US Highways and State Trunk Highways.

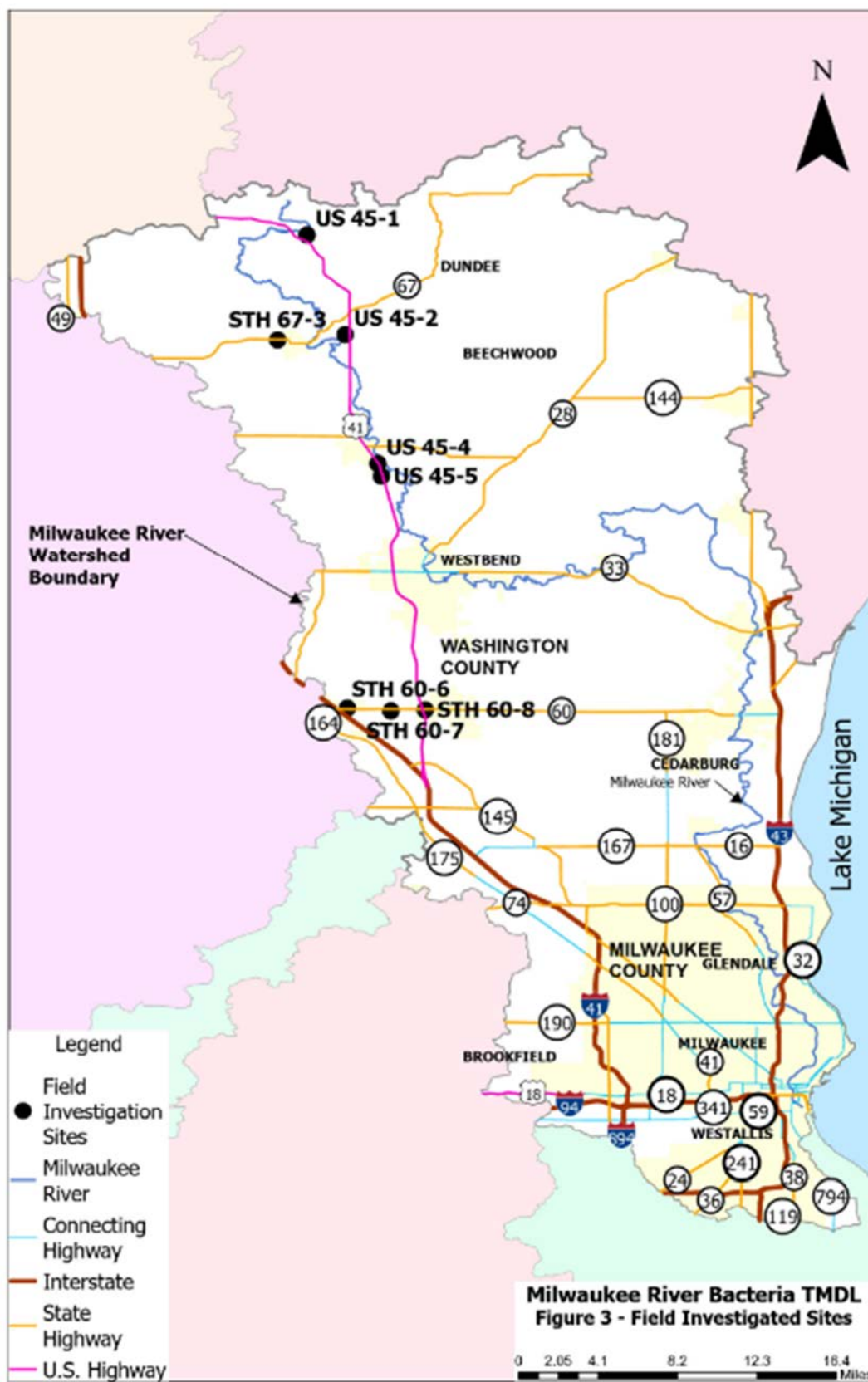




**Figure 2.** Milwaukee River TMDL drainage basin showing the 80 miles of highway selected in the pilot study and all the possible bacteria sources identified during the desktop analysis. In this figure, green represents highways in rural areas, gray indicates highways in suburban areas, and purple indicates highways in urban areas. The highway sections are labeled according to the watershed area they're located in, R for rural, SU for suburban, and U for urban. The highway sections are numbered starting from the northern section of the watershed and going south.



**Figure 3.** Field investigation sites labeled with the highway name (i.e. U.S. Highway 45 is US-45) along with the corresponding I.D. number. These labels correspond to the labels in **Appendix 2c**.



## 2. Desktop Analysis

A desktop mapping and viewing analysis was conducted to locate possible bacteria sources along WisDOT owned highways. Using the Google Maps aerial imagery and street view options, AECOM searched for any areas listed in the possible bacteria sources list shown below that were adjacent to the highway. If a possible bacteria source was identified, it was cataloged in the spreadsheet inventory. Further investigation was done using Google Street View and topographic maps to determine if the site drained to the highway right-of-way (ROW). If the site did drain to the highway ROW, it was flagged for field investigation.

### Possible Sources of Bacteria

- Sanitary sewer overflow locations
- Livestock housed or raised adjacent to the highway right-of-way
- Manure storage sites
- Zoos
- Kennels
- Animal breeders
- Pet stores
- Dog training facilities
- Waste hauling
- Storage and transfer facilities
- Areas that attract congregations of nuisance urban birds and wildlife
- Known or suspected properties with inadequate food or organic waste handling or storage
- Composting sites or facilities
- CAFOs and barns immediately adjacent to the highway
- Urban parks
- Wet detention ponds
- The Milwaukee County Zoo
- Dead animal transfer locations
- Known or suspected areas with improper human sanitation use
- Fast food restaurants
- Any other sources that the permittee of the DNR has reason to believe are discharging bacteria to the highway right-of-way (none were forwarded to WisDOT by the DNR).

### Develop Spreadsheet Inventory

The desktop analysis was recorded in the spreadsheet inventory **Appendix 2. Appendix 2a** is a summary of the desktop Google Street View analysis broken down by the type of watershed subarea (rural, suburban, and urban) to provide a varied sample set of land uses for highways in the watershed for the pilot study. This distinction will become irrelevant when the balance of the TMDL is reviewed when the miles of WisDOT highway miles for this study are completed. There is additional information such as the start location of the analysis, the miles analyzed, and the time it took to analyze this segment of highway in this spreadsheet tab. The cost analysis was developed using the data in this table.

**Appendix 2b** includes every identified possible bacteria location in the pilot study, along with detailed information such as coordinates, type of source, and screenshots from street view. Following discussion and review with WisDOT, eight locations required field investigations (**Appendix 2c**). The 8 possible bacteria locations were noted in **Appendix 2a** as well.

### 3. Field Investigation

On October 8, 2024, AECOM staff and the WisDOT BTS-ESS Statewide Stormwater Quality Engineer, completed a field investigation of the eight possible bacteria sources identified from the desktop analysis that drained to the highway right-of-way. Each site review was conducted visually and only from the public ROW, avoiding any entry onto private properties. Observational assessments focused on the surrounding area drainage to the highway ROW and where possible bacteria sources may be on the site (i.e. dog play areas, grease traps, etc.). Photos of the site and ROW area were taken and an investigation form completed for each site.

The investigation form described the possible bacteria site, where the bacteria source is located and if it drains to the ROW. It includes space for site photos as well.

During this investigation, no indicators of bacterial contamination were identified across the eight sites. Each investigation took approximately 22 minutes per site, not including driving time. The completed investigation forms are in **Appendix 3**.

### 4. Cost Analysis

The pilot study costs include the raw hourly rates for two inspectors plus overhead and fixed fees. The direct costs include total mileage plus lunches for two inspectors. The total cost includes an additional 5% to account for project management. The final cost estimate is \$573 per mile of highway (\$45,820 total cost/80 miles studied). If the balance of the TMDL were evaluated the cost estimate for the remaining 185 miles would be \$105,959 (\$573 per mile \* 185 miles).

No.	Task	Time Spent (hours)	Cost
1	GIS setup	20	\$1,900
2	Desktop Analysis	67	\$5,490
3	Field Investigation (80 miles)	16	\$1,310
4	Document preparation & Report/Memo	100	\$8,190
5	Meeting & Discussion	9	\$780
6	Direct Costs	Travel Mileage/Lunch 2x	\$170
7	Overhead Costs		\$22,160
8	Fixed Fee		\$3,640
	<b>Totals (including project management)</b>		<b>\$45,820</b>

### 5. Lessons Learned

#### ArcGIS Setup

The possible bacteria sites identified for field investigation are numbered first by highway name and then by numbered going north to south and east to west. For example, the most northeast site on US Highway 45 is US 45-1 and the most southwest site on State Highway 60 is STH 60-8.

## Desktop Analysis

Perform a keyword search on Google Maps using terms such as "pet," "vet," "grooming", etc. at the beginning of each section analysis. This approach can save time and provide an initial indication of whether the selected section contains any apparent possible bacteria sources. It is also crucial to conduct a detailed review using Google Street View, as there may be unnamed farms or animal-related areas with possible bacterial sources that might be overlooked. Utilize Google Earth or GIS tools to obtain detailed elevation data if determining the water flow direction from Google Maps proves challenging. These tools provide precise topographic information that can help accurately assess flow paths. Typically, a half mile or less was found to be a manageable length of roadway to perform the detailed desktop analysis.

## Field Investigation

This task should be done with two staff for the most efficiency and for safety. One person should take photos and the other should fill out the investigation form. Take notes to describe the flow path going from the possible bacteria site to the ROW.

## 6. Results of the Pilot Study Field Investigation

The eight field sites did not reveal any signs of bacteria draining into the WisDOT owned ROW. The sites either had sufficient lawns that acted as a filter strip for any bacteria before getting to the ROW or the possible sources of bacteria (e.g. animal walking areas) were well maintained and there was no evidence of bacteria from the site draining to the ROW.

## 7. Recommended Next Steps

1. Develop a new Work Order Contract to perform the bacteria study for the rest of the roadways in the Milwaukee River Watershed.
2. Share the results with the DNR as part of the TS4 Report.
3. If potential bacteria sources are found when the entire watershed is studied, develop a bacteria management plan. This may involve coordination with local units of government.

## Appendix 1: WPDES Permit No. WI-S066800-2, Section 3.5

### TMDL Compliance and Implementation for Bacteria Waste Load Allocations (WLA).

**3.5 TMDL Compliance and Implementation for Bacteria WLAs.** This section applies to TMDL reachsheds with a bacteria WLA specified in the Milwaukee River Basin TMDL Final Report dated March 19, 2018. DOT shall comply with the following: By September 30, 2026, the DOT shall develop and submit to the Department an inventory of bacteria sources and a map indicating the locations of the possible sources of fecal coliform and *E. coli* entering its TS4. The inventory shall be in a tabular format and include a label code, the name of the source, the physical address or location description of the source, and the ownership of the source (i.e. public or private). The map shall be to scale, identify all streets within the TS4, and indicate the locations of the sources using the label codes. The DOT shall consider the variation in flow conditions in its identification of possible sources. The inventory and map shall include the following possible sources of bacteria such as:

- Sanitary sewer overflow locations.
- Livestock housed or raised adjacent to the TS4 permitted area and discharging to the TS4, but not including household pets.
- Zoos, kennels, animal breeders, pet stores, and dog training facilities.
- Waste hauling, storage, and transfer facilities.
- Areas that attract congregations of nuisance urban birds and wildlife.
- Known or suspected properties with inadequate food or organic waste handling or storage.
- Composting sites or facilities.
- Known or suspected areas with improper human sanitation use.
- Any other source that the permittee or the Department has a reason to believe is discharging bacteria to the TS4.

**3.5.2.** By September 30, 2027, the DOT shall collaborate with adjacent municipalities to submit to the Department a proposed bacteria source elimination plan. The plan shall consist of a strategy and prioritization scheme to eliminate each source of bacteria identified under section 3.5.1. The plan shall include:

- A copy of the evidence provided to the adjacent MS4.
- How DOT is collaborating with the MS4 containing the source to eliminate it.
- If appropriate, add filter strips or other green infrastructure practice to break the flow path and intercept the bacteria sources.
- What education was provided to the owner of the source area and how it was provided.

**Note:** While the TMDL allocations in the Milwaukee River Basin TMDL are expressed only in terms of fecal coliform, both fecal coliform and *E. coli* have been listed as sources of recreational use impairments that the TMDL was completed to address.

## Appendix 2: Desktop Analysis Spreadsheets

**Appendix 2a - Desktop Analysis Logs for Rural Drainage Areas**

Highway Segment No. Analyzed	Segment Number	Highway Name	Type of Highway	Start Location	GIS Source	Subarea	Miles	Desktop Analysis Time (Minutes)	Notes
1	R-1	US Highway 45	US Highway	US 45 & 3938-3816 County Rd W	Google Maps	Rural	0.32	26	Possible bacteria source identified - US 45-1
2	R-1	US Highway 45	US Highway	43.673095, -88.270547	Google Maps	Rural	0.33	21	-
3	R-1	US Highway 45	US Highway	43.669565, -88.268019	Google Maps	Rural	0.43	30	-
4	R-1	US Highway 45	US Highway	Mitchell Rd 43.666649, -88.266030	Google Maps	Rural	0.30	17	-
5	R-1	US Highway 45	US Highway	Schultz Family Farms N3132 US-45, Eden, WI 53019	Google Maps	Rural	0.45	22	-
6	R-1	US Highway 45	US Highway	43.650352, -88.259693	Google Maps	Rural	0.33	21	-
7	R-1	US Highway 45	US Highway	Dave's Auto & Truck N2935 US-45, Campbellsport, WI	Google Maps	Rural	0.49	32	-
8	R-1	US Highway 45	US Highway	Woodland Dr 43.644852, -88.253117	Google Maps	Rural	0.36	26	-
9	R-1	US Highway 45	US Highway	Happy Hollow Rd 43.637673, -88.243214	Google Maps	Rural	0.51	24	-
10	R-1	US Highway 45	US Highway	43.636121, -88.241360	Google Maps	Rural	0.36	22	-
11	R-1	US Highway 45	US Highway	Valley Hydro Excavation LLC N 2496, N2496 US-45,	Google Maps	Rural	0.35	19	-
12	R-1	US Highway 45	US Highway	43.623319, -88.240980	Google Maps	Rural	0.32	35	-
13	R-1	US Highway 45	US Highway	Lovers Rd & Jim Pfantz Concrete Contractor	Google Maps	Rural	0.38	26	-
14	R-1	US Highway 45	US Highway	O'Henrys Service N1776 US-45, Campbellsport, WI	Google Maps	Rural	0.35	29	Possible bacteria source identified - US 45-2
15	R-1	US Highway 45	US Highway	Sunset Dr 43.601289, -88.240646	Google Maps	Rural	0.41	26	-
16	R-1	US Highway 45	US Highway	43.593914, -88.240612	Google Maps	Rural	0.36	22	-
17	R-1	US Highway 45	US Highway	43.589232, -88.240598	Google Maps	Rural	0.39	28	-
18	R-1	US Highway 45	US Highway	Gatzke Ln, 43.579337, -88.240582	Google Maps	Rural	0.38	24	-
19	R-1	US Highway 45	US Highway	Haven Dr & Christy Ln 43.572110, -88.240546	Google Maps	Rural	0.42	21	-
20	R-1	US Highway 45	US Highway	Auburn Ashford Dr 43.564818, -88.240525	Google Maps	Rural	0.37	25	-
21	R-1	US Highway 45	US Highway	Old BridGE Rd, 43.557505, -88.240597	Google Maps	Rural	0.34	22	-
22	R-1	US Highway 45	US Highway	Sandy Rd 43.550218, -88.240709	Google Maps	Rural	0.42	28	-
23	R-1	US Highway 45	US Highway	43.544671, -88.238424	Google Maps	Rural	0.38	21	-
24	R-1	US Highway 45	US Highway	Co Hwy V 43.532524, -88.236068	Google Maps	Rural	0.37	29	-
25	R-6	State Highway 60	State Highway	43.324522, -88.257033	Google Maps	Rural	0.49	31	-
26	R-6	State Highway 60	State Highway	Tillie Lake Veterinary Clinic 2015 American Eagle Dr, Slinger,	Google Maps	Rural	0.34	24	Possible bacteria source identified - STH 60-6
27	R-6	State Highway 60	State Highway	43.324479, -88.225335	Google Maps	Rural	0.34	22	-
28	R-6	State Highway 60	State Highway	Scenic Rd 43.324507, -88.221458	Google Maps	Rural	0.38	25	-
29	R-6	State Highway 60	State Highway	Pet Resort 3473 WI-60 Trunk, Jackson, WI	Google Maps	Rural	0.33	23	Possible bacteria source identified - STH 60-7
30	R-6	State Highway 60	State Highway	Lily Rd 43.324552, -88.206940	Google Maps	Rural	0.35	24	-
31	R-6	State Highway 60	State Highway	S Mayfield Rd 43.324535, -88.202120	Google Maps	Rural	0.30	20	-
32	R-6	State Highway 60	State Highway	John's A-1 Auto Body 43.324487, -88.194546	Google Maps	Rural	0.33	21	-
33	R-6	State Highway 60	State Highway	Tillie Rd 43.324471, -88.190800	Google Maps	Rural	0.36	27	-
34	R-6	State Highway 60	State Highway	Pharmacial Way 43.324507, -88.184384	Google Maps	Rural	0.34	21	-
35	R-6	State Highway 60	State Highway	Pharmacial Way 43.324342, -88.184384	Google Maps	Rural	0.32	10	-
36	R-6	State Highway 60	State Highway	Pharmacial Way 43.324299, -88.183708	Google Maps	Rural	0.35	21	Possible bacteria source identified - STH 60-8
37	R-6	State Highway 60	State Highway	3747-3731 Co Hwy P 43.324516, -88.183236	Google Maps	Rural	0.43	29	-
38	R-6	State Highway 60	State Highway	43.324249, -88.173066	Google Maps	Rural	0.42	34	-



Highway Segment No. Analyzed	Segment Number	Highway Name	Type of Highway	Start Location	GIS Source	Subarea	Miles	Desktop Analysis Time (Minutes)	Notes
39	R-6	State Highway 60	State Highway	43.324091, -88.169392	Google Maps	Rural	0.39	30	-
40	R-6	State Highway 60	State Highway	S Center St 43.324006, -88.166592	Google Maps	Rural	0.34	20	-
41	R-6	State Highway 60	State Highway	Jackson Dr 43.323917, -88.162135	Google Maps	Rural	0.38	27	-
42	R-6	State Highway 60	State Highway	Ridgeway Rd 43.323759, -88.155322	Google Maps	Rural	0.35	29	-
43	R-6	State Highway 60	State Highway	Eagle Dr 43.323645, -88.149649	Google Maps	Rural	0.40	30	-
44	R-6	State Highway 60	State Highway	Maple Rd 43.323528, -88.142322	Google Maps	Rural	0.56	35	-
45	R-6	State Highway 60	State Highway	Division Rd 43.323265, -88.122831	Google Maps	Rural	0.44	25	-
46	R-6	State Highway 60	State Highway	Johnson Ln 43.323199, -88.117514	Google Maps	Rural	0.42	27	-
47	R-6	State Highway 60	State Highway	Center Rd 43.323139, -88.112561	Google Maps	Rural	0.38	29	-
48	R-6	State Highway 60	State Highway	Lusan Dr 43.323050, -88.106258	Google Maps	Rural	0.46	29	-
49	R-6	State Highway 60	State Highway	Church Rd 43.322991, -88.102617	Google Maps	Rural	0.60	36	-
50	R-6	State Highway 60	State Highway	Briarwood Dr 43.322734, -88.086632	Google Maps	Rural	0.40	20	-
51	R-6	State Highway 60	State Highway	County Dr 43.322647, -88.082847	Google Maps	Rural	0.44	30	-
52	R-7	Interstate 43	Interstate	43.407938, -87.912368	Google Maps	Rural	0.36	25	-
53	R-7	Interstate 43	Interstate	Co Hwy B 43.411539, -87.890783	Google Maps	Rural	0.45	33	-
54	R-7	Interstate 43	Interstate	43.409387, -87.906476	Google Maps	Rural	0.38	24	-
55	R-7	Interstate 43	Interstate	43.408031, -87.912087	Google Maps	Rural	0.40	22	-
56	R-7	Interstate 43	Interstate	43.405506, -87.920654	Google Maps	Rural	0.47	34	-
57	R-7	Interstate 43	Interstate	43.401633, -87.928022	Google Maps	Rural	0.45	23	-
58	R-7	Interstate 43	Interstate	43.388752, -87.928841	Google Maps	Rural	0.75	35	-
59	R-7	Interstate 43	Interstate	43.375724, -87.926430	Google Maps	Rural	0.63	33	-
60	R-7	Interstate 43	Interstate	E Sauk Rd 43.368321, -87.925578	Google Maps	Rural	0.61	27	-
61	R-7	Interstate 43	Interstate	E Sauk Rd 43.368321, -87.925579	Google Maps	Rural	0.49	22	-
62	R-7	Interstate 43	Interstate	43.353146, -87.925195	Google Maps	Rural	0.47	25	-
63	R-7	Interstate 43	Interstate	43.344555, -87.925037	Google Maps	Rural	0.51	29	-
64	R-7	Interstate 43	Interstate	43.334466, -87.923981	Google Maps	Rural	0.42	18	-
65	R-7	Interstate 43	Interstate	Arrowhead Rd 43.331342, -87.922045	Google Maps	Rural	0.45	29	-
66	R-7	Interstate 43	Interstate	43.328154, -87.920505	Google Maps	Rural	0.48	28	-
67	R-7	Interstate 43	Interstate	43.315675, -87.919912	Google Maps	Rural	0.35	27	-
68	R-7	Interstate 43	Interstate	43.311660, -87.920333	Google Maps	Rural	0.45	30	-
69	R-7	Interstate 43	Interstate	Lakefield Rd 43.296644, -87.920758	Google Maps	Rural	0.43	19	-
Totals							28.31	1778	

**Appendix 2a - Desktop Analysis Logs for Suburban Drainage Areas**

Highway Segment No. Analyzed	Segment Number	Highway Name	Type of Highway	Start Location	GIS Source	Subarea	Miles	Desktop Analysis Time (Minutes)	Notes
1	SU-3	US Highway 45	US Highway	43.532071, -88.236230	Google Maps	Suburban	0.38	22	-
2	SU-3	US Highway 45	US Highway	43.528458, -88.235106	Google Maps	Suburban	0.45	27	-
3	SU-3	US Highway 45	US Highway	43.521078, -88.228967	Google Maps	Suburban	0.42	23	-
4	SU-3	US Highway 45	US Highway	43.513882, -88.223724	Google Maps	Suburban	0.56	38	-
5	SU-3	US Highway 45	US Highway	43.506529, -88.218330	Google Maps	Suburban	0.63	35	Possible bacteria source identified - US 45-5
6	SU-3	US Highway 45	US Highway	43.448584, -88.209398	Google Maps	Suburban	0.57	10	Possible bacteria source identified - US 45-4
7	SU-4	US Highway 45	US Highway	43.443507, -88.209834	Google Maps	Suburban	0.39	12	-
8	SU-4	US Highway 45	US Highway	43.432580, -88.208738	Google Maps	Suburban	0.45	25	-
9	SU-4	US Highway 45	US Highway	43.427383, -88.208277	Google Maps	Suburban	0.44	23	-
10	SU-4	US Highway 45	US Highway	43.421085, -88.207334	Google Maps	Suburban	0.56	29	-
11	SU-4	US Highway 45	US Highway	43.412806, -88.205722	Google Maps	Suburban	0.55	28	-
12	SU-4	US Highway 45	US Highway	43.408029, -88.201224	Google Maps	Suburban	0.55	21	-
13	SU-4	US Highway 45	US Highway	43.403371, -88.194032	Google Maps	Suburban	0.37	19	-
14	SU-4	US Highway 45	US Highway	43.397760, -88.191214	Google Maps	Suburban	0.43	21	-
15	SU-4	US Highway 45	US Highway	43.393995, -88.191522	Google Maps	Suburban	0.38	19	-
16	SU-5	US Highway 45	US Highway	43.332399, -88.189313	Google Maps	Suburban	0.43	20	-
17	SU-5	US Highway 45	US Highway	43.324369, -88.186437	Google Maps	Suburban	0.46	25	-
18	SU-5	US Highway 45	US Highway	43.309579, -88.184830	Google Maps	Suburban	0.49	23	-
19	SU-2	State Highway 67	State Highway	N Baumann St 43.601140, -88.295406	Google Maps	Suburban	0.36	21	Possible bacteria source identified - STH 67-3
20	SU-2	State Highway 67	State Highway	N Railroad St 43.601086, -88.289284	Google Maps	Suburban	0.45	26	-
21	SU-2	State Highway 67	State Highway	N Fond Du Lac Ave 43.601076, -88.286972	Google Maps	Suburban	0.42	28	-
22	SU-2	State Highway 67	State Highway	S Fond Du Lac Ave 43.598131, -88.285200	Google Maps	Suburban	0.42	25	-
23	SU-2	State Highway 67	State Highway	S Helena St 43.598017, -88.276561	Google Maps	Suburban	0.41	21	-
24	SU-2	State Highway 67	State Highway	S Jenny St 43.597997, -88.274442	Google Maps	Suburban	0.38	20	-
25	SU-8	State Highway 41	State Highway	43.204381, -88.136649	Google Maps	Suburban	0.85	38	-
26	SU-8	State Highway 41	State Highway	43.192540, -88.122417	Google Maps	Suburban	0.49	25	-
27	SU-8	State Highway 41	State Highway	43.187803, -88.113338	Google Maps	Suburban	0.65	36	-
28	SU-8	State Highway 41	State Highway	43.181536, -88.098987	Google Maps	Suburban	0.44	26	-
29	SU-8	State Highway 41	State Highway	43.176358, -88.087492	Google Maps	Suburban	0.46	18	-
30	SU-8	State Highway 41	State Highway	43.173100, -88.082131	Google Maps	Suburban	0.72	39	-
31	SU-8	State Highway 41	State Highway	43.160267, -88.064065	Google Maps	Suburban	0.49	28	-
32	SU-8	State Highway 41	State Highway	43.146899, -88.054698	Google Maps	Suburban	0.41	27	-
33	SU-8	State Highway 41	State Highway	43.126479, -88.056599	Google Maps	Suburban	0.55	30	-
34	SU-9	Interstate 181	Interstate	43.170786, -88.004446	Google Maps	Suburban	0.43	31	-
35	SU-9	Interstate 181	Interstate	43.177771, -88.005319	Google Maps	Suburban	0.40	24	-
36	SU-9	Interstate 181	Interstate	43.180816, -88.004218	Google Maps	Suburban	0.42	25	-
37	SU-9	Interstate 181	Interstate	43.192558, -88.003678	Google Maps	Suburban	0.52	21	-



Highway Segment No. Analyzed	Segment Number	Highway Name	Type of Highway	Start Location	GIS Source	Subarea	Miles	Desktop Analysis Time (Minutes)	Notes
38	SU-9	Interstate 181	Interstate	43.201945, -88.003905	Google Maps	Suburban	0.67	35	-
39	SU-9	Interstate 181	Interstate	43.207120, -88.003593	Google Maps	Suburban	0.42	27	-
40	SU-9	Interstate 181	Interstate	43.218300, -88.003550	Google Maps	Suburban	0.63	31	-
41	SU-9	Interstate 167	Interstate	43.221621, -88.003530	Google Maps	Suburban	0.51	30	-
42	SU-9	Interstate 167	Interstate	43.221559, -87.993914	Google Maps	Suburban	0.45	23	-
43	SU-9	Interstate 167	Interstate	43.221565, -87.989645	Google Maps	Suburban	0.48	25	-
44	SU-9	Interstate 57	Interstate	43.221509, -87.982662	Google Maps	Suburban	0.69	37	-
45	SU-9	Interstate 57	Interstate	43.217223, -87.979983	Google Maps	Suburban	0.56	31	-
46	SU-9	Interstate 57	Interstate	43.214460, -87.978081	Google Maps	Suburban	0.57	31	-
47	SU-9	Interstate 57	Interstate	43.209467, -87.974604	Google Maps	Suburban	0.39	24	-
48	SU-9	Interstate 57	Interstate	43.204764, -87.971294	Google Maps	Suburban	0.40	20	-
49	SU-9	Interstate 57	Interstate	43.198495, -87.967482	Google Maps	Suburban	0.42	23	-
50	SU-9	Interstate 57	Interstate	43.192488, -87.964561	Google Maps	Suburban	0.51	35	-
51	SU-9	Interstate 57	Interstate	43.182794, -87.963358	Google Maps	Suburban	0.43	22	-
52	SU-9	Interstate 57	Interstate	43.178395, -87.961662	Google Maps	Suburban	0.34	23	-
53	SU-9	Interstate 57	Interstate	43.171991, -87.963156	Google Maps	Suburban	0.38	24	-
Totals							25.64	1370	















































Appendix 2a - Desktop Analysis Logs for Urban Drainage Areas									
Highway Segment No. Analyzed	Segment Number	Highway Name	Type of Highway	Start Location	GIS Source	Subarea	Miles	Desktop Analysis Time (Minutes)	Notes
23	U-10	State Highway 100	State Highway	43.110798, -88.055578	Google Maps	Urban	0.45	22	-
24	U-10	State Highway 100	State Highway	43.104749, -88.052782	Google Maps	Urban	0.39	18	-
25	U-10	State Highway 100	State Highway	43.096936, -88.051072	Google Maps	Urban	0.38	17	-
26	U-10	State Highway 100	State Highway	43.089567, -88.047600	Google Maps	Urban	0.42	21	-
27	U-10	State Highway 100	State Highway	43.085680, -88.047612	Google Maps	Urban	0.34	15	-
28	U-10	State Highway 100	State Highway	43.082129, -88.047634	Google Maps	Urban	0.41	21	-
29	U-10	State Highway 100	State Highway	43.074766, -88.047803	Google Maps	Urban	0.50	27	-
30	U-10	State Highway 100	State Highway	43.067419, -88.047665	Google Maps	Urban	0.51	25	-
31	U-10	State Highway 100	State Highway	43.059885, -88.047545	Google Maps	Urban	0.57	20	-
32	U-10	State Highway 100	State Highway	43.055323, -88.047462	Google Maps	Urban	0.43	19	-
33	U-10	State Highway 100	State Highway	43.045538, -88.047059	Google Maps	Urban	0.70	30	-
34	U-10	State Highway 100	State Highway	43.034925, -88.046968	Google Maps	Urban	0.45	19	-
35	U-10	State Highway 100	State Highway	43.027927, -88.047295	Google Maps	Urban	0.78	32	-
36	U-10	State Highway 100	State Highway	43.016329, -88.046786	Google Maps	Urban	0.58	20	-
37	U-10	State Highway 100	State Highway	43.009890, -88.046571	Google Maps	Urban	0.57	20	-
57	U-11	Interstate 94	Interstate	43.025536, -88.089483	Google Maps	Urban	0.97	28	-
58	U-12	Interstate 94	Interstate	43.027962, -88.031976	Google Maps	Urban	0.84	27	-
59	U-12	Interstate 94	Interstate	43.030453, -87.994076	Google Maps	Urban	0.88	24	-
60	U-12	Interstate 94	Interstate	43.033143, -87.966166	Google Maps	Urban	1.24	32	-
61	U-12	Interstate 94	Interstate	43.034608, -87.947165	Google Maps	Urban	0.92	29	-
15	U-18	US Highway 18	US Highway	43.036589, -88.141480	Google Maps	Urban	0.23	16	-
16	U-18	US Highway 18	US Highway	43.036852, -88.136904	Google Maps	Urban	0.27	20	-
17	U-18	US Highway 18	US Highway	43.036557, -88.131309	Google Maps	Urban	0.22	15	-
18	U-18	US Highway 18	US Highway	43.036594, -88.127099	Google Maps	Urban	0.32	21	-
19	U-18	US Highway 18	US Highway	43.037215, -88.120669	Google Maps	Urban	0.31	20	-
20	U-18	US Highway 18	US Highway	43.036413, -88.114363	Google Maps	Urban	0.38	25	-
21	U-18	US Highway 18	US Highway	43.036139, -88.106654	Google Maps	Urban	0.22	17	-
22	U-18	US Highway 18	US Highway	43.035940, -88.078277	Google Maps	Urban	0.26	21	-
49	U-13	Interstate 43	Interstate	43.089845, -87.921841	Google Maps	Urban	0.26	18	All elevated highway
50	U-13	Interstate 43	Interstate	43.085930, -87.921553	Google Maps	Urban	0.29	19	-
51	U-13	Interstate 43	Interstate	43.057689, -87.924116	Google Maps	Urban	0.21	15	-
52	U-13	Interstate 43	Interstate	43.054852, -87.925152	Google Maps	Urban	0.23	16	-
53	U-13	Interstate 43	Interstate	43.017736, -87.916494	Google Maps	Urban	0.26	18	-
54	U-13	Interstate 43	Interstate	43.000009, -87.916119	Google Maps	Urban	0.21	15	-
55	U-13	Interstate 43	Interstate	42.979424, -87.916406	Google Maps	Urban	0.23	17	-
56	U-13	Interstate 43	Interstate	42.975366, -87.915694	Google Maps	Urban	0.22	16	-
62	U-13	Interstate 94	Interstate	43.089660, -87.921875	Google Maps	Urban	0.69	21	-

Highway Segment No. Analyzed	Segment Number	Highway Name	Type of Highway	Start Location	GIS Source	Subarea	Miles	Desktop Analysis Time (Minutes)	Notes
63	U-13	Interstate 94	Interstate	43.077610, -87.920827	Google Maps	Urban	0.86	23	-
64	U-13	Interstate 94	Interstate	43.057687, -87.924193	Google Maps	Urban	0.84	22	-
38	U-14	State Highway 36	State Highway	42.946992, -87.983551	Google Maps	Urban	0.42	22	-
39	U-14	State Highway 36	State Highway	42.949369, -87.980755	Google Maps	Urban	0.58	23	-
40	U-14	State Highway 36	State Highway	42.951368, -87.978627	Google Maps	Urban	0.76	29	-
41	U-14	State Highway 36	State Highway	42.959956, -87.969420	Google Maps	Urban	0.49	19	-
42	U-14	State Highway 36	State Highway	42.964865, -87.965570	Google Maps	Urban	0.47	17	-
43	U-14	State Highway 36	State Highway	42.973688, -87.957389	Google Maps	Urban	0.54	24	-
44	U-14	State Highway 36	State Highway	42.975499, -87.955636	Google Maps	Urban	0.45	22	-
45	U-14	State Highway 241	State Highway	42.978269, -87.948513	Google Maps	Urban	0.58	22	-
46	U-14	State Highway 241	State Highway	42.974035, -87.948596	Google Maps	Urban	0.48	29	-
47	U-14	State Highway 241	State Highway	42.966791, -87.948717	Google Maps	Urban	0.43	25	-
48	U-14	State Highway 241	State Highway	42.960618, -87.948815	Google Maps	Urban	0.46	25	-
10	U-15	US Highway 38	US Highway	42.977911, -87.909548	Google Maps	Urban	0.28	19	-
11	U-15	US Highway 38	US Highway	42.973767, -87.909599	Google Maps	Urban	0.50	31	-
12	U-15	US Highway 38	US Highway	42.966477, -87.909679	Google Maps	Urban	0.50	30	-
13	U-15	US Highway 38	US Highway	42.959151, -87.909788	Google Maps	Urban	1.15	42	-
14	U-15	US Highway 38	US Highway	42.968002, -87.948749	Google Maps	Urban	0.28	18	-
65	U-15	Interstate 94	Interstate	43.019216, -87.917391	Google Maps	Urban	0.75	19	-
66	U-15	Interstate 94	Interstate	42.996446, -87.915363	Google Maps	Urban	0.93	26	-
67	U-16	Interstate 94	Interstate	42.979433, -87.916373	Google Maps	Urban	0.79	22	-
68	U-16	Interstate 94	Interstate	42.964995, -87.933120	Google Maps	Urban	1.19	34	-
1	U-17	US Highway 24	US Highway	43.000524, -87.948448	Google Maps	Urban	0.45	25	-
2	U-17	US Highway 24	US Highway	42.996286, -87.955531	Google Maps	Urban	0.25	18	-
3	U-17	US Highway 24	US Highway	42.993260, -87.960855	Google Maps	Urban	0.54	34	-
4	U-17	US Highway 24	US Highway	42.988399, -87.969098	Google Maps	Urban	0.41	23	-
5	U-17	US Highway 24	US Highway	42.986041, -87.972701	Google Maps	Urban	0.52	35	-
6	U-17	US Highway 24	US Highway	42.981061, -87.980855	Google Maps	Urban	0.47	24	-
7	U-17	US Highway 24	US Highway	42.973838, -87.992704	Google Maps	Urban	0.35	20	-
8	U-17	US Highway 24	US Highway	42.970289, -87.998149	Google Maps	Urban	0.28	18	-
9	U-17	US Highway 24	US Highway	42.966506, -88.004238	Google Maps	Urban	0.24	16	-
Totals							17.20	821	

### Appendix 2b - Possible Bacteria Sites from the Desktop Analysis






ID	Highway Name	Lat	Long	Address/Location	County	City/Village/Town	Rural/Urban/Suburban	Type of Bacteria Source	GIS Source (Google Earth, County/Municipal GIS, WisDOT DOTView)	Date of Field Verification	Google Street View Screen Shots	Google Aerial Map View	Decision
1	US Highway 45	43.52	-88.23	1526 Fond Du Lac Ave, Kewaskum, WI 53040	Washington and Fond du Lac	Village of Kewaskum	Suburban	Restaurant	Google Maps	N/A			Unlikely bacteria source
2	US Highway 45	43.52	-88.23	102 Main St, Kewaskum, WI 53040	Washington and Fond du Lac	Village of Kewaskum	Suburban	Restaurant	Google Maps	N/A			Unlikely bacteria source
3	US Highway 45	43.52	-88.23	1273 Fond Du Lac Ave, Kewaskum, WI 53040	Washington and Fond du Lac	Village of Kewaskum	Suburban	Restaurant	Google Maps	N/A			Unlikely bacteria source
4	US Highway 45	43.52	-88.23	109 Main St, Kewaskum, WI 53040	Washington and Fond du Lac	Village of Kewaskum	Suburban	Restaurant	Google Maps	N/A			Unlikely bacteria source
5	US Highway 45	43.52	-88.22	1041 Fond Du Lac Ave, Kewaskum, WI 53040	Washington and Fond du Lac	Village of Kewaskum	Suburban	Restaurant	Google Maps	N/A			Unlikely bacteria source
6	US Highway 45	43.513990	-88.22	1010 Fond Du Lac Ave, Kewaskum, WI 53040	Washington and Fond du Lac	Village of Kewaskum	Suburban	Restaurant	Google Maps	N/A			Unlikely bacteria source
7	US Highway 45	43.497640	-88.22	102 Badger Rd #45, Kewaskum, WI 53040	Washington	Town of Kewaskum	Rural	Restaurant	Google Maps	N/A			Unlikely bacteria source
8	State Highway 67	43.60	-88.28	116 E Main St, Campbellsport, WI 53010	Fond du Lac	Village of Campbellsport	Suburban	Restaurant	Google Maps	N/A			Unlikely bacteria source
9	State Highway 67	43.60	-88.28	128 E Main St, Campbellsport, WI 53010	Fond du Lac	Village of Campbellsport	Suburban	Restaurant	Google Maps	N/A			Unlikely bacteria source
10	State Highway 67	43.60	-88.28	153 E Main St, Campbellsport, WI 53010	Fond du Lac	Village of Campbellsport	Suburban	Restaurant	Google Maps	N/A			Unlikely bacteria source
11	Interstate 181	43.21	-88.00	7520 W Donges Bay Rd, Mequon, WI 53092	Ozaukee	City of Mequon	Suburban	Restaurant	Google Maps	N/A			Unlikely bacteria source
12	Interstate 167	43.221530	-87.99	6411 W Mequon Rd, Mequon, WI 53092	Ozaukee	City of Mequon	Suburban	Restaurant	Google Maps	N/A			Unlikely bacteria source
13	Interstate 57	43.221744	-87.98	5900 W Mequon Rd, Mequon, WI 53092	Ozaukee	City of Mequon	Suburban	Restaurant	Google Maps	N/A			Unlikely bacteria source
14	Interstate 57	43.220560	-87.98	11120 N Cedarburg Rd, Mequon, WI 53092	Ozaukee	City of Mequon	Suburban	Restaurant	Google Maps	N/A			Unlikely bacteria source
15	Interstate 57	43.22	-87.98	6005 W Mequon Rd, Mequon, WI 53092	Ozaukee	City of Mequon	Suburban	Restaurant	Google Maps	N/A			Unlikely bacteria source
16	Interstate 57	43.21	-87.97	10365 N Cedarburg Rd, Mequon, WI 53092	Ozaukee	City of Mequon	Suburban	Restaurant	Google Maps	N/A			Unlikely bacteria source
17	Interstate 57	43.19	-87.97	4327 W Schroeder Dr, Brown Deer, WI 53223	Milwaukee	Village of Brown Deer	Suburban	Restaurant	Google Maps	N/A			Unlikely bacteria source
18	Interstate 57	43.18	-87.96	9133 N Deerwood Dr, Brown Deer, WI 53223	Milwaukee	Village of Brown Deer	Suburban	Restaurant	Google Maps	N/A			Unlikely bacteria source
19	US Highway 45	43.65	-88.26	N3104 US-45, Campbellsport, WI 53010	Fond du Lac	Town of Osceola	Rural	Restaurant	Google Maps	N/A			Unlikely bacteria source
20	US Highway 45	43.62	-88.24	N 2245 US-45, Campbellsport, WI 53010	Fond du Lac	Town of Auburn	Rural	Restaurant	Google Maps	N/A			Unlikely bacteria source
21	US Highway 45	43.60	-88.24	N1690 US-45, Campbellsport, WI 53010	Fond du Lac	Town of Auburn	Rural	Restaurant	Google Maps	N/A			Unlikely bacteria source
22	US Highway 45	43.55	-88.24	192 US-45, Kewaskum, WI 53040	Fond du Lac	Town of Auburn	Rural	Restaurant	Google Maps	N/A			Unlikely bacteria source

ID	Highway Name	Lat	Long	Address/Location	County	City/Village/Town	Rural/Urban/Suburban	Type of Bacteria Source	GIS Source (Google Earth, County/Municipal GIS, WisDOT DOTView)	Date of Field Verification	Google Street View Screen Shots	Google Aerial Map View	Decision
23	State Highway 60	43.32	-88.18	N168W21991 Main St, Jackson, WI 53037	Washington	Village of Jackson	Rural	Restaurant	Google Maps	N/A			Unlikely bacteria source
24	State Highway 60	43.32	-88.17	W213 N16770, Glen Brooke Dr, Jackson, WI 53037	Washington	Village of Jackson	Rural	Restaurant	Google Maps	N/A			Unlikely bacteria source
25	State Highway 60	43.32	-88.16	N168W20594 Main St, Jackson, WI 53037	Washington	Village of Jackson	Rural	Restaurant	Google Maps	N/A			Unlikely bacteria source
26	State Highway 60	43.32	-88.16	N168W20101 Main St, Jackson, WI 53037	Washington	Village of Jackson	Rural	Restaurant	Google Maps	N/A			Unlikely bacteria source
27	State Highway 60	43.32	-88.15	N168W19490 Main St, Jackson, WI 53037	Washington	Town of Jackson	Rural	Restaurant	Google Maps	N/A			Unlikely bacteria source
28	State Highway 100	43.08	-88.05	3131 N Mayfair Rd, Wauwatosa, WI 53222	Milwaukee	City of Wauwatosa	Urban	Restaurant	Google Maps	N/A			Unlikely bacteria source
29	State Highway 100	43.07	-88.05	3041 N Mayfair Rd, Wauwatosa, WI 53222	Milwaukee	City of Wauwatosa	Urban	Restaurant	Google Maps	N/A			Unlikely bacteria source
30	State Highway 100	43.07	-88.05	2751 N Mayfair Rd, Wauwatosa, WI 53222	Milwaukee	City of Wauwatosa	Urban	Restaurant	Google Maps	N/A			Unlikely bacteria source
31	State Highway 100	43.07	-88.05	2711 N Mayfair Rd, Wauwatosa, WI 53222	Milwaukee	City of Wauwatosa	Urban	Restaurant	Google Maps	N/A			Unlikely bacteria source
32	State Highway 100	43.07	-88.05	2635 N Mayfair Rd, Wauwatosa, WI 53226	Milwaukee	City of Wauwatosa	Urban	Restaurant	Google Maps	N/A			Unlikely bacteria source
33	State Highway 100	43.06	-88.05	2350 N Mayfair Rd, Wauwatosa, WI 53226	Milwaukee	City of Wauwatosa	Urban	Restaurant	Google Maps	N/A			Unlikely bacteria source
34	State Highway 100	43.06	-88.05	2201 N Mayfair Rd, Wauwatosa, WI 53226	Milwaukee	City of Wauwatosa	Urban	Restaurant	Google Maps	N/A			Unlikely bacteria source
35	State Highway 100	43.05	-88.05	1701 N Mayfair Rd, Wauwatosa, WI 53226	Milwaukee	City of Wauwatosa	Urban	Restaurant	Google Maps	N/A			Unlikely bacteria source
36	State Highway 100	43.04	-88.05	869 N Mayfair Rd, Wauwatosa, WI 53226	Milwaukee	City of Wauwatosa	Urban	Restaurant	Google Maps	N/A			Unlikely bacteria source
37	State Highway 100	43.04	-88.05	817 N Mayfair Rd, Milwaukee, WI 53226	Milwaukee	City of Wauwatosa	Urban	Restaurant	Google Maps	N/A			Unlikely bacteria source
38	State Highway 100	43.04	-88.05	725 N Mayfair Rd, Wauwatosa, WI 53226	Milwaukee	City of Wauwatosa	Urban	Restaurant	Google Maps	N/A			Unlikely bacteria source
39	State Highway 100	43.04	-88.05	510 N Mayfair Rd, Wauwatosa, WI 53226	Milwaukee	City of Wauwatosa	Urban	Restaurant	Google Maps	N/A			Unlikely bacteria source
40	State Highway 100	43.04	-88.05	418 N Mayfair Rd, Wauwatosa, WI 53226	Milwaukee	City of Wauwatosa	Urban	Restaurant	Google Maps	N/A			Unlikely bacteria source
41	State Highway 100	43.04	-88.05	10842 W Bluemound Rd, Wauwatosa, WI 53226	Milwaukee	City of Wauwatosa	Urban	Restaurant	Google Maps	N/A			Unlikely bacteria source
42	State Highway 100	43.03	-88.05	151 N Mayfair Rd, Wauwatosa, WI 53226	Milwaukee	City of Wauwatosa	Urban	Restaurant	Google Maps	N/A			Unlikely bacteria source
43	State Highway 100	43.02	-88.05	837 S 108th St, Milwaukee, WI 53214	Milwaukee	City of West Allis	Urban	Restaurant	Google Maps	N/A			Unlikely bacteria source
44	State Highway 100	43.02	-88.05	1117 S 108th St, Milwaukee, WI 53214	Milwaukee	City of West Allis	Urban	Restaurant	Google Maps	N/A			Unlikely bacteria source
45	State Highway 100	43.02	-88.05	1234 S 108th St, West Allis, WI 53214	Milwaukee	City of West Allis	Urban	Restaurant	Google Maps	N/A			Unlikely bacteria source











ID	Highway Name	Lat	Long	Address/Location	County	City/Village/Town	Rural/Urban/Suburban	Type of Bacteria Source	GIS Source (Google Earth, County/Municipal GIS, WisDOT DOTView)	Date of Field Verification	Google Street View Screen Shots	Google Aerial Map View	Decision
46	State Highway 100	43.02	-88.05	1427 S 108th St, West Allis, WI 53214	Milwaukee	City of West Allis	Urban	Restaurant	Google Maps	N/A			Unlikely bacteria source
47	State Highway 100	43.01	-88.05	1500 S 108th St, West Allis, WI 53214	Milwaukee	City of West Allis	Urban	Restaurant	Google Maps	N/A			Unlikely bacteria source
48	State Highway 100	43.01	-88.05	1507 S 108th St, West Allis, WI 53214	Milwaukee	City of West Allis	Urban	Restaurant	Google Maps	N/A			Unlikely bacteria source
49	State Highway 100	43.01	-88.05	1550 S 108th St, West Allis, WI 53214	Milwaukee	City of West Allis	Urban	Restaurant	Google Maps	N/A			Unlikely bacteria source
50	State Highway 100	43.01	-88.05	1657 S 108th St, West Allis, WI 53214	Milwaukee	City of West Allis	Urban	Restaurant	Google Maps	N/A			Unlikely bacteria source
51	State Highway 36	42.95	-87.98	5235 W Loomis Rd, Greendale, WI 53129	Milwaukee	City of Greenfield	Urban	Restaurant	Google Maps	N/A			Unlikely bacteria source
52	State Highway 36	42.95	-87.98	5110 W Loomis Rd, Greendale, WI 53129	Milwaukee	City of Greenfield	Urban	Restaurant	Google Maps	N/A			Unlikely bacteria source
53	State Highway 36	42.95	-87.98	5045 W Loomis Rd, Milwaukee, WI 53220	Milwaukee	City of Greenfield	Urban	Restaurant	Google Maps	N/A			Unlikely bacteria source
54	State Highway 36	42.96	-87.97	4306 W Layton Ave, Greenfield, WI 53220	Milwaukee	City of Greenfield	Urban	Restaurant	Google Maps	N/A			Unlikely bacteria source
55	State Highway 36	42.96	-87.97	4060 W Loomis Rd, Milwaukee, WI 53221	Milwaukee	City of Greenfield	Urban	Restaurant	Google Maps	N/A			Unlikely bacteria source
56	State Highway 36	42.97	-87.96	3400 W Loomis Rd, Milwaukee, WI 53221	Milwaukee	City of Greenfield	Urban	Restaurant	Google Maps	N/A			Unlikely bacteria source
57	State Highway 36	42.97	-87.96	3374 W Loomis Rd, Greenfield, WI 53221	Milwaukee	City of Greenfield	Urban	Vet	Google Maps	N/A			Unlikely bacteria source
58	State Highway 36	42.98	-87.96	3322 W Loomis Rd, Greenfield, WI 53221	Milwaukee	City of Greenfield	Urban	Restaurant	Google Maps	N/A			Unlikely bacteria source
59	State Highway 241	42.98	-87.95	3606 S 27th St, Milwaukee, WI 53221	Milwaukee	Town of Lake	Urban	Restaurant	Google Maps	N/A			Unlikely bacteria source
60	State Highway 241	42.98	-87.95	3657 S 27th St, Milwaukee, WI 53221	Milwaukee	Town of Lake	Urban	Restaurant	Google Maps	N/A			Unlikely bacteria source
61	State Highway 241	42.98	-87.95	3801 S 27th St, Milwaukee, WI 53221	Milwaukee	Town of Lake	Urban	Restaurant	Google Maps	N/A			Unlikely bacteria source
62	State Highway 241	42.97	-87.95	3871 S 27th St, Milwaukee, WI 53221	Milwaukee	Town of Lake	Urban	Restaurant	Google Maps	N/A			Unlikely bacteria source
63	State Highway 241	42.97	-87.95	4275 S 27th St, Greenfield, WI 53221	Milwaukee	City of Greenfield	Urban	Restaurant	Google Maps	N/A			Unlikely bacteria source
64	State Highway 241	42.96	-87.95	4624 S 27th St, Milwaukee, WI 53221	Milwaukee	City of Milwaukee	Urban	Restaurant	Google Maps	N/A			Unlikely bacteria source
65	State Highway 241	42.96	-87.95	4756 S 27th St, Milwaukee, WI 53221	Milwaukee	City of Milwaukee	Urban	Restaurant	Google Maps	N/A			Unlikely bacteria source
66	State Highway 241	42.96	-87.95	4841 S 27th St, Greenfield, WI 53221	Milwaukee	City of Greenfield	Urban	Restaurant	Google Maps	N/A			Unlikely bacteria source
67	State Highway 241	42.95	-87.95	5051 S 27th St, Greenfield, WI 53221	Milwaukee	City of Greenfield	Urban	Restaurant	Google Maps	N/A			Unlikely bacteria source
68	State Highway 241	42.95	-87.95	5077 S 27th St, Greenfield, WI 53221	Milwaukee	City of Greenfield	Urban	Restaurant	Google Maps	N/A			Unlikely bacteria source



ID	Highway Name	Lat	Long	Address/Location	County	City/Village/Town	Rural/Urban/Suburban	Type of Bacteria Source	GIS Source (Google Earth, County/Municipal GIS, WisDOT DOTView)	Date of Field Verification	Google Street View Screen Shots	Google Aerial Map View	Decision
69	US Highway 45	43.65	-88.26	-	Fond du Lac	Town of Osceola	Rural	Propan storage tank	Google Maps	N/A			Unlikely bacteria source
70	US Highway 45	43.60	-88.24	W1728 Sunset Dr, Campbellsport, WI 53010	Fond du Lac	Town of Auburn	Rural	Storage	Google Maps	N/A			Unlikely bacteria source
71	US Highway 45	43.59	-88.24	W1782 Co Rd Y, Campbellsport, WI 53010	Fond du Lac	Town of Auburn	Rural	Farm	Google Maps	N/A			Unlikely bacteria source
72	State Highway 60	43.32	-88.19	3160 WI-60 Trunk, Jackson, WI 53037	Washington	Town of Polk	Rural	Auto Body	Google Maps	N/A			Unlikely bacteria source
73	State Highway 60	43.32	-88.18	N168W22224 Main St, Jackson, WI 53037	Washington	Town of Jackson	Rural	Gas Station	Google Maps	N/A			Unlikely bacteria source
74	State Highway 60	43.32	-88.18	N168W22225 Main St, Jackson, WI 53037	Washington	Town of Jackson	Rural	Sanitary Sewer Overflow	Google Maps	N/A			Unlikely bacteria source
75	State Highway 60	43.32	-88.18	1 Pharmacal Way, Jackson, WI 53037	Washington	Town of Jackson	Rural	Sanitary Sewer Overflow	Google Maps	N/A			Unlikely bacteria source
76	State Highway 60	43.32	-88.18	-	Washington	Town of Jackson	Rural	Sanitary Sewer Overflow	Google Maps	N/A			Unlikely bacteria source
77	State Highway 60	43.32	-88.17	-	Washington	Town of Jackson	Rural	Sanitary Sewer Overflow	Google Maps	N/A			Unlikely bacteria source
78	State Highway 60	43.323645,	-88.15	W194N16774 Eagle Dr, Jackson, WI 53037	Washington	Town of Jackson	Rural	Sanitary Sewer Overflow	Google Maps	N/A			Unlikely bacteria source
79	Interstate 43	43.41	-87.91	-	Ozaukee	Town of Port Washington	Rural	Sanitary Sewer Overflow	Google Maps	N/A			Unlikely bacteria source
80	Interstate 43	43.41	-87.91	-	Ozaukee	Town of Port Washington	Rural	Sanitary Sewer Overflow	Google Maps	N/A			Unlikely bacteria source
81	Interstate 43	43.41	-87.91	-	Ozaukee	Town of Port Washington	Rural	Sanitary Sewer Overflow	Google Maps	N/A			Unlikely bacteria source
82	Interstate 43	43.35	-87.93	-	Ozaukee	Town of Grafton	Rural	Sanitary Sewer Overflow	Google Maps	N/A			Unlikely bacteria source

ID	Highway Name	Lat	Long	Address/Location	County	City/Village/Town	Rural/Urban/Suburban	Type of Bacteria Source	GIS Source (Google Earth, County/Municipal GIS, WisDOT DOTView)	Date of Field Verification	Google Street View Screen Shots	Google Aerial Map View	Decision
83	Interstate 43	43.33	-87.92	-	Ozaukee	Town of Grafton	Rural	Sanitary Sewer Overflow	Google Maps	N/A			Unlikely bacteria source
84	Interstate 43	43.33	-87.92	-	Ozaukee	Town of Grafton	Rural	Sanitary Sewer Overflow	Google Maps	N/A			Unlikely bacteria source
85	Interstate 43	43.32	-87.92	-	Ozaukee	Town of Grafton	Rural	Sanitary Sewer Overflow	Google Maps	N/A			Unlikely bacteria source
86	Interstate 43	43.31	-87.92	-	Ozaukee	Town of Grafton	Rural	Sanitary Sewer Overflow	Google Maps	N/A			Unlikely bacteria source
87	Interstate 43	43.31	-87.92	-	Ozaukee	Town of Grafton	Rural	Sanitary Sewer Overflow	Google Maps	N/A			Unlikely bacteria source

### Appendix 2c - Possible Bacteria Sites Included in the Field Investigation

ID	Field Investigation Location	Highway Name	Lat	Long	Address/Location	County	City/Village/Town	Rural/Urban/Suburban	Type of Bacteria Source	GIS Source (Google Earth, County/Municipal GIS, WisDOT DOTView)	Date of Field Verification	Google Street View Screen Shots	Notes	Google Aerial Map View	Decision
1	US 45-1	US Highway 45	43.67	-88.27	N3832 County Rd W, Eden, WI 53019	Fond du Lac	Town of Osceola	Rural	CAFO	Google Maps	10/8/2024		Appears standing water could be runoff from the CAFO		Bacteria Source
2	US 45-2	US Highway 45	43.60	-88.24	N1776 US-45, Campbellsport, WI 53010	Fond du Lac	Town of Auburn	Rural	Truck repair	Google Maps	10/8/2024		Appears standing water could be runoff from the truck repair shop		Bacteria Source
3	STH 67-3	State Highway 67	43.60	-88.29	W2796 WI-67, Campbellsport, WI 53010	Fond du Lac	Village of Campbellsport	Suburban	Veterinary Clinic	Google Maps	10/8/2024		Appears standing water could be runoff from the vet clinic		Bacteria Source
4	US 45-4	US Highway 45	43.51	-88.22	8715 Fond Du Lac Ave, Kewaskum, WI 53040	Washington and Fond du Lac	Village of Kewaskum	Suburban	Farm	Google Maps	10/8/2024		Potential runoff to ROW from the small farm		Bacteria Source
5	US 45-5	US Highway 45	43.50	-88.22	500 Trading Post Ln, Kewaskum, WI 53040	Washington and Fond du Lac	Village of Kewaskum	Suburban	Pet Store	Google Maps	10/8/2024		Appears standing water could be runoff from the pet store		Bacteria Source
6	STH 60-6	State Highway 60	43.32	-88.24	2015 American Eagle Dr, Slinger, WI 53086	Washington	Village of Slinger	Rural	Veterinary Clinic	Google Maps	10/8/2024		Drainage from vet clinic appears to drain towards ROW		Bacteria Source
7	STH 60-7	State Highway 60	43.32	-88.21	3473 WI-60 Trunk, Jackson, WI 53037	Washington	Town of Polk	Rural	Pet Resort	Google Maps	10/8/2024		Appears standing water could be runoff from the pet resort		Bacteria Source
8	STH 60-8	State Highway 60	43.32	-88.18	1 Pharmacal Way, Jackson, WI 53037	Washington	Town of Jackson	Rural	Restaurant	Google Maps	10/8/2024		Appears standing water could be runoff from the pharmaceutical company		Bacteria Source

## Appendix 3: Completed Investigation Forms

# WisDOT Milwaukee River TMDL Study

## Possible Bacteria Source Field Investigation Review Form

### Part A: Possible Bacteria Source Site Information

City/Village/Town: Town of Osceola	County: Fond du Lac	WisDOT Highway Name: US 45
Site Name: 2nd Look Holsteins (CAFO)	Address: N3832 County Rd W, Eden, WI 53019	
Field Investigation Location*: US 45-1	Review date: 10/8/24	Weather: 59°F Sunny
Reviewers: Lu Chen/ Emma Connell/ Rachel Clark/ John Voorhees/ Hans Hallanger	Arrived: 11:19am	Left: 11:32am
Reviewer Firm/Region: AECOM	Site Owner: Private	
Possible Source Type: This site is a Confined Animal Feeding Operation (CAFO)		

*\*Reference Location Map*



Source Location: LAT: 43.674702°, LNGT: -88.273318°

○ Inspection areas

### Part B: Field Investigation Results

Field Investigation Questions	Comments
Investigation Location?	US 45 roadside ditch drainage ditch adjacent to the intersection of US45 & CTHW that receives runoff from the CAFO
Field Evidence of Bacteria?	No

**ADDITIONAL COMMENTS:**

- This site is a CAFO.
- Drainage path uncertain once it gets to USH 45

**Photos:**



**Likely drainage path from CAFO site to highway**





Another possible drainage path through the field

# WisDOT Milwaukee River TMDL Study

## Possible Bacteria Source Field Investigation Review Form

### Part A: Possible Bacteria Source Site Information

City/Village/Town: Town of Auburn	County: Fond du Lac	WisDOT Highway Name: US 45
Site Name: OHenry's Service	Address: N1776 US-45, Campbellsport, WI 53010	
Field Investigation Location*: US 45-2	Review date: 10/8/24	Weather: 61°F Sunny
Reviewers: Lu Chen/ Emma Connell/ Rachel Clark/ John Voorhees/ Hans Hallanger	Arrived: 11:59am	Left: 12:10pm
Reviewer Firm/Region: AECOM	Site Owner: Private (OHenry's Service)	
Possible Source Type: This site is an auto repair shop		

*\*Reference Location Map*



Source Location: LAT: 43.604034°, LNGT: -88.24069°

○ Inspection areas

### Part B: Field Investigation Results

Field Investigation Questions	Comments
Investigation Location?	US 45 roadside ditches that receives drainage from the O'Henry's Service flows eastward and collects in a natural low area
Field Evidence of Bacteria?	No

**ADDITIONAL COMMENTS:** None



**Photos:**











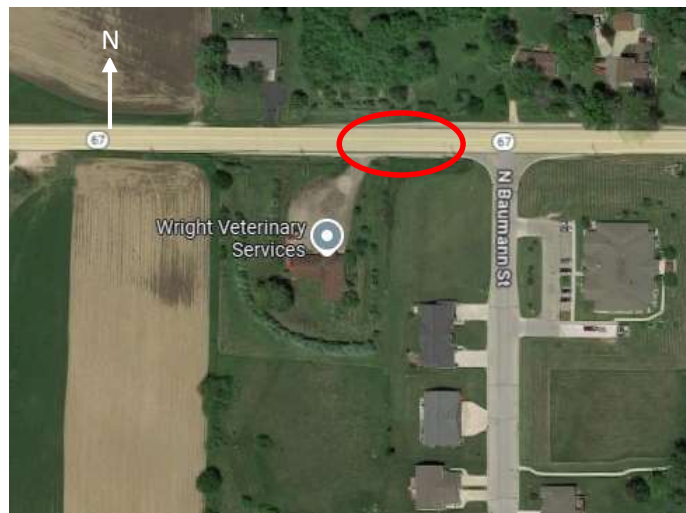
# WisDOT Milwaukee River TMDL Study

## Possible Bacteria Source Field Investigation Review Form

### Part A: Possible Bacteria Source Site Information

City/Village/Town: Village of Campbellsport	County: Fond du Lac	WisDOT Highway Name: STH 67
Site Name: Wright Veterinary Services	Address: W2796 WI-67, Campbellsport, WI 53010	
Field Investigation Location*: STH 67-3	Review date: 10/8/24	Weather: 59°F Sunny
Reviewers: Lu Chen/ Emma Connell/ Rachel Clark/ John Voorhees/ Hans Hallanger	Arrived: 11:44am	Left: 11:47am
Reviewer Firm/Region: AECOM	Site Owner: Private (Wright Veterinary Services)	
Possible Source Type: This site is a veterinary clinic		

*\*Reference Location Map*



Source Location: LAT: 43.601115°, LNGT: -88.294385°

○ Inspection areas

### Part B: Field Investigation Results

Field Investigation Questions	Comments
Investigation Location?	STH 67 ROW area that receives drainage from Wright Veterinary Clinic flows eastward into a vegetated buffer area before passing beneath STH 67 to the north
Field Evidence of Bacteria?	No

**ADDITIONAL COMMENTS:** None



**Photos:**



**Drainage towards vegetated buffered area**



**Covered dumpsters**

# WisDOT Milwaukee River TMDL Study

## Possible Bacteria Source Field Investigation Review Form

### Part A: Possible Bacteria Source Site Information

City/Village/Town: Village of Kewaskum	County: Washington and Fond du Lac	WisDOT Highway Name: US 45
Site Name: Unnamed farm	Address: 8715 Fond Du Lac Ave, Kewaskum, WI 53040	
Field Investigation Location*: US 45-4	Review date: 10/8/24	Weather: 62°F Sunny
Reviewers: Lu Chen/ Emma Connell/ Rachel Clark/ John Voorhees/ Hans Hallanger	Arrived: 12:26pm	Left: 12:30pm
Reviewer Firm/Region: AECOM	Site Owner: Private (Unnamed farm)	
Possible Source Type: This site is a farm		

*\*Reference Location Map*



Source Location: LAT: 43.508148°, LNGT: -88.219337°

○ Inspection areas

### Part B: Field Investigation Results

Field Investigation Questions	Comments
Investigation Location?	US 45 roadside ditch that collects drainage from a farmyard near US 45. The manure is in an enclosed barnyard located outside of the ROW.
Field Evidence of Bacteria?	No

**ADDITIONAL COMMENTS:** None



**Photos:**



**Drainage towards vegetated ditch**







# WisDOT Milwaukee River TMDL Study

## Possible Bacteria Source Field Investigation Review Form

### Part A: Possible Bacteria Source Site Information

City/Village/Town: Village of Kewaskum	County: Washington and Fond du Lac		WisDOT Highway Name: US 45
Site Name: Kettle Moraine Town & Country	Address: 500 Trading Post Ln, Kewaskum, WI 53040		
Field Investigation Location*: US 45-5	Review date: 10/8/24	Weather: 62°F Sunny	
Reviewers: Lu Chen/ Emma Connell/ Rachel Clark/ John Voorhees/ Hans Hallanger	Arrived: 12:36pm	Left: 12:47pm	
Reviewer Firm/Region: AECOM	Site Owner: Private (Kettle Moraine Town & Country)		
Possible Source Type: This site is a pet store			

*\*Reference Location Map*



Source Location: LAT: 43.498641°, LNGT: -88.216362°

○ Inspection areas

### Part B: Field Investigation Results

Field Investigation Questions	Comments
Investigation Location?	US 45 roadside ditch that receives drainage from Kettle Moraine Town & Country flows toward a wide grass buffer and into a drainage swale, with a well-maintained grassy pet area nearby and dense grass along the fence.
Field Evidence of Bacteria?	No

**ADDITIONAL COMMENTS:** None

Photos:







# WisDOT Milwaukee River TMDL Study

## Possible Bacteria Source Field Investigation Review Form

### Part A: Possible Bacteria Source Site Information

City/Village/Town: Village of Slinger	County: Washington	WisDOT Highway Name: STH 60
Site Name: Tilie Lake Veterinary Clinic	Address: 2015 American Eagle Dr, Slinger, WI 53086	
Field Investigation Location*: STH 60-6	Review date: 10/8/24	Weather: 53°F Sunny
Reviewers: Lu Chen/ Emma Connell/ Rachel Clark/ John Voorhees/ Hans Hallanger	Arrived: 9:50am	Left: 10:00am
Reviewer Firm/Region: AECOM	Site Owner: Private (Tilie Lake Veterinary Clinic)	
Possible Source Type: This site is a veterinary clinic		

*\*Reference Location Map*



Source Location: LAT: 43.324507°, LNGT: -88.243066°

○ Inspection areas

### Part B: Field Investigation Results

Field Investigation Questions	Comments
Investigation Location?	STH 60 roadside ditch west of the detention pond west of Tilie Lake Veterinary Clinic receives drainage from the clinic, while a vegetated buffer to the north collects runoff from the southern area.
Field Evidence of Bacteria?	No

**ADDITIONAL COMMENTS:** None



**Photos:**







**Covered dumpsters**





Fenced areas

# WisDOT Milwaukee River TMDL Study

## Possible Bacteria Source Field Investigation Review Form

### Part A: Possible Bacteria Source Site Information

City/Village/Town: Town of Polk	County: Washington	WisDOT Highway Name: STH 60
Site Name: Cedar Creek Pet Resort	Address: 3473 WI-60 Trunk, Jackson, WI 53037	
Field Investigation Location*: STH 60-7	Review date: 10/8/24	Weather: 55°F Sunny
Reviewers: Lu Chen/ Emma Connell/ Rachel Clark/ John Voorhees/ Hans Hallanger	Arrived: 10:08am	Left: 10:15am
Reviewer Firm/Region: AECOM	Site Owner: Private (Cedar Creek Pet Resort)	
Possible Source Type: This site is a pet resort		

*\*Reference Location Map*



Source Location: LAT: 43.324392°, LNGT: -88.210159°

○ Inspection areas

### Part B: Field Investigation Results

Field Investigation Questions	Comments
Investigation Location?	STH 60 vegetated buffer area north of Cedar Creek Pet Resort receives drainage from the facility before it enters STH 60 ROW.
Field Evidence of Bacteria?	No

**ADDITIONAL COMMENTS:** None



Photos:





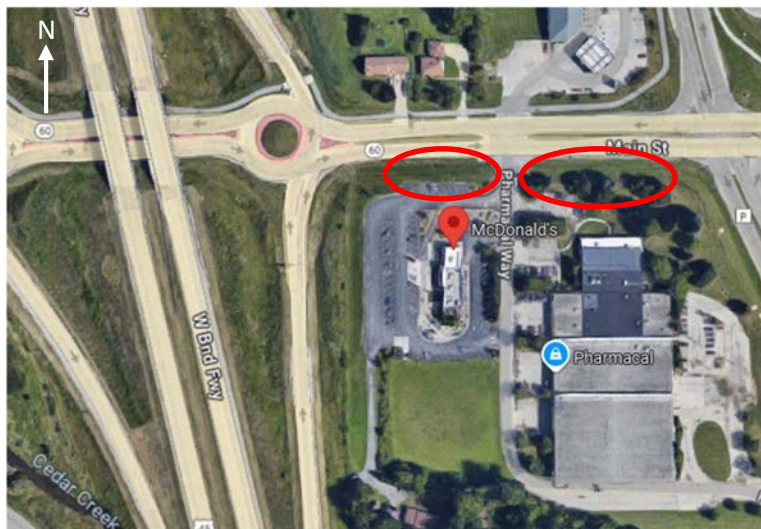
# WisDOT Milwaukee River TMDL Study

## Possible Bacteria Source Field Investigation Review Form

### Part A: Possible Bacteria Source Site Information

City/Village/Town: Town of Jackson	County: Washington	WisDOT Highway Name: STH 60
Description: McDonald’s & Pharmacal	Address: 1 Pharmacal Way, Jackson, WI 53037	
Field Investigation Location*: STH 60-8	Review date: 10/8/24	Weather: 55°F Sunny
Reviewers: Lu Chen/ Emma Connell/ Rachel Clark/ John Voorhees/ Hans Hallanger	Arrive: 10:21am	Left: 10:35am
Reviewer Firm/Region: AECOM	Site Owner: Private (McDonald’s & Pharmacal)	
Possible Source Type: Pharmaceutical manufacturer and fast-food restaurant located off STH 60.		

*\*Reference Location Map*



Source Location: LAT: 43.324341°, LNGT: -88.184697°

○ Inspection areas

### Part B: Field Investigation Results

Assessment	Comments
Investigation Location?	STH 60 roadside ditch drainage ditch off the STH 60 that receives runoff from the McDonald's and Pharmalac.
Field Evidence of Bacteria?	No

**ADDITIONAL COMMENTS:** None



Photos:







