

**Michigan Department of Environmental Quality  
Water Bureau  
March 2005**

**Total Maximum Daily Load for *Escherichia coli* for  
The Salt River  
Macomb County**

**INTRODUCTION**

Section 303(d) of the federal Clean Water Act and the United States Environmental Protection Agency's (USEPA's) Water Quality Planning and Management Regulations (Title 40 of the Code of Federal Regulations (CFR), Part 130) require states to develop Total Maximum Daily Loads (TMDLs) for water bodies that are not meeting water quality standards (WQS). The TMDL process establishes the allowable loadings of pollutants for a water body based on the relationship between pollution sources and in-stream water quality conditions. TMDLs provide states a basis for determining the pollutant reductions necessary from both point and nonpoint sources to restore and maintain the quality of their water resources. The purpose of this TMDL is to identify the allowable levels of *Escherichia coli* (*E. coli*) that will result in the attainment of the applicable WQS in the Salt River, a tributary of Lake St. Clair (Anchor Bay), located in Macomb County, Michigan.

**PROBLEM STATEMENT**

This water body was placed on the Section 303(d) list in 2004. This TMDL listing addresses approximately ten miles of stream in the vicinity of New Baltimore. The TMDL reach is on the 2004 Section 303(d) list as:

**SALT RIVER**

County: Macomb

Location: Vicinity of New Baltimore extending from Anchor Bay u/s to 29 Mile Road.

HUC: 4090002

Problem: Pathogens (Rule 100).

TMDL YEAR(s): 2005

WBID#: 061409D

Size: 10 M

RF3RchID: 4090002 281 0.00

The Salt River (Figure 1) was placed on the Section 303(d) list due to impairment of recreational uses as indicated by the presence of elevated levels of *E. coli* (Wolf and Wuycheck, 2004). Monitoring data collected by the Michigan Department of Environmental Quality (MDEQ) in 2003, documented exceedances of the WQS for *E. coli* at all sampling locations during the total body contact recreational season of May 1 through October 31 (Table 1).

**NUMERIC TARGET**

The impaired designated use addressed by this TMDL is total body contact recreation. Rule 100 of the Michigan WQS requires that this water body be protected for total body contact recreation from May 1 through October 31. The target levels for this designated use are the ambient *E. coli* standards established in Rule 62 of the WQS as follows:

R 323.1062 Microorganisms.

Rule 62. (1) All waters of the state protected for total body contact recreation shall not contain more than 130 *E. coli* per 100 milliliters (ml), as a 30-day geometric mean. Compliance shall be based on the geometric mean of all individual samples taken during five or more sampling events representatively

spread over a 30-day period. Each sampling event shall consist of three or more samples taken at representative locations within a defined sampling area. At no time shall the waters of the state protected for total body contact recreation contain more than a maximum of 300 *E. coli* per 100 ml. Compliance shall be based on the geometric mean of three or more samples taken during the same sampling event at representative locations within a defined sampling area.

In addition, sanitary wastewater discharges have an additional target:

Rule 62. (3) Discharges containing treated or untreated human sewage shall not contain more than 200 fecal coliform bacteria per 100 ml, based on the geometric mean of all of five or more samples taken over a 30-day period, nor more than 400 fecal coliform bacteria per 100 ml, based on the geometric mean of all of three or more samples taken during any period of discharge not to exceed seven days. Other indicators of adequate disinfection may be utilized where approved by the Department.

Sanitary wastewater discharges are considered in compliance with the WQS of 130 *E. coli* per 100 ml if their National Pollutant Discharge Elimination System (NPDES) permit limit of 200 fecal coliforms per 100 ml as a monthly average is met. This is assumed because *E. coli* are a subset of fecal coliform (American Public Health Association, 1995). Fecal coliform are substantially higher than *E. coli* when the wastewater of concern is sewage (Whitman, 2001). Therefore, it can reasonably be assumed that there are less than 130 *E. coli* per 100 ml in the effluent when the point source discharge is meeting its limit of 200 fecal coliform per 100 ml.

For this TMDL, the WQS of 130 *E. coli* per 100 ml as a 30-day geometric mean and 300 *E. coli* per 100 ml as a daily maximum are the target levels for the TMDL reach from May 1 to October 31. As previously stated, the 2003 monitoring data indicated exceedances of WQS at all locations sampled. The station with the highest concentration is located at 23 Mile Road.

## **DATA DISCUSSION**

The Salt River was sampled at six stations (Figure 1). Thirty-day geometric mean *E. coli* concentrations in the Salt River ranged from 23 *E. coli* per 100 ml in September at 26 Mile Road (Salt 3) to 698 *E. coli* per 100 ml in July at 23 Mile Road (Salt 5). The highest observed *E. coli* concentrations in the Salt River were located at the 23 Mile Road station (Salt 5) (Table 1 and Figure 2). Thirty-day geometric mean concentrations at this station exceeded the WQS, with the exception of September 5, 2003, from the end of June through the remainder of the sampling season. Daily geometric mean concentrations exceeded 1,000 *E. coli* per 100 ml five times during the sampling season (Table 1).

## **SOURCE ASSESSMENT**

The official listed reach for the Salt River is the confluence with Anchor Bay (Lake St. Clair) upstream approximately ten miles to 29 Mile Road. The municipalities in the TMDL reach for the Salt River include Lenox Township, Chesterfield Township, Casco Township, and Richmond Township, as well as the cities of New Haven, Richmond, and New Baltimore (Figure 1). Table 2 shows the distribution of land for each municipality.

The primary pathogen sources for this water body are typical of mixed suburban and agricultural land uses. Agricultural runoff, failing septic systems, and pet and/or wildlife wastes are possible sources of *E. coli* to the Salt River. Agriculture accounts for approximately 40% of the land use in the TMDL watershed (Choi and Engel, 2004). *E. coli* has been shown to enter water bodies via field drainage systems, such as tiles. Field tiles have shown significant transport of enteric bacteria through tile drainage systems under all manure application protocols and

environmental conditions (Jamieson, et al., 2002). A large portion of Macomb County utilizes on-site septic systems for waste treatment. Over 150 septic systems suspected of failing have been investigated in Macomb County (Macomb County, 2003).

Daily geometric mean exceedances observed at 23 Mile Road exceeded 1,000 *E. coli* per 100 ml on numerous occasions during the sampling season. The exceedances found at this location often did not correspond with exceedances found upstream (Salt 4) or downstream (Salt 6), indicating a possible localized source. This station exceeded WQS during both wet and dry weather events (Table 1). In an effort to identify the source of *E. coli* at this location, two samples were collected for Deoxyribonucleic acid (DNA) ribotyping analysis. This is a relatively new technology that extracts DNA from *E. coli* isolates and compares the DNA to a library of known source isolates. The samples were collected on August 7 and September 22, 2003. The sample collected on August 7, 2003, was representative of dry weather conditions; the sample collected September 22, 2003, represented a wet event (approximately 1.3 inches of rain in a 24-hour period). The results from both samples collected indicate all isolates were of nonhuman origin (Tables 3 & 4).

Currently, there are 29 NPDES permitted discharges to the Salt River or its tributaries in the TMDL reach (Table 5, Figure 3); 2 individual permits, 8 industrial storm water permits, 13 Notice of Coverage (NOC) permits, and 6 Municipal Separate Storm Sewer System permits (MS4s). The Richmond Wastewater Treatment Plant (WWTP) (MI0023906) and the Northhampton Mobile Home Park WWTP (MI0056472) (when constructed) are permitted to discharge treated human waste. The industrial storm water discharges are not considered to contain treated or untreated human sewage or animal waste; therefore, they are not considered a significant source of *E. coli* to the Salt River TMDL watershed. The NOC permits involve earth work in the TMDL watershed and are not considered a source of *E. coli* to the TMDL reach. The 6 MS4 permits may be a source of *E. coli*.

## **LINKAGE ANALYSIS**

Determining the link between the *E. coli* concentrations in the Salt River and the potential sources is necessary to develop the TMDL. This link provides the basis for estimating the total assimilative capacity of the river and any needed load reductions. For this TMDL, the major loadings of pathogens appear to enter the Salt River during wet and dry weather. Potential sources include agricultural runoff, failing septic systems, and pet and/or wildlife wastes.

The guiding water quality management principle used to develop the TMDL was that compliance with the numeric pathogen target in the Salt River depends on the control of *E. coli* from wet and dry weather sources. If the *E. coli* inputs can be controlled to meet the numeric standards, then total body contact recreation in the Salt River will be restored and protected.

## **TMDL DEVELOPMENT**

The TMDL represents the maximum loading that can be assimilated by the water body while still achieving WQS. As indicated in the Numeric Target section, the targets for this pathogen TMDL are the thirty-day geometric mean WQS of 130 *E. coli* per 100 ml and daily geometric mean of 300 *E. coli* per 100 ml. Concurrent with the selection of a numeric concentration endpoint, TMDL development also defines the environmental conditions that will be used when defining allowable levels. Many TMDLs are designed around the concept of a "critical condition." The "critical condition" is defined as the set of environmental conditions that, if controls are designed to protect, will ensure attainment of objectives for all other conditions. For example, the critical conditions for the control of point sources in Michigan are given in R 323.1082 and R 323.1090. In general, the lowest monthly 95% exceedance flow for streams is used as a design condition for point source discharges. However, for pathogens in point source discharges of treated or

untreated human sewage, levels are restricted to a monthly average limit of 200 Fecal coliform per 100 ml regardless of stream flow. Therefore, the design stream flow is not a critical condition for determining the allowable loading of pathogen for WWTPs. In addition, sources of pathogens to the Salt River arise from a mixture of wet and dry weather-driven nonpoint sources. For these sources, there are a number of different allowable loads that will ensure compliance, as long as they are distributed properly throughout the watershed.

For most pollutants, TMDLs are expressed on a mass loading basis (e.g., pounds per day). For *E. coli*, however, mass is not an appropriate measure, and the USEPA allows pathogen TMDLs to be expressed in terms of organism counts (or resulting concentration) (USEPA, 2001). Therefore, this pathogen TMDL is concentration-based consistent with R 323.1062, and the TMDL is equal to the target concentration of 130 *E. coli* per 100 ml as a 30-day geometric mean and daily geometric mean of 300 *E. coli* per 100 ml in all portions of the TMDL reach for each month of the recreational season (May through October). Expressing the TMDL as a concentration equal to the WQS ensures that the WQS will be met under all flow and loading conditions; therefore, a critical condition is not applicable for this TMDL.

## **ALLOCATIONS**

TMDLs are comprised of the sum of individual waste load allocations (WLAs) for point sources and load allocations (LAs) for nonpoint sources and natural background levels. In addition, the TMDL must include a margin of safety (MOS), either implicitly within the WLA or LA, or explicitly, that accounts for uncertainty in the relation between pollutant loads and the quality of the receiving water body. Conceptually, this definition is denoted by the equation:

$$\text{TMDL} = \sum \text{WLAs} + \sum \text{LAs} + \text{MOS}$$

The term TMDL represents the maximum loading that can be assimilated by the receiving water while still achieving WQS. This pathogen TMDL will not be expressed on a mass loading basis and is concentration-based consistent with USEPA regulations in 40 CFR, Section 130.2(i).

### WLAs

There are a total of 29 permitted point source discharges to the listed reach of the Salt River. Two individual permits, 8 industrial storm water permits, 13 NOC permits for earthwork, and 6 MS4 permits. The permit for the Richmond WWTP authorizes the discharge of treated human waste to Fistler Drain, a tributary of the Salt River, and has a fecal coliform limit. When constructed, the Northhampton Mobile Home Park WWTP will be authorized to discharge treated human waste to Kirkham Drain, another tributary to the Salt River. Both WWTPs will be considered in compliance with the WQS of 130 *E. coli* per 100 ml if their NPDES permit limits of 200 fecal coliform per 100 ml as a monthly average are met.

The WLA for the Richmond WWTP, Northhampton Mobile Home Park WWTP, and the industrial storm water permits is equal to 130 *E. coli* per 100 ml during the recreational season between May 1 and October 31. The storm water permitted discharges are not considered significant sources of *E. coli* to the Salt River due to Best Management Practices required in the permits. These permits do not authorize the discharge of non-storm water and require a certified storm water operator for the facility. The NOC permits involve earth work in the watershed and, due to the nature of the permits, are not considered significant sources of *E. coli* to the Salt River. The MS4 permits may contain *E. coli* due to materials washing into the storm drains during wet weather events.

## LAs

Because this TMDL is concentration-based, the LA is equal to 130 *E. coli* per 100 ml. This is based on the assumption that all land, regardless of use, will be required to meet the WQS. Therefore, the relative responsibility for achieving the necessary reductions of bacteria and maintaining acceptable conditions will be determined by the amount of land under the jurisdiction of the local unit of government in the watershed. This TMDL reach is located in the townships of Lenox, Chesterfield, Casco, and Richmond, the cities of Richmond and New Baltimore, and the Village of New Haven.

## MOS

This section addresses the incorporation of an MOS in the TMDL analysis. The MOS accounts for any uncertainty or lack of knowledge concerning the relationship between pollutant loading and water quality, including the pollutant decay rate if applicable. The MOS can be either implicit (i.e., incorporated into the WLA or LA through conservative assumptions) or explicit (i.e., expressed in the TMDL as a portion of the loadings). This TMDL uses an implicit MOS because no rate of decay was used. Pathogen organisms have a limited capability of surviving outside of their hosts and a rate of decay could be developed. However, applying a rate of decay could result in an allocation that would be greater than the WQS, thus no rate of decay is applied in order to provide for a greater protection of water quality. The MDEQ has determined that the use of the WQS of 130 *E. coli* per 100 ml for the WLA and LA is a more conservative approach than developing an explicit MOS and accounts for the uncertainty in the relationship between pollutant loading and water quality based on available data and the assumption to not use a rate of decay. Applying the WQS to be met under all flow conditions also adds to the assurance that an explicit MOS is unnecessary.

## **SEASONALITY**

Seasonality in the TMDL is addressed by expressing the TMDL in terms of a total body contact recreation season that is defined as May 1 through October 31 by R 323.1100 of the WQS. There is no total body contact during the remainder of the year primarily due to cold weather. In addition, because this is a concentration-based TMDL, WQS will be met regardless of flow conditions in the applicable season.

## **MONITORING**

In 2003, pathogens were monitored weekly at a total of six stations from May through September. Future monitoring will take place as part of the five-year rotating basin monitoring. When these results indicate that the water body may be meeting WQS, sampling will be conducted at the appropriate frequency (as defined in the numeric target section) to determine if the 30-day geometric mean value of 130 *E. coli* per 100 ml and 300 *E. coli* per 100 ml as a daily maximum are being met.

## **REASONABLE ASSURANCE ACTIVITIES**

The Richmond WWTP is presently meeting their NPDES permit limits for fecal coliform. Compliance is evaluated based on monthly review of Discharge Monitoring Report data by the MDEQ.

Macomb County, Lenox Township, Chesterfield Township, and the village of New Haven are under MS4 permits. These permits require activities that reduce *E. coli* inputs to surface waters through public education, a storm water management plan, and illicit connection identification and elimination requirements.

Macomb County is in the second year of required activities. For the period of August 1, 2002 through July 31, 2003, over 1,000 outfalls were identified in the county. Specific activity in the TMDL watershed includes the inspection of approximately 75 outfalls in Chesterfield and Lenox Townships – which accounts for 80% of the TMDL watershed (Macomb County, 2003). The purpose of the inspections is to catalog each outfall and report any unusual color or odors for follow-up by the appropriate authorities. Beginning August 1, 2002, Macomb County adopted an on-site sewage disposal and water-supply systems property transfer evaluation regulation. This requires an inspection to ensure that the sewage disposal system and water-supply are in good working order. Any deficiencies found must be repaired prior to completing the sales transaction. Since then, over 400 systems have been evaluated and an additional 150 systems suspected of failing were evaluated (Macomb County, 2003). Public outreach and educational programs related to nonpoint source pollution and recycling have reached over 6,000 students in the watershed. Workshops on the impacts of run-off, native landscaping, fertilizer/pesticide use, and proper disposal of animal waste are offered multiple times a year in various communities. It is anticipated that these activities will improve awareness in the watershed and ultimately benefit water quality in the TMDL watershed.

In addition, activities in Lenox Township, Chesterfield Township, and New Haven will reduce *E. coli* inputs to the Salt River. Each municipality is responsible for submitting illicit connection identification and elimination plans to the MDEQ. A partnership between Macomb County and the three municipalities has resulted in county efforts to screen all outfalls to waters of the state in each township and city. In return, each municipality will assure that there are no illicit connections to the municipal storm water system from township and city-owned and operated properties and facilities. At a minimum, outfalls will be inspected once every five years. This covers between 25-30 outfalls in the TMDL watershed (Lenox Township, Chesterfield Township, village of New Haven, 2004).

The Macomb County Health Department (MCHD) conducts weekly *E. coli* monitoring at 57 locations in the county, 3 of which are on the Salt River. Samples are also collected in relation to rain events or in areas where potential problems are anticipated (i.e., combined sewer overflows). This data is entered into a database and is available to the public at the following link: *The link provided was broken. The data is no longer available online. This online document was revised 10/11/2016.* The MDEQ works with the Macomb County Public Works and the MCHD to identify *E. coli* sampling locations and share data.

Macomb and St. Clair Counties were awarded a Section 319 Watershed Management Grant that was approved by the MDEQ in December 2003. The plan includes activities that reduce and eliminate sources of *E. coli* to the Anchor Bay portion of Lake St. Clair and includes the Salt River. Long-term goals include restoring and enhancing recreational uses and protecting public health. Both goals include objectives that will benefit the Salt River and Lake St. Clair by reducing *E. coli* concentrations.

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Michigan Department of Environmental Quality  
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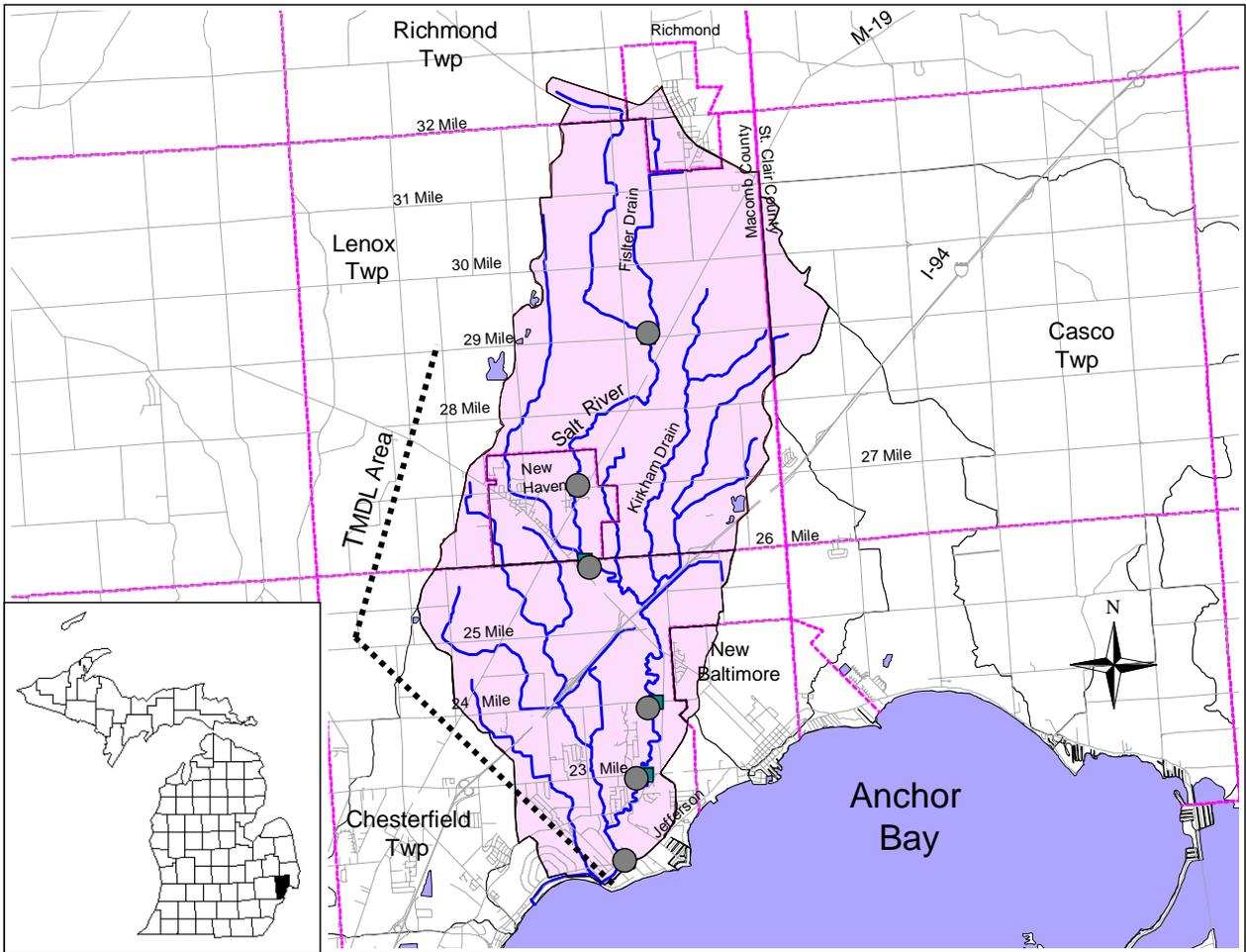
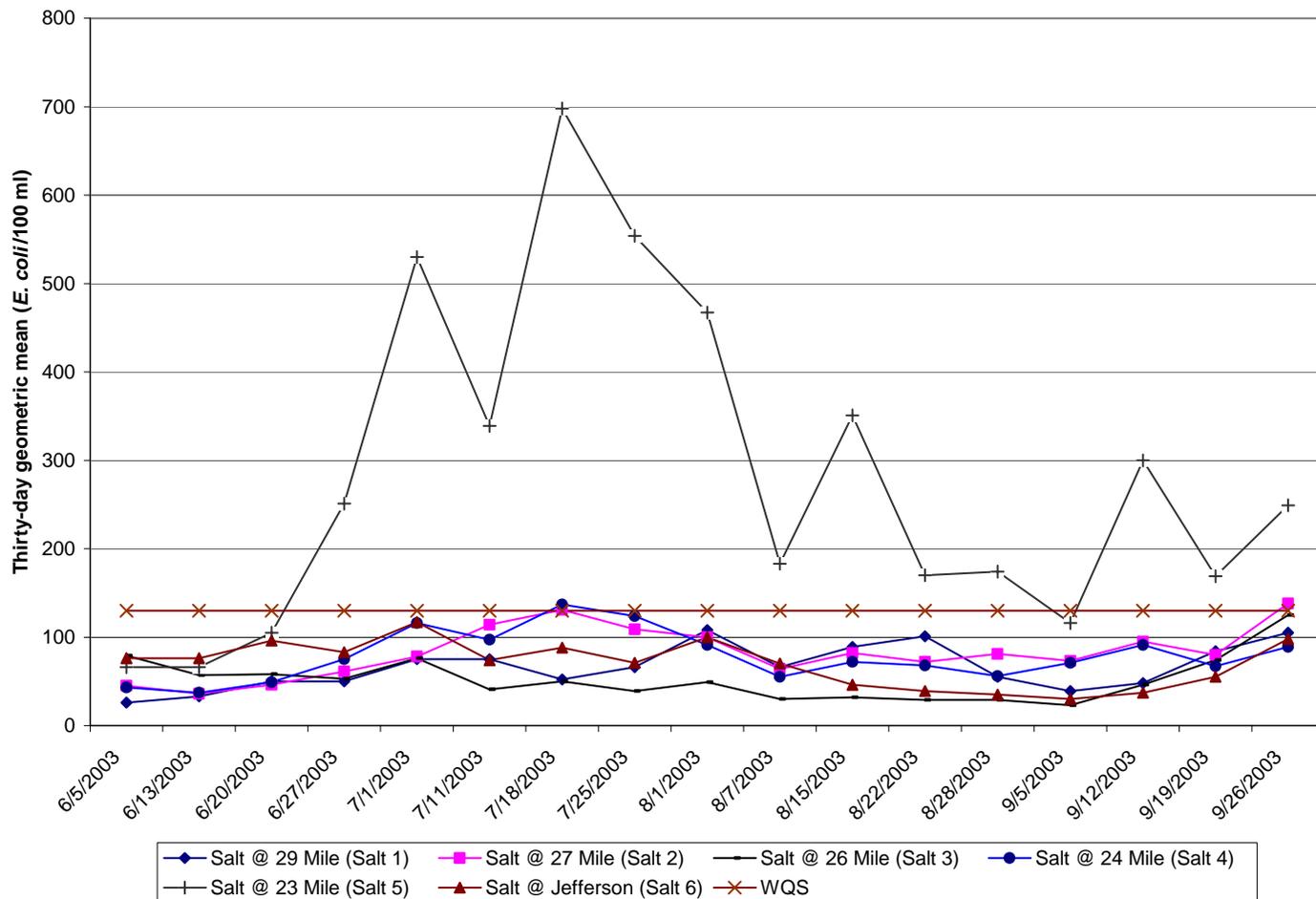
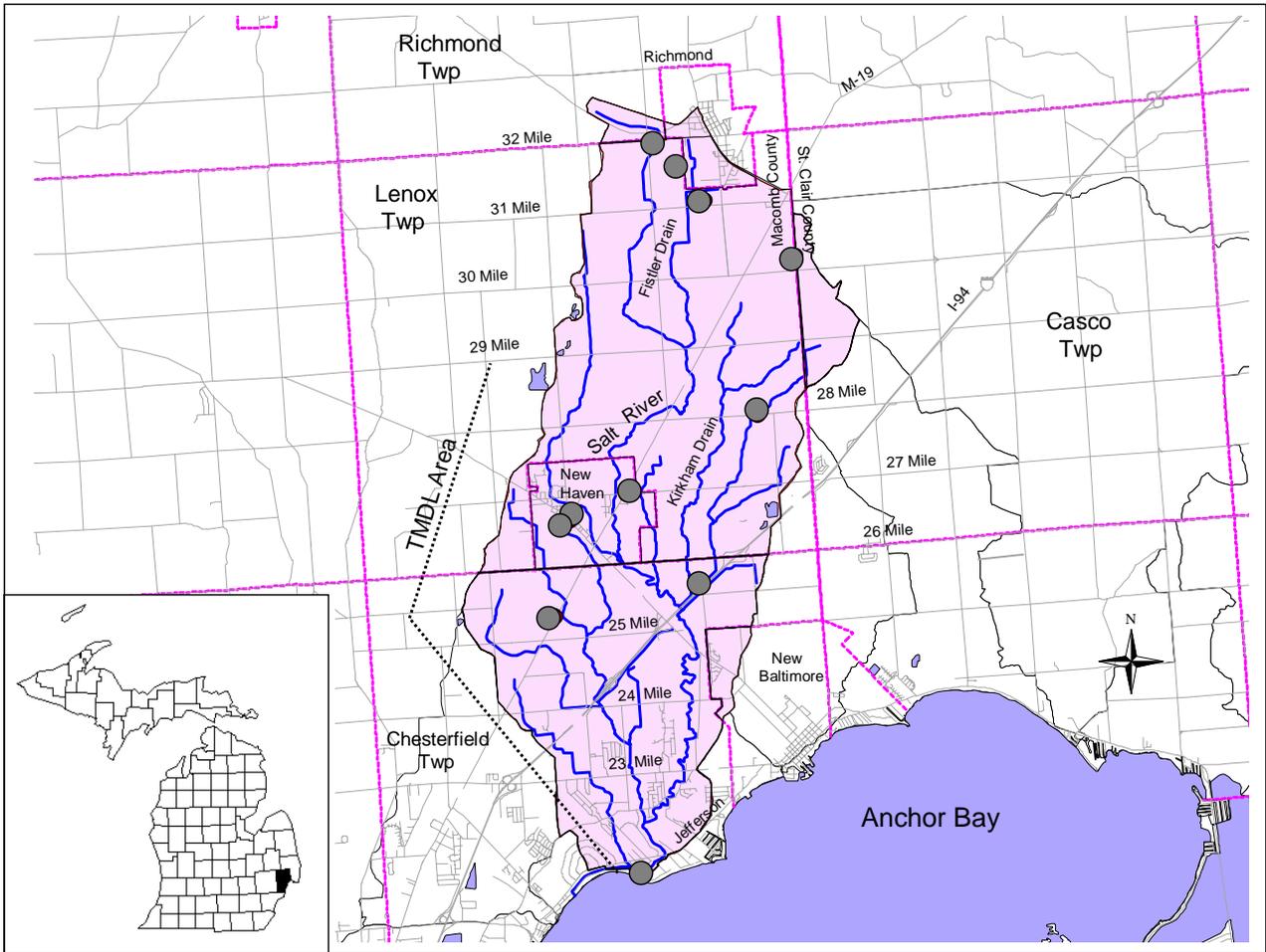


Figure 1. The Salt River *E. coli* sampling locations, vicinity of New Baltimore, Michigan, 2003. Shaded areas represent the TMDL watershed.



**Figure 2. Thirty-day Geometric mean for *E. coli* in the Salt River in the vicinity of New Baltimore, Macomb County, Michigan, 2003.**



**Figure 3. NPDES permitted discharges to the Salt River, vicinity of New Baltimore, Macomb County, Michigan, 2003.**

**\*Note: Notice of Coverage and MS4 permits are not included.**

**Table 1. MDEQ 2003 *E. coli* monitoring data for the Salt River (*E. coli*/100 ml) in the vicinity of New Baltimore. Shaded areas indicate exceedances of the Water Quality Standards. Data are presented upstream to downstream.**

	Salt River @ 29 Mile (SALT1)			Salt River @ 27 Mile (SALT 2)			Salt River @ 26 Mile (SALT 3)			
DATE	SAMPLE RESULTS	DAILY G. MEAN	30-day G. MEAN	SAMPLE RESULTS	DAILY G. MEAN	30-day G. MEAN	SAMPLE RESULTS	DAILY G. MEAN	30-day G. MEAN	Weather data
5/9/2003	20	40	---	60	58	---	200	106	---	light rain, 50° 0.5"
	40			20			60			
	80			160			100			
5/16/2003	20	20	---	400	86	---	60	62	---	cloudy, 50° 0.0"
	20			20			20			
	20			80			200			
5/23/2003	20	20	---	20	20	---	20	32	---	cloudy, 60° 0.0"
	20			20			80			
	20			20			20			
5/30/2003	20	36	---	140	92	---	20	36	---	partly sunny, 65° 0.6"
	20			140			60			
	120			40			40			
6/5/2003	20	20	26	20	20	45	20	416	79	cloudy, 50° 0.3"
	20			20			1800			
	20			20			2000			
6/13/2003	100	131	33	20	20	36	20	20	57	cloudy, 60° 1.1"
	160			20			20			
	140			20			20			
6/20/2003	120	157	50	360	281	46	240	66	58	sunny, 75° 0.8"
	200			280			20			
	160			220			60			
6/27/2003	20	20	50	20	83	61	20	20	53	cloudy, 68° 0.3"
	20			480			20			
	20			60			20			

Table 1 continued (*E. coli*/100 ml).

	Salt River @ 29 Mile (SALT1)			Salt River @ 27 Mile (SALT 2)			Salt River @ 26 Mile (SALT 3)			
DATE	SAMPLE RESULTS	DAILY G. MEAN	30-day G. MEAN	SAMPLE RESULTS	DAILY G. MEAN	30-day G. MEAN	SAMPLE RESULTS	DAILY G. MEAN	30-day G. MEAN	Weather data
7/1/2003	480	292	75	560	300	78	260	233	76	partly cloudy, 80° 0.0"
	200			200			220			
	260			240			220			
7/11/2003	20	20	75	20	137	114	20	20	41	cloudy, 65° 0.4"
	20			320			20			
	20			400			20			
7/18/2003	20	20	52	20	40	131	20	50	50	sunny, 60° 0.0"
	20			80			160			
	20			40			40			
7/25/2003	360	524	66	420	115	109	20	20	39	sunny, 85° 0.0"
	400			20			20			
	1000			180			20			
8/1/2003	360	236	108	360	52	100	20	58	49	fog, 65° 0.4"
	140			20			20			
	260			20			480			
8/7/2003	20	25	66	20	32	64	20	20	30	partly cloudy, 75° 0.0"
	40			80			20			
	20			20			20			
8/15/2003	480	92	89	300	491	82	20	29	32	overcast, 75° 0.3"
	80			520			20			
	20			760			60			
8/22/2003	20	36	101	20	20	72	60	29	29	sunny, 80° 0.0"
	40			20			20			
	60			20			20			

Table 1 continued (*E. coli*/100 ml).

	Salt River @ 29 Mile (SALT1)			Salt River @ 27 Mile (SALT 2)			Salt River @ 26 Mile (SALT 3)			
DATE	SAMPLE RESULTS	DAILY G. MEAN	30-day G. MEAN	SAMPLE RESULTS	DAILY G. MEAN	30-day G. MEAN	SAMPLE RESULTS	DAILY G. MEAN	30-day G. MEAN	Weather data
8/28/2003	20	25	55	400	213	81	20	20	29	sunny, 80° 0.0"
	20			1200			20			
	40			20			20			
9/5/2003	200	43	39	20	32	73	20	20	23	sunny, 70° 0.0"
	20			80			20			
	20			20			20			
9/12/2003	20	70	48	920	114	95	960	626	46	sunny, 80° 0.0"
	20			80			400			
	840			20			640			
9/19/2003	440	1548	84	160	217	80	280	312	74	rain, 65° 1.6"
	1240			160			300			
	6800			400			360			
9/26/2003	120	110	105	260	304	138	440	396	125	cloudy, 60° 0.0"
	140				360	440				
	80				300	320				

Table 1 continued (*E. coli*/100 ml).

DATE	Salt River @ 24 Mile (SALT 4)			Salt River @ 23 Mile (SALT 5)			Salt River @ Jefferson (SALT 6)			Weather data
	SAMPLE	DAILY	30-day	SAMPLE	DAILY	30-day	SAMPLE	DAILY	30-day	
	RESULTS	G. MEAN	G. MEAN	RESULTS	G. MEAN	G. MEAN	RESULTS	G. MEAN	G. MEAN	
5/9/2003	20	44	---	20	20	---	20	20	---	light rain, 50° 0.5"
	20			20			20			
	220			20			20			
5/16/2003	20	20	---	80	58	---	40	46	---	cloudy, 50° 0.0"
	20			60			40			
	20			40			60			
5/23/2003	20	20	---	20	20	---	20	43	---	cloudy, 60° 0.0"
	20			20			40			
	20			20			100			
5/30/2003	160	40	---	20	51	---	200	43	---	partly sunny, 65° 0.6"
	20			20			20			
	20			340			20			
6/5/2003	800	210	43	640	1086	66	1200	1517	76	cloudy, 50° 0.3"
	20			2000			2800			
	580			1000			1040			
6/13/2003	20	20	37	20	20	66	20	20	76	cloudy, 60° 1.1"
	20			20			20			
	20			20			20			
6/20/2003	80	86	49	680	573	105	340	146	96	sunny, 75° 0.8"
	100			460			460			
	80			600			20			
6/27/2003	20	163	75	1600	1566	251	20	20	83	cloudy, 68° 0.3"
	600			1600			20			
	360			1500			20			

Table 1 continued (*E. coli*/100 ml).

DATE	Salt River @ 24 Mile (SALT 4)			Salt River @ 23 Mile (SALT 5)			Salt River @ Jefferson (SALT 6)			Weather data
	SAMPLE	DAILY	30-day	SAMPLE	DAILY	30-day	SAMPLE	DAILY	30-day	
	RESULTS	G. MEAN	G. MEAN	RESULTS	G. MEAN	G. MEAN	RESULTS	G. MEAN	G. MEAN	
7/1/2003	340	353	116	2400	2139	530	320	243	117	partly cloudy, 80° 0.0"
	340			2400			160			
	380			1700			280			
7/11/2003	20	86	97	800	117	339	20	155	74	cloudy, 65° 0.4"
	20			100			440			
	1600			20			420			
7/18/2003	20	115	137	60	739	698	20	47	88	sunny, 60° 0.0"
	200			2800			20			
	380			2400			260			
7/25/2003	20	51	124	640	181	554	20	52	71	sunny, 85° 0.0"
	340			460			20			
	20			20			360			
8/1/2003	100	34	91	460	665	467	140	106	100	fog, 65° 0.4"
	20			800			420			
	20			800			20			
8/7/2003	20	29	55	20	20	183	180	42	70	partly cloudy, 75° 0.0"
	60			20			20			
	20			20			20			
8/15/2003	80	340	72	2200	2997	351	20	20	46	overcast, 75° 0.3"
	180			2140			20			
	2730			5720			20			
8/22/2003	140	85	68	20	20	170	20	20	39	sunny, 80° 0.0"
	20			20			20			
	220			20			20			

Table 1 continued (*E. coli*/100 ml).

DATE	Salt River @ 24 Mile (SALT 4)			Salt River @ 23 Mile (SALT 5)			Salt River @ Jefferson (SALT 6)			Weather data
	SAMPLE RESULTS	DAILY G. MEAN	30-day G. MEAN	SAMPLE RESULTS	DAILY G. MEAN	30-day G. MEAN	SAMPLE RESULTS	DAILY G. MEAN	30-day G. MEAN	
8/28/2003	20	20	56	60	201	174	20	29	35	sunny, 80° 0.0"
	20			140			20			
	20			960			60			
9/5/2003	20	108	71	20	87	116	300	49	30	sunny, 70° 0.0"
	520			20			20			
	120			1640			20			
9/12/2003	20	99	91	1300	2320	300	60	119	37	sunny, 80° 0.0"
	120			3000		140				
	400			3200		200				
9/19/2003	320	73	67	20	169	169	1440	151	55	rain, 65° 1.6"
	60			320			120			
	20			760			20			
9/26/2003	240	352	89	20	139	249	720	359	98	cloudy, 60° 0.0"
	760			160				400		
	240			840				160		

**Table 2. Distribution of land for each municipality in the Salt River TMDL reach.**

<b>Municipality</b>	<b>Square Miles</b>	<b>Percent</b>
Lenox Township	17.4	48
Chesterfield Township	11.4	32
Village of New Haven	3.4	9
Casco Township	1.6	4
City of Richmond	0.9	3
Richmond Township	0.6	2
City of New Baltimore	0.7	2
<b>TOTAL</b>	<b>36</b>	<b>100</b>

**Table 3. Discriminant Analysis of Ribotype Profiles of *E. coli* isolates from water sample received from Twenty-three Road (Salt 5) on August 7, 2003.**

<b>Fecal coliform mpn*/100 ml</b>	<b><i>E. coli</i> isolate number (5 colonies of cultured <i>E. coli</i> were analyzed)</b>	<b>Probable Source</b>
>2,400	1 2 3 4 5	Non-human Non-human Non-human Non-human Non-human

\*mpn = most probable number of fecal coliforms in 100 mL of sample after 20 hrs of cultivation at 44.5 degrees Celcius.

**Table 4. Discriminant Analysis of Ribotype Profiles of *E. coli* isolates from water sample received from Twenty-three Mile Road (Salt 5) on September 22, 2003.**

<b>Fecal coliform mpn*/100 ml</b>	<b><i>E. coli</i> isolate number (5 colonies of cultured <i>E. coli</i> were analyzed)</b>	<b>Probable Source</b>
> 2,400	1 2 3 4 5	Non-human Non-human Non-human Non-human Non-human

\*mpn = most probable number of fecal coliforms in 100 mL of sample after 20 hrs of cultivation at 44.5 degrees Celcius.

**Table 5. Permitted outfalls to the Salt River TMDL watershed in the vicinity of New Baltimore. Source: MDEQ, Water Division's NPDES Permit Management System.**

Facility	Permit Number	Receiving Water	Latitude	Longitude
Richmond WWTP	MI0023906	Fistler Drain	42.79556	-82.75861
Northhampton Community MHP*	MI0056472	Kirkham Drain	42.71556	-82.76528
Allwood Building Components	MIS510100	Fistler Drain	42.80833	-82.77278
Anchor Bay Marina - New Baltimore	MIS510435	Salt River	42.65000	-82.78333
Bundy – New Haven	MIS510508	West Branch Fish Creek	42.70944	-82.80611
C & S Auto Parts – Lenox	MIS510469	Salt River	42.78333	-82.73333
Fisher Kellering - Chesterfield	MIS510522	West Branch Fish Creek	42.70917	-82.80611
H & B Auto Electric - New Haven	MIS510437	Salt River	42.73444	-82.78417
Pine Tree Acres – Lenox	MIS510465	Kirkham Drain	42.75000	-82.74583
Shoreline Steel - New Haven	MIS510117	Fish Creek	42.72917	-82.80083
Admiral Dev – Admirals Cove	MIR107603		42.65085	-82.84473
Autumn Creek – Pendleton Village	MIR107293		42.69511	-82.80572
Ag B & A Steel Parcel A	MIR106939		42.66554	-82.84541
Anton – Millstone Pond Mfg Housing	MIR104237		42.72628	-82.73775
Baycourt Estates Sub No. 2	MIR104813		42.71126	-82.74591
Brandenburg – Lakeview Estates	MIR106709		42.66682	-82.76424
Brandenburg – Secluded Woods	MIR106710		42.66682	-82.76424
Burgess Estates Sub	MIR104865		42.69563	-82.78552
Charter Oak Covington Phase II	MIR105210		42.68329	-82.74314
Chesterfield Commons	MIR106878		42.68010	-82.84577
Chesterfield Corporate Center	MIR108057		42.70981	-82.80637
Copperfield Industrial	MIR106140		42.72576	-82.75776
Cotton Creek Condos	MIR106272		42.71126	-82.74591

\*facility not yet constructed.

**Table 5 continued.**

<b>Facility</b>	<b>Permit Number</b>	<b>Receiving Water</b>	<b>Latitude</b>	<b>Longitude</b>
Casco Twp MS4-St. Clair	MIG610259	Anchor Bay	--	--
Chesterfield Twp MS4 – Macomb	MIG610310	Anchor Bay	--	--
Lenox Twp MS4 - Macomb	MIG610301	Anchor Bay	--	--
Macomb Co MS4	MIG610052	Anchor Bay	--	--
New Baltimore MS4 – Macomb	MIG610303	Anchor Bay	--	--
New Haven MS4 – Macomb	MIG610302	Anchor Bay	--	--