Michigan Department of Environmental Quality
Water Bureau
August 2007

Total Maximum Daily Load for *E. coli* for Lake St. Clair Metropolitan and Memorial Beaches 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 *E. coli* that will result in the attainment of the applicable WQS at Lake St. Clair Metropolitan and Memorial Beaches, located in Macomb County, Michigan.

PROBLEM STATEMENT

This TMDL addresses two listings that appear on the Section 303(d) list as:

LAKE ST. CLAIR METROPOLITAN BEACH WBID#: **061410B**
County: MACOMB SIZE: 2 M
Location: Metropolitan Beach area.
NHD Reach Code: 04090002000526
Problem Summary: CSO, pathogens (Rule 100).
TMDL Year(s): 2007

LAKE ST. CLAIR SHORES MEMORIAL BEACH WBID#: **061410C**
County: MACOMB SIZE: 1 M
Location: Lake St. Clair at Memorial Beach.
NHD Reach Code: 04090002000526
Problem Summary: CSO, pathogens (Rule 100).
TMDL Year(s): 2007

Lake St. Clair Metropolitan and Memorial Beaches were placed on the 2006 Section 303(d) list due to impairment of recreational uses as indicated by elevated levels of *E. coli* reported by the Macomb County Health Department (MCHD) (Edly and Wuycheck, 2006). Monitoring data collected by the Michigan Department of Environmental Quality (MDEQ) in 2003 and 2004 documented occasional exceedances of the daily maximum WQS for *E. coli* during the total body contact recreational season of May 1 through October 31 (Tables 1a-3b). Both TMDL reaches are located in the Lake St. Clair watershed, Hydrologic Unit Code (HUC) 4090002, which is bisected by the Clinton River watershed (Figure 1). An *E. coli* TMDL is scheduled for the Clinton River in 2010. The infrastructure for the city of Detroit alters the hydrology of the Lake St. Clair watershed such that discharges to the municipal system are routed to the Detroit River watershed. Therefore, sources of *E. coli* from the Detroit municipal boundaries are not included in this TMDL.

NUMERIC TARGET

The impaired designated use addressed by this TMDL is total body contact recreation. The designated use rule (R 323.1100 of the Part 4 rules, WQS, promulgated under Part 31, Water Resources Protection, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended) states that this water body be protected for total body contact recreation from May 1 to 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.

The target for sanitary wastewater discharges is:

> 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 coliform 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). Overall fecal coliform concentrations are substantially higher than *E. coli* concentrations alone when the wastewater of concern is sewage (Whitman, 2001). Therefore, typically it can 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 geometric mean are the target levels for the TMDL reach from May 1 to October 31. As previously stated, the 2003-2004 monitoring data indicated occasional daily maximum WQS exceedances at both TMDL beaches.

LINKAGE ANALYSIS

Determining the link between the *E. coli* concentrations and the potential sources is necessary to develop the TMDL. TMDLs must be established at a level necessary to attain and maintain the applicable WQS. In Michigan, the applicable WQS for *E. coli* consists of two criteria values: a daily maximum value of 300 *E. coli* per 100 mL and a 30-day geometric mean of 130 *E. coli* per 100 mL. Because the waste load allocations (WLAs) provided herein are based on the daily maximum criterion, a linkage analysis is needed to demonstrate these allocations also assure attainment of the 30-day geometric mean.

The USEPA's "Ambient Water Quality Criteria for Bacteria-1986," defines the statistical relationship between the daily maximum and geometric mean water quality criteria (USEPA, 1986). The assumptions used to develop the 30-day geometric mean of 126 *E. coli* per 100 mL (rounded to 130 *E. coli* per 100 mL as the Michigan criterion) are a log-normal distribution using a log standard deviation of 0.4. Using these assumptions and a comparable recurrence interval (e.g., 30 days), a daily maximum projected from the 30-day mean would be 713 *E. coli* per 100 mL. Conversely, a 30-day geometric mean projected from the Michigan daily maximum criterion of 300 *E. coli* per 100 mL would be 55 *E. coli* per 100 mL. This relationship provides the basis for demonstrating that attaining the daily maximum target in the TMDL will also achieve the 30-day geometric mean criteria.

Michigan regulates discharges containing treated or untreated human waste (i.e., sanitary wastewater) using fecal coliform. Sanitary wastewater discharges are required to meet 200 fecal coliform per 100 mL as a monthly average and 400 fecal coliform per 100 mL as a maximum. The sanitary discharges are expected to be in compliance with the ambient WQS of 130 *E. coli* per 100 mL and 300 *E. coli* per 100 mL if their NPDES permit limits for fecal coliform are met. The *E. coli* criteria contained in the 1986 document were derived to approximate the degree of protection, no more than 8 illnesses per 1000 swimmers, provided by the fecal coliform indicator level of 200 *E. coli* per 100 mL recommended by the USEPA prior to the adoption of the 1986 criteria. All Wastewater Treatment Plants (WWTPs) provide year-round disinfection, providing another level of confidence that the WQS will be met.

DATA DISCUSSION

Metropolitan Beach

Data were collected from seven stations in Lake St. Clair along Metropolitan Beach, and one station on a nearby marina canal, from May 1-October 31 in 2003 and 2004 (Figure 2). Precipitation data for the two days prior to each MDEQ sampling event were obtained from a weather station in Mt. Clemens, Michigan (Tables 1a-2b; Weather Underground, 2006). Metropolitan Beach daily maximum and 30-day geometric mean data for 2003 and 2004 are shown in Tables 1a and 1b, and Figures 4a and 4b. In July 2003, the daily maximum WQS was exceeded on only one occasion at station MET-2 (Table 1a). However, in 2004, the daily maximum WQS was exceeded at multiple sites; MET-3 and MET-7 exceeded WQS in August, and MET-2, MET-3, MET-4, and MET-6 exceeded in September (Table 1b). The highest daily maximum concentration recorded was 1100 *E. coli* per 100 mL at MET-4 in September. Sampling of the canal at Station CLT-1 showed a peak daily maximum of 160 *E. coli* per 100 mL in July 2003 and no WQS exceedances (Tables 2a and 2b). There were no exceedances of the 30-day geometric mean WQS at Metropolitan Beach during the sampling period.

Memorial Beach

Data were collected from three stations in Lake St. Clair along Memorial Beach, and one station in the lake near the outlet of Hetchler Drain (MEM-4), from May 1-October 31 in 2003 and 2004 (Figure 2). Memorial Beach daily maximum and 30-day geometric mean data for 2003 and 2004 are shown in Tables 3a and 3b and Figures 5a and 5b, respectively. One exceedance of the daily maximum WQS occurred at MEM-4 on September 23, 2003 (Table 3a). In 2004, there were several exceedances of the daily maximum WQS; June 16 and August 4 at MEM-1, and May 27 at MEM-2. There were no exceedances of the 30-day geometric mean WQS at Memorial Beach.

E. coli monitoring was also conducted twice weekly at Metropolitan and Memorial Beaches by the MCHD, May-September 2003 and 2004. The MCHD issued a whole body contact advisory and closed Memorial Beach for 13 days in 2003, and 39 days in 2004 due to exceedances of the daily maximum WQS. Metropolitan Beach was closed by the MCHD for 6 days in 2003 and 4 days in 2004 due to exceedances of the daily maximum WQS (MDEQ Beach Monitoring Web site).

SOURCE ASSESSMENT

The listed reaches for this TMDL cover approximately two miles of Lake St. Clair at Metropolitan Beach and approximately one mile of Lake St. Clair at Memorial Beach. There are several municipalities, located either wholly or in part, within the Lake St. Clair watershed, the largest of which includes Clay Township (17 percent) and Casco Township (13 percent) (Table 4).

Metropolitan and Memorial Beaches are located along the western shore of Lake St. Clair in Macomb County, Michigan. Metropolitan Beach is on the northern edge of L'anse Creuse Bay located just south of the main Clinton River outlet to Lake St. Clair. Memorial Beach is approximately 2.5 miles north of St. Clair Shores, Michigan.

Land use is primarily high and low density residential development in the mid to southern portions of the TMDL watershed (L'Anse Creuse Bay) (USACE, 2004). About 40 percent of the northern portion of the TMDL watershed (Anchor Bay subwatershed) was agricultural land in 2004 (Alexander, 2005). However, agricultural land in the TMDL watershed is being converted to residential use at an unprecedented rate. Population growth across the Lake St. Clair watershed averaged 15 percent between 1990 and 1999, but in portions of the Anchor Bay area, populations have increased by 80 percent (USACE, 2004). Population growth is most rapid in townships adjacent to the lakeshore. Possible sources of *E. coli* include combined sewer overflows (CSOs), sanitary sewer overflows (SSOs), failing septic systems, illicit connections to storm sewers, and wildlife and/or pet waste.

There are 145 NPDES permitted discharges in the TMDL watershed, including 13 individual permits, 113 Certificates of Coverage (COCs) under 6 general permits, and 19 Notices of coverage (NOCs) under 1 permit-by-rule (Table 5). There are no Concentrated Animal Feeding Operations in the TMDL watershed. Locations of permitted discharges in the TMDL watershed are shown in Figure 1.

The Lake St. Clair watershed (HUC 4090002), minus the city of Detroit, has 2 permitted CSOs, and 3 general permits for wastewater stabilization lagoons. Grosse Pointe Farms CSO (MI0026077) has implemented their long-term control plan (separation of their combined sewer system) and is not a likely source of *E. coli*. Grosse Pointe Shores CSO (MI0026085) has also implemented their long-term control plan (separation of their combined sewer system) and is not a likely source of *E. coli* to Lake St. Clair. These cities are completing corrective action plans, as required by the MDEQ, to install bulkheads on their former CSO outfalls (now considered possible SSO outfalls). The wastewater stabilization lagoons are allowed to discharge between the months of March through May and October through December, overlapping the recreational season by two months. They are considered in compliance with the WQS of 130 *E. coli* per 100 mL if their NPDES permit limit of 200 fecal coliform per 100 mL as a monthly average is met, as discussed in the Linkage Analysis section. In addition, the Martin Retention Basin (RTB), Chapaton RTB, and Milk River CSO RTB discharge CSOs directly to Lake St. Clair; however, these CSOs receive disinfection prior to discharge so are not likely a significant source of *E. coli*.

The Richmond and New Baltimore WWTPs each reported one SSO on May 23, 2004. New Baltimore had a discharge of 0.4 million gallons per day of partially treated sewage to Crapeau Creek. Sampling was not conducted on the beaches immediately following the discharge; therefore, it is unclear if water quality was impacted. The SSO from the Richmond WWTP did not reach surface waters and was not considered a source of *E. coli*. These SSOs both occurred following the same rain event, during which four inches of rain were received in May 2004 (MDEQ, 2006). As a result of these SSO discharges, the MDEQ required corrective programs of each city. Richmond will be constructing collection system improvements and a storage basin at their WWTP in order to comply with the MDEQ's SSO requirements. New Baltimore will be conducting collection system improvements and constructing an upgraded/expanded WWTP in order to comply with the MDEQ's SSO requirements.

On-site septic systems serve many homes in the Lake St. Clair watershed. When they are not functioning properly, they can be another potential source of *E. coli* contamination. The MCHD maintains point-of-sale septic inspection records, and indicated a failure rate of 16 percent of systems inspected in 2005 (MCHD). Wayne County also maintains a point-of-sale septic inspection program, and reported a 22 percent failure rate in 2006 (www.waynecounty.com). St. Clair County does not maintain point-of-sale records, but does conduct illicit connection investigations for their illicit discharge elimination plan (IDEP).

The MCHD monitors multiple locations in the Clinton River watershed, including the Clinton River spillway. Data collected during the total body contact seasons of 2000-2005 indicates that the Clinton River is a potential source of *E. coli* to Lake St. Clair (USGS, 2007). Concentrations as high as 15,531 *E. coli* per 100 mL have been observed in the Clinton River spillway (Macomb County, 2006).

The United States Geologic Survey (USGS) conducted a study to assist the MDEQ in determining possible sources of *E. coli* to the TMDL beaches (Holtschlag et al., 2007). The study explored the relationship of *E. coli* concentrations on both beaches with the movement and circulation of water and contaminants in Lake St. Clair. Multiple environmental parameters (e.g., wind speed and direction, water surface temperatures and gage levels, wave height, air temperature, precipitation, etc.) were used to develop linear regression, regression tree, and logistic regression models. A two-dimensional hydrodynamic model was developed with simulated particle tracking. *E. coli* data collected by the MCHD was used in this modeling project because of the large size of that dataset.

Analysis of wind speed and direction data in relation to beach *E. coli* data was conducted at both beaches. At Memorial Beach, it was determined that wind direction and wind speed (averaged over the prior 24 hours) were not statistically significant factors in median *E. coli* concentrations (Holtschlag et al., 2007). Memorial Beach exceedances of the daily maximum WQS occurred in all wind sectors uniformly. However, at Metropolitan Beach, the highest number of WQS exceedances occurred during onshore winds from the east-southeast to the south-southwest sectors. From these directions, the wind moves across the broadest portions of the lake toward the beach, creating the largest waves and possibly resuspending particulate waste in the nearshore zones. At Metropolitan Beach, no exceedances of the daily maximum WQS occurred when the wind direction was from the west-northwest or north-northwest sectors. Wind from those sectors originate from land and thus would not create significant nearshore wave action.

Logistic regressions were conducted to explain the variability in *E. coli* results for each beach (Holtschlag et al., 2007). Increased water temperature, rainfall prior to sampling, and increased turbidity were positively associated with *E. coli* concentrations at both beaches. In terms of the probability of WQS exceedance on any given sampling date, rainfall preceding sampling events

was a predictor at both beaches. Specifically, each inch increase in rainfall during the 24 hours prior to sampling, resulted in a 30-fold increase in the odds of WQS exceedances. While the flow of the Clinton River was positively associated with exceedances at Memorial Beach, it was negatively associated with the probability of exceedances at Metropolitan Beach.

Hydrodynamic simulations found that particles (hypothetical *E. coli* colonies) released from multiple alongshore drains and the Clinton River generally hug the coastline, as opposed to moving to the center of the basin in most wind scenarios (Holtschlag et al, 2007). Hypothetical particles released from the North Channel St. Clair River, moved west along the coast of Anchor Bay and around to L'anse Cruese Bay past both TMDL beaches and circulating back north along the coast in most wind scenarios. Particles released from the Clinton River mainstem followed the coastline south, also moving past both TMDL beaches. The MCHD has monitored various drains and spillways throughout the county. Single sample data collected in Lake St. Clair at the outlets of drains throughout 2004 and 2005 by the MCHD near the mouths of the Salt River, Milk River, Crapeau Creek, the Clinton River Spillway, Irwin Branch Relief Drain, and Marsac Drain indicate that all of these drainages may be contributing to high *E. coli* concentrations and are potential sources to the TMDL beaches (Figure 3). As part of their Phase II Stormwater Permit compliance, the Macomb County Department of Public Works monitored 80 locations on enclosed drains in the Lake St. Clair watershed in 2002 for *E. coli*, and found that many enclosed drains contain high concentrations and are also a possible source to the lake (Macomb County, 2006). Historic data from Hetchler Drain, which enters the lake immediately adjacent to Memorial Beach, indicate that it may have been a source prior to 1999, but is no longer a likely source (MCHD, unpublished data). Given the high concentrations of *E. coli* in the drains monitored by Macomb County, and the results of the USGS particle tracking study, it is likely that the numerous drains as well as the Clinton River, including the spillway, contribute to the Memorial and Metropolitan Beach water quality problems.

LOADING CAPACITY (LC) DEVELOPMENT

The LC 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 30-day geometric mean WQS of 130 *E. coli* per 100 mL and daily maximum of 300 *E. coli* per 100 mL. Concurrent with the selection of a numeric concentration endpoint, development of the LC requires identification of the critical condition. The "critical condition" is defined as the set of environmental conditions (e.g., flow) used in development of the TMDL that results in attaining WQS and has an acceptably low frequency of occurrence.

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). 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 maximum 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.

LC

The LC is comprised of the sum of individual WLAs for point sources and load allocations (LAs) for nonpoint sources and natural background levels. In addition, the LC 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:

$$LC = \sum WLAs + \sum LAs + MOS$$

The LC represents the maximum loading that can be assimilated by the receiving water while still achieving WQS. Because this TMDL is concentration-based, the total loading for this TMDL is equal to 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 during the recreation season.

WLAs

Table 5 as well as Figure 1 outline the permitted point source discharges to the watershed surrounding Metropolitan and Memorial Beaches. The discharges include 13 individual permits, 87 storm water COCs, 3 wastewater lagoon COCs, 22 Municipal Separate Storm Sewer System COCs, 1 Water Supply Discharge COC, and 19 NOCs under 1 permit-by-rule. The WLA for the permits in Table 5 is equal to 130 *E. coli* per 100 mL as a 30-day average and 300 *E. coli* per 100 mL as a daily maximum during the recreational season between May 1 and October 31.

LAs

Because this TMDL is concentration based, the LA is also equal to 130 *E. coli* per 100 mL as a monthly geometric mean and 300 *E. coli* per 100 mL as a daily maximum. This LA 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 (Table 4). Twenty municipalities have land area within the Lake St. Clair watershed.

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 ordinarily 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 to provide for greater protection of water quality. The MDEQ has determined that the use of the WQS of 130 *E. coli* per 100 mL as a monthly geometric mean and 300 *E. coli* per 100 mL as a daily maximum for the WLA and LA is a more conservative approach than developing an explicit MOS. This 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. It is expected that there is no total body contact during the remainder of the year due to cold weather. Allocations developed to protect during the total body contact season are also

expected to assure attainment of the daily maximum partial body contact standard of 1000 *E. coli* per 100 mL, which applies year-round. Because this is a concentration-based TMDL, WQS must be met regardless of flow conditions in the applicable season.

REASONABLE ASSURANCE ACTIVITIES

The individual and general permittees listed in Table 5 with treated human waste discharges are responsible for maintaining compliance with their respective NPDES permit limitations for fecal coliform, and shall continue to monitor their effluent according to their permit requirements. Compliance is determined based on review of discharge monitoring report data by the MDEQ.

The Lake St. Clair Regional Monitoring Project (Project) is a joint effort between county governments in southeast Michigan, the MDEQ, and the USGS. Water quality data, including *E. coli*, were collected during 2004 and 2005 at 75 previously unsampled locations and is available on the Internet to aid in source assessment and the improvement of water quality. From the Project Web site at *The link provided was broken. This online document was revised 10/13/2017.* : "The Project, with its Web site and the embedded database, is intended to be a valuable resource to environmental scientists, environmental and public health workers, community executives and elected officials, and citizens. Information from the Project data can be used for making decisions on prevention strategies and on priorities for remediation and for the protection of public health. Analysis and interpretation contained in several project reports will examine historic and current water quality data relative to effects on the water quality of Lake St. Clair and its tributaries; will examine relationships between bed sediment contaminant concentrations and aquatic life criteria; will determine contaminant loadings to the lake and its tributaries; will describe the impact of land use on water quality; and will identify data gaps and areas for future investigation." The final report is expected in September 2007.

Section 426 of the Water Resources Development Act of 1999 authorized the United States Army Corps of Engineers (USACE) to develop a comprehensive management plan for Lake St. Clair and the St. Clair River. Congress provided appropriations for the management plan in Fiscal Years 2001 and 2002. The USACE contracted with the Great Lakes Commission to prepare the management plan, which the USACE submitted to Congress and released to the public in April 2005 (***The link provided was broken. This online document was revised 9/22/2016.***). One of the goals of the management plan is to attain water quality that is suitable and healthy for swimming. The final document contains recommendations to improve water quality for both the United States and Canada.

The Clinton River is an Area of Concern, designated by the International Joint Commission, and the Remedial Action Plan lists beach closings as a beneficial use impairment (specifically Metropolitan Beach). The goal of the Remedial Action Plan is to identify environmental problems, establish water use goals, and provide cleanup solutions that will restore the Area of Concern's beneficial uses. The Clinton River Public Advisory Council has received a $32,000 grant from the MDEQ to develop restoration criteria for the Clinton River Area of Concern. The Public Advisory Committee will be setting restoration goals for the beach closing impairment this year (2007). The Clinton River, from the confluence with Lake St. Clair upstream to Yates Dam, is also scheduled for an *E. coli* TMDL in 2010 (Edly and Wuycheck, 2006).

Phase II Stormwater Permits require an IDEP. Macomb County has been conducting IDEP activities from 2001 through 2007, and is required to sample outfalls to waters of the state, county road outfalls, and county drains. Macomb County estimates that approximately 17 million gallons of wastewater have been excluded from the Clinton River and Lake St. Clair due to their efforts. Macomb County produces an annual report on Lake St. Clair water quality and sampled over 400 sites in 2005 and 2006. St. Clair County Health Department began their IDEP in 2002 and has identified 295 failing septic systems within the Anchor Bay and Pine River

watersheds over a two-year timeframe (http://www.stclaircounty.org/offices/metro/Default.aspx). St. Clair County estimates that this effort has removed 6.9 million gallons of wastewater from surface waters annually. Wayne County has been identifying and removing illicit connections since 1987 and between 1987 and 2002 staff discovered 1,433 illicit connections at 370 facilities (Brzozowski, 2004).

The MCHD will continue to sample Memorial and Metropolitan Beaches twice weekly during the total body contact season using federal Beaches Environmental Assessment and Coastal Health Act funds. The MCHD reviews the data and posts total body contact recreation warnings when appropriate. The data reported by the MCHD is reviewed by the MDEQ and published on the MDEQ Beach Monitoring Database Web site at https://www.egle.state.mi.us/beach/.

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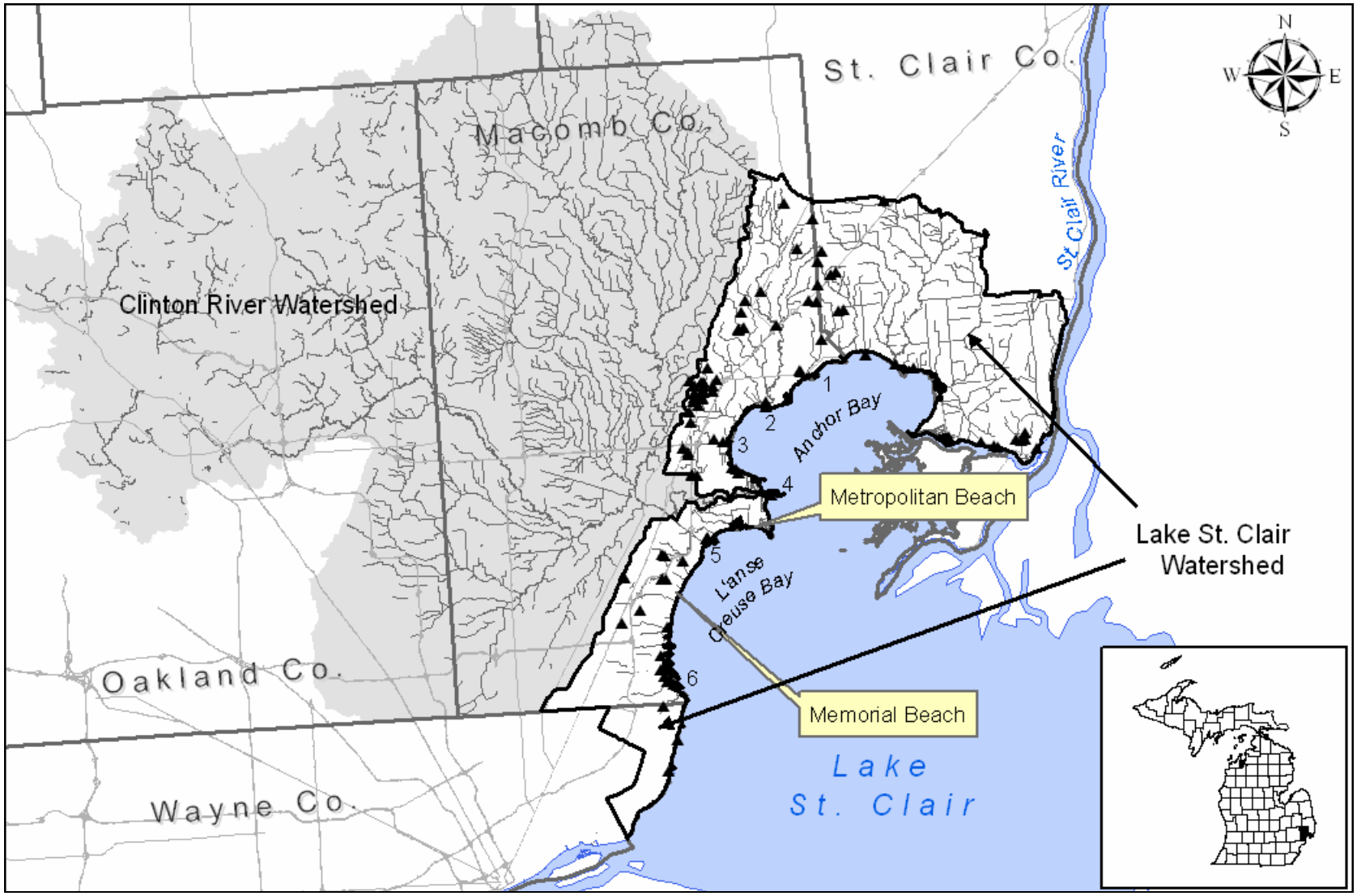


Figure 1. Locations of point sources within the Lake St. Clair watershed surrounding Metropolitan and Memorial Beaches.

Figure 2. Locations of sampling sites at Memorial and Metropolitan Beaches (insets) and surrounding municipalities within the Lake St. Clair watershed.

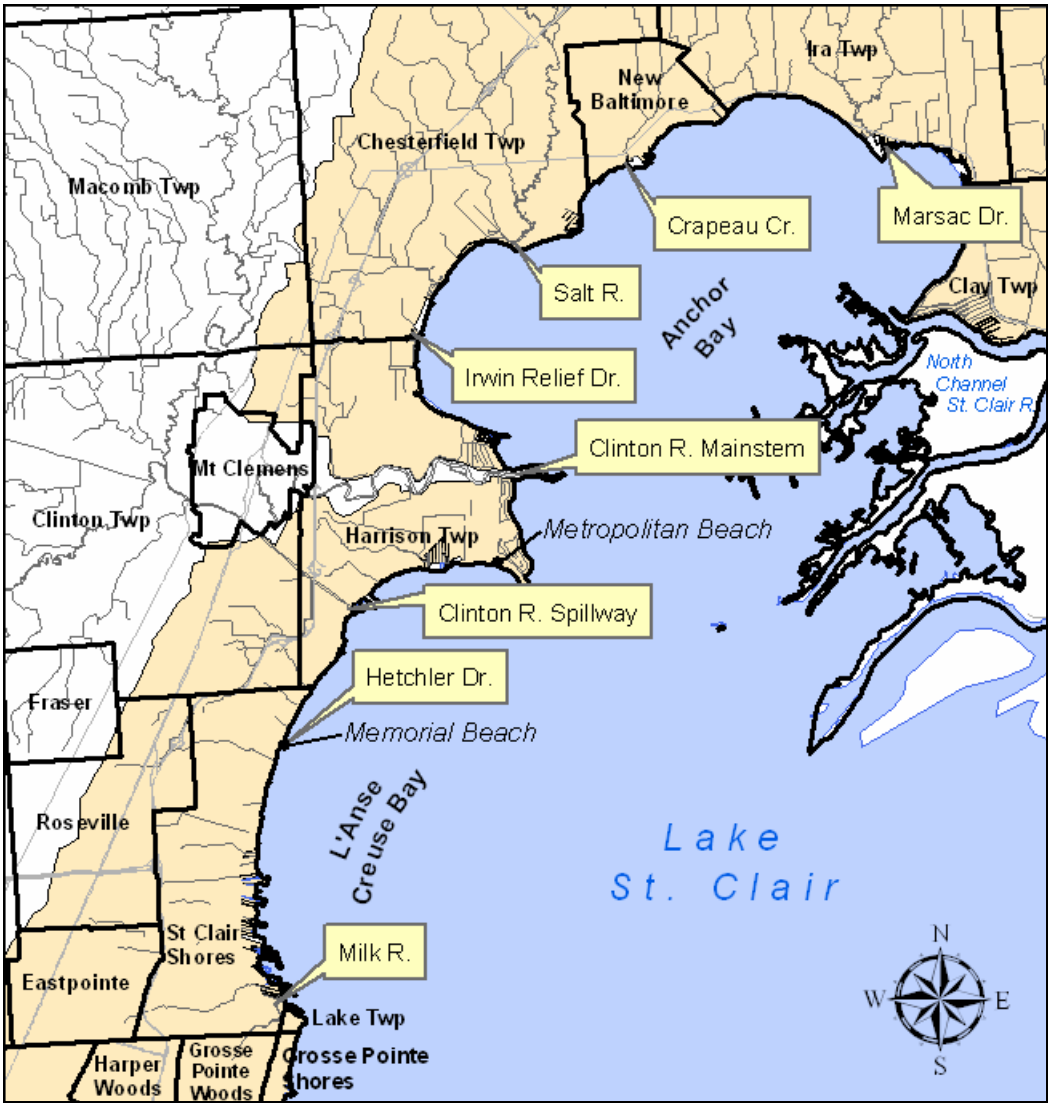
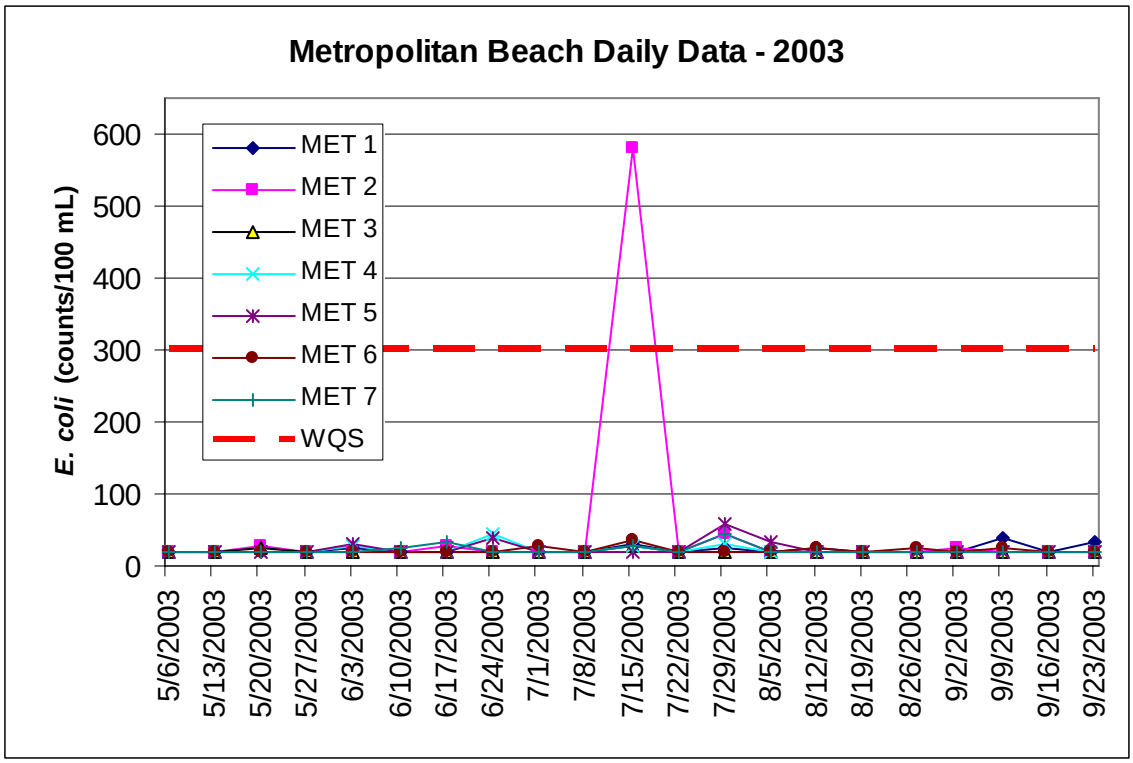


Figure 3. Locations of nearshore water quality stations at river and drain outlets sampled by the MCHD.



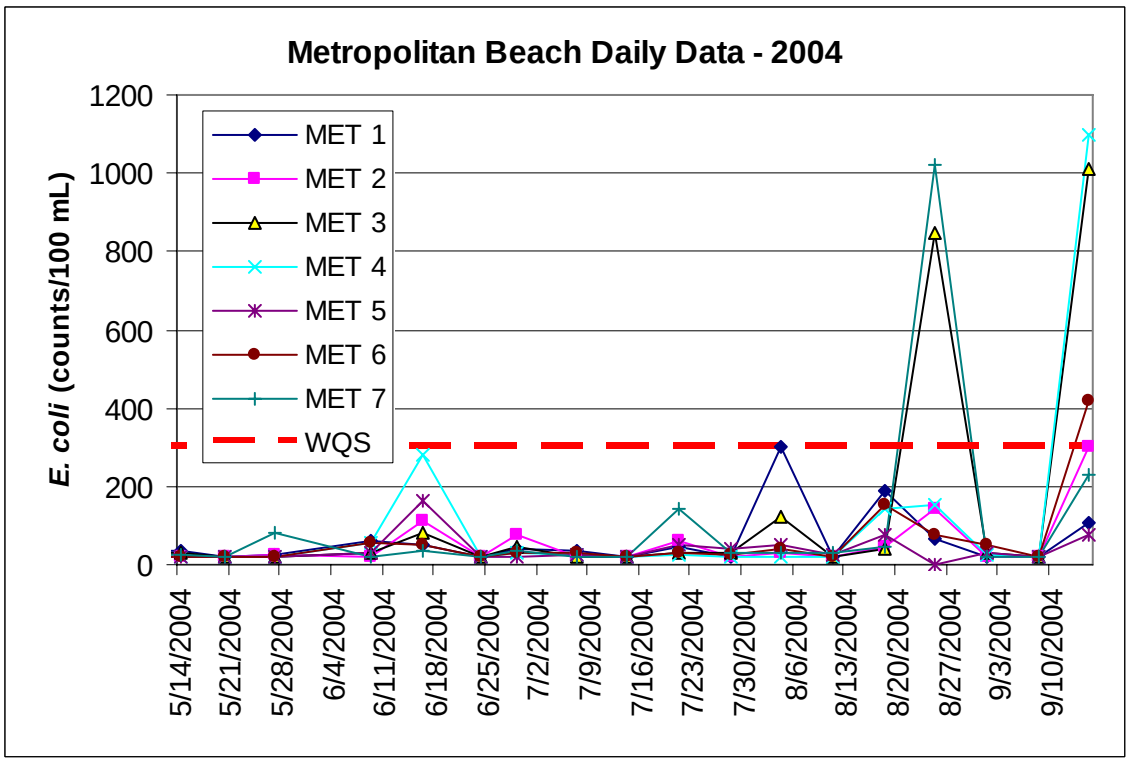
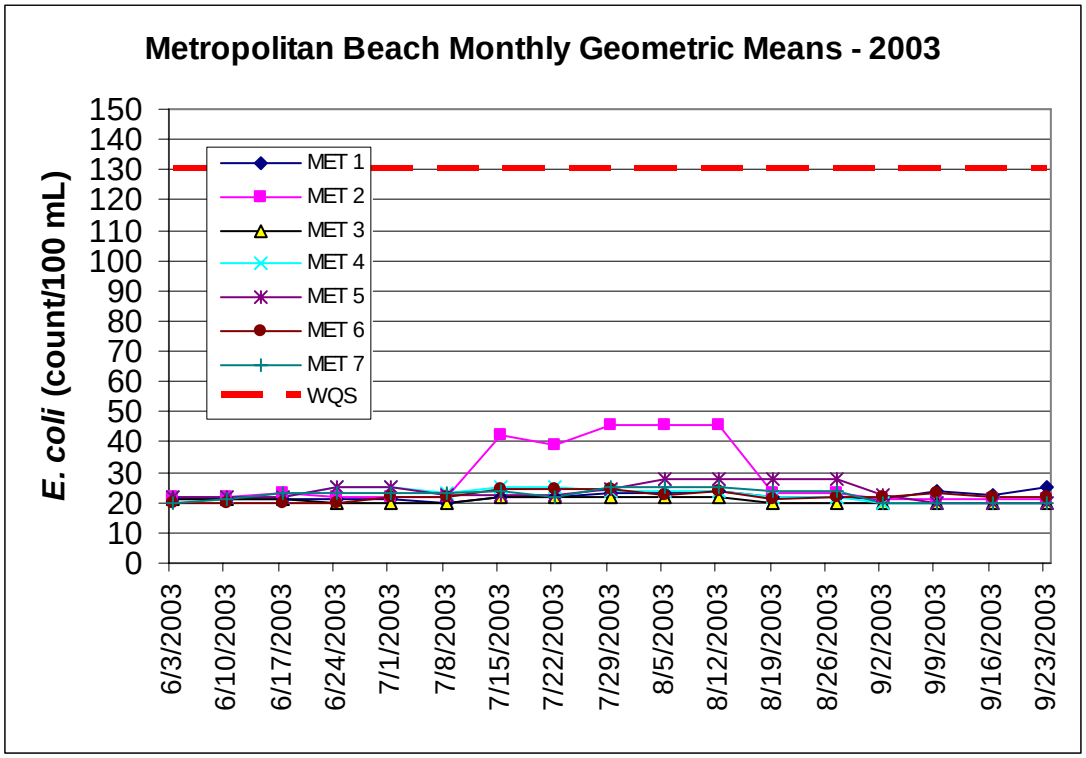


Figure 4a. Metropolitan Beach daily maximum *E. coli* results for 2003 and 2004.



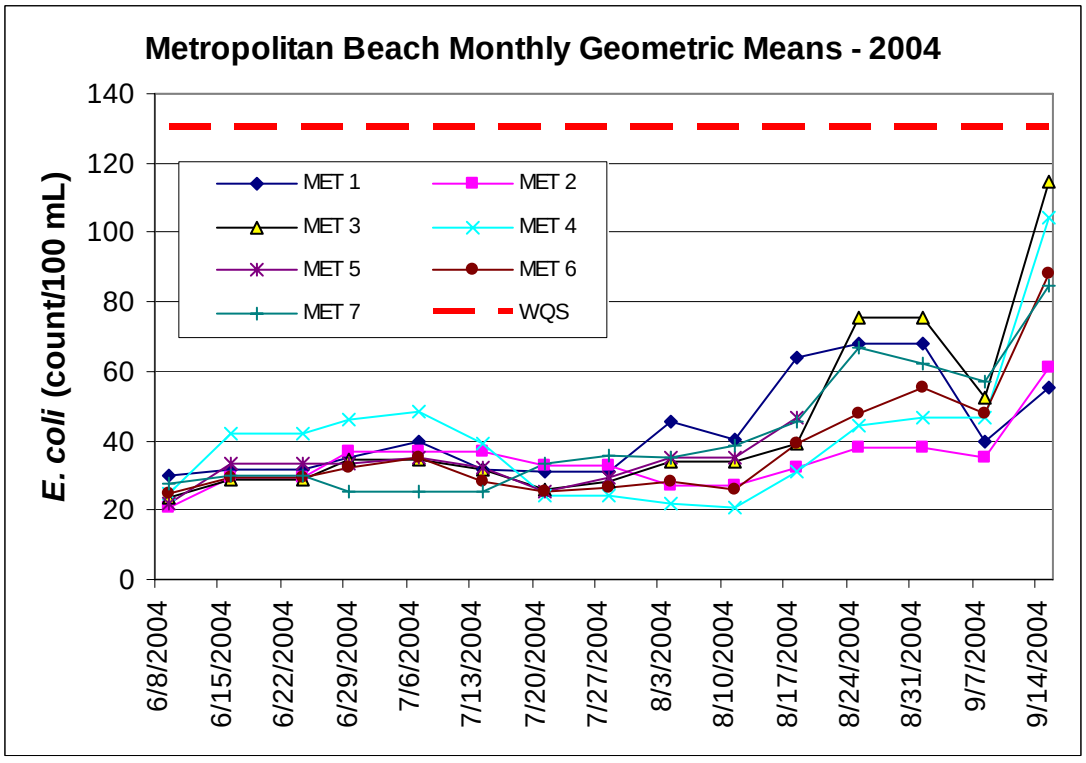
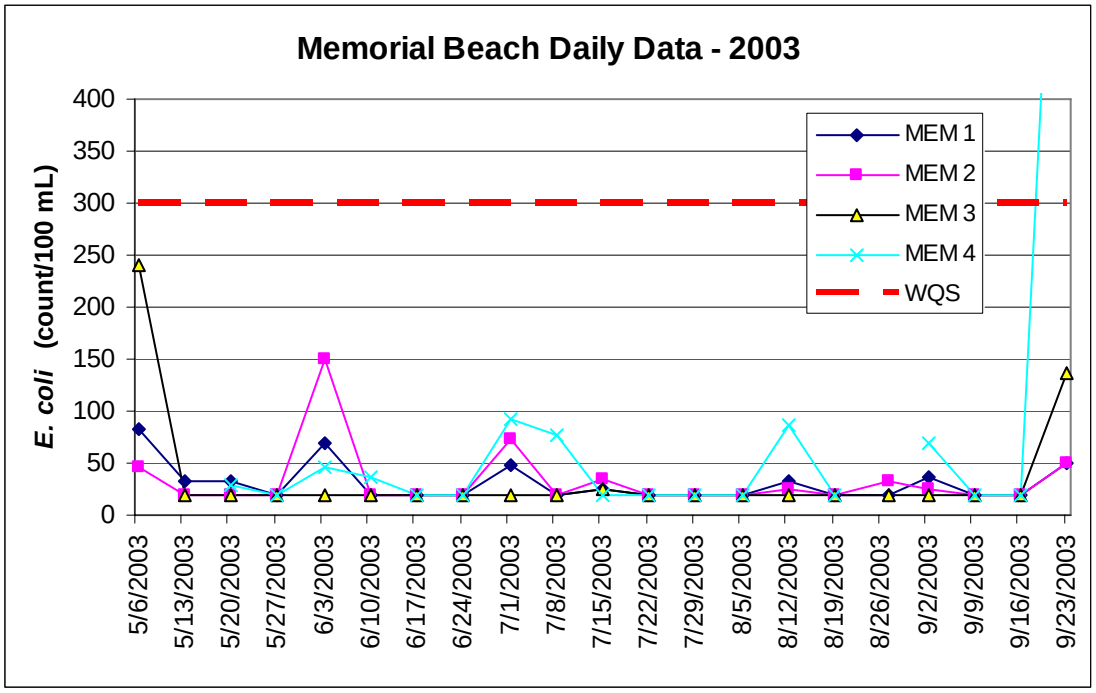


Figure 4b. Metropolitan Beach monthly geometric means for 2003 and 2004.



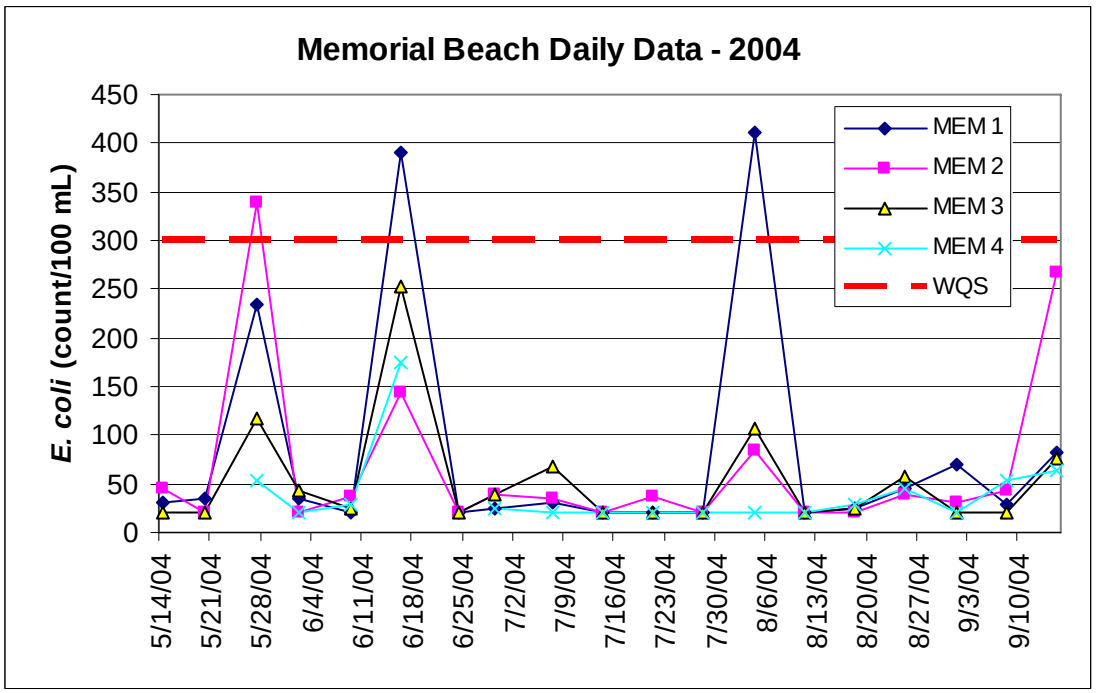
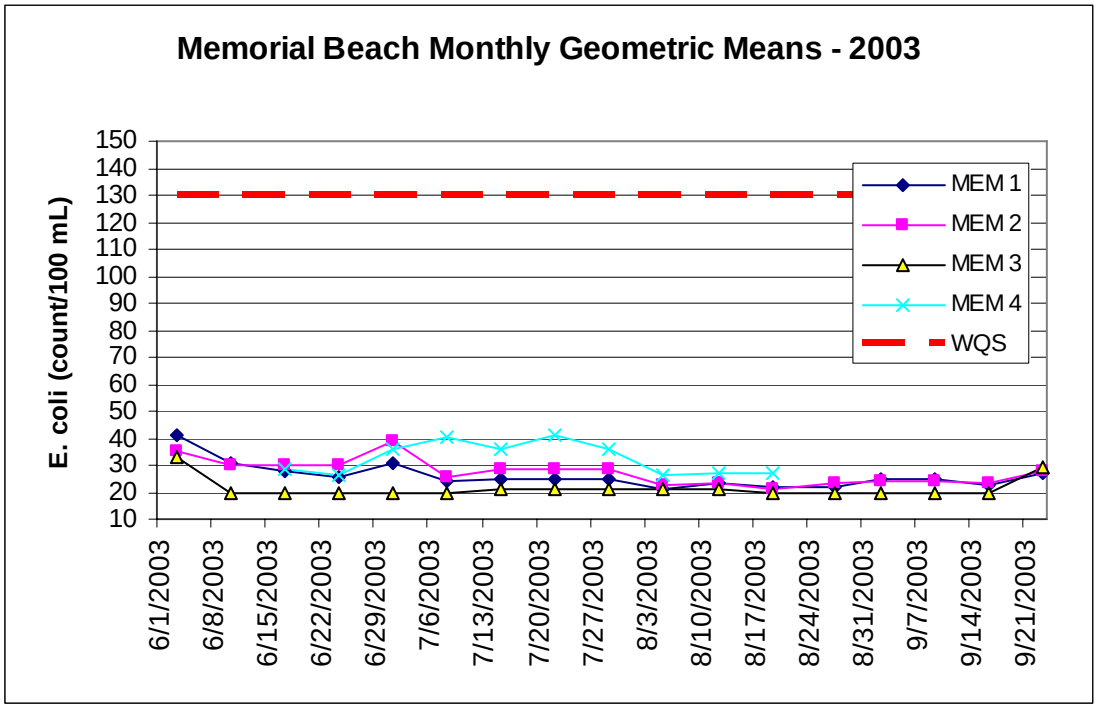


Figure 5a. Memorial Beach daily maximum *E. coli* results for 2003 and 2004.



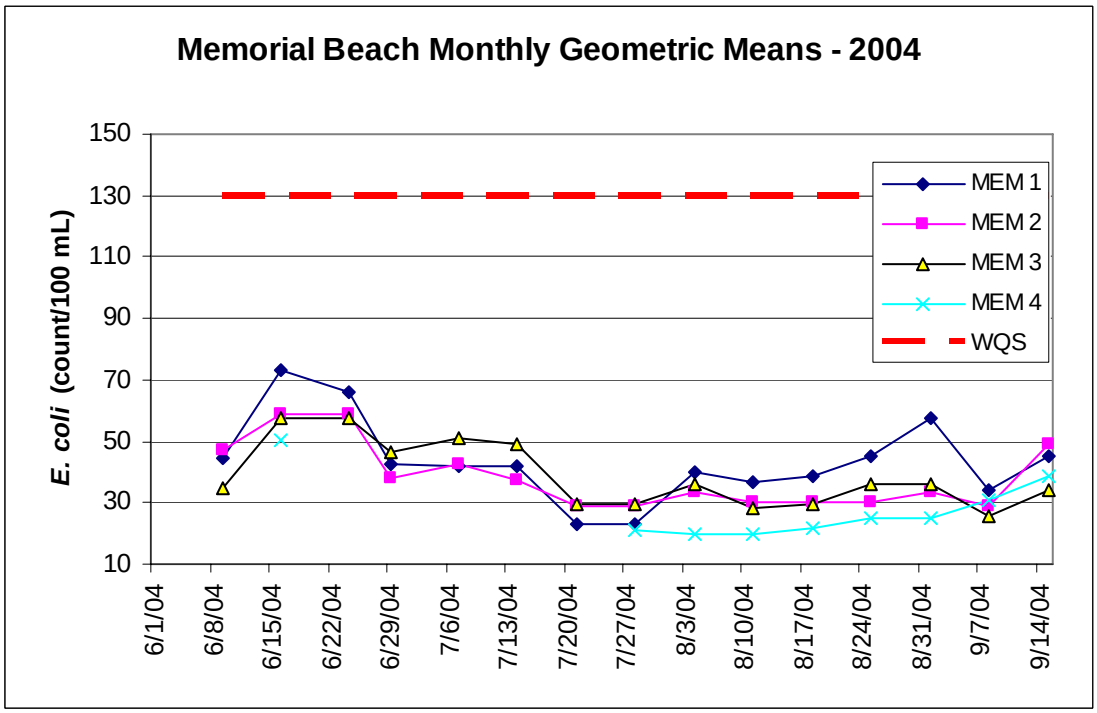


Figure 5b. Memorial Beach monthly geometric means for 2003 and 2004.

Table 1a. Weekly *E. coli* sampling results (counts per 100 mL) from Metropolitan Beach sampling stations 1-7, May 1-October 31, 2003. Exceedances of the daily maximum and monthly geometric mean WQS are shaded gray.

	MET 1			MET 2			MET 3			MET 4			MET 5			MET 6			MET 7			Precipitation (inches)
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	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	SAMPLE RESULTS	DAILY G. MEAN	30- DAY G. MEAN	
5/6/2003	20	20	---	20	20	---	20	20	---	20	20	---	20	20	---	20	20	---	20	20	---	0.79
	20			20			20			20			20			20			20			
	20			20			20			20			20			20			20			
5/13/2003	20	20	---	20	20	---	20	20	---	20	20	---	20	20	---	20	20	---	20	20	---	0.26
	20			20			20			20			20			20			20			
	20			20			20			20			20			20			20			
5/20/2003	20	20	---	20	29	---	20	25	---	20	20	---	20	20	---	20	20	---	20	20	---	0.49
	20			20			40			20			20			20			20			
	20			60			20			20			20			20			20			
5/27/2003	20	20	---	20	20	---	20	20	---	20	20	---	20	20	---	20	20	---	20	20	---	0.24
	20			20			20			20			20			20			20			
	20			20			20			20			20			20			20			
6/3/2003	40	25	21	20	20	22	20	20	21	60	29	22	20	32	22	20	20	20	20	20	20	0
	20			20			20			20			80			20			20			
	20			20			20			20			20			20			20			
6/10/2003	20	20	21	20	20	22	20	20	21	20	20	22	20	20	22	20	20	20	20	25	21	0.27
	20			20			20			20			20			20			20			
	20			20			20			20			20			20			40			
6/17/2003	20	20	21	20	29	23	20	20	21	20	20	22	20	20	22	20	20	20	100	34	23	0
	20			20			20			20			20			20			20			
	20			60			20			20			20			20			20			
6/24/2003	20	20	21	20	20	22	20	20	20	20	43	25	20	38	25	20	20	20	20	20	23	0
	20			20			20			40			20			20			20			
	20			20			20			100			140			20			20			
7/1/2003	20	20	21	20	20	22	20	20	20	20	20	25	20	20	25	20	29	22	20	20	23	0.19
	20			20			20			20			20			60			20			
	20			20			20			20			20			20			20			
7/8/2003	20	20	20	20	20	22	20	20	20	20	20	23	20	20	23	20	20	22	20	20	23	0.21
	20			20			20			20			20			20			20			
	20			20			20			20			20			20			20			

Table 1a continued.

	MET 1			MET 2			MET 3			MET 4			MET 5			MET 6			MET 7			Precipitation (inches)
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	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	SAMPLE RESULTS	DAILY G. MEAN	30- DAY G. MEAN	
7/15/2003	80	32	22	1560	581	42	60	29	22	20	29	25	20	20	23	20	36	24	60	29	24	0
	20			900			20			60			20			120			20			
	20			140			20			20			20			20			20			
7/22/2003	20	20	22	20	20	39	20	20	22	20	20	25	20	20	23	20	20	24	20	20	22	0.18
	20			20			20			20			20			20			20			
	20			20			20			20			20			20			20			
7/29/2003	40	25	23	100	43	46	20	20	22	20	32	24	60	58	25	20	20	24	120	46	25	0
	20			40			20			40			20			20			20			
	20			20			20			40			160			20			40			
8/5/2003	20	20	23	20	20	46	20	20	22	20	20	24	20	34	28	20	20	23	20	20	25	0.31
	20			20			20			20			100			20			20			
	20			20			20			20			20			20			20			
8/12/2003	20	25	24	20	20	46	20	20	22	20	20	24	20	20	28	20	25	24	20	20	25	0
	40			20			20			20			20			40			20			
	20			20			20			20			20			20			20			
8/19/2003	20	20	22	20	20	23	20	20	20	20	20	22	20	20	28	20	20	21	20	20	24	0
	20			20			20			20			20			20			20			
	20			20			20			20			20			20			20			
8/27/2003	20	20	22	20	20	23	20	20	20	20	20	22	20	20	28	20	25	22	20	20	24	0.46
	20			20			20			20			20			40			20			
	20			20			20			20			20			20			20			
9/2/2003	20	20	21	20	25	21	20	20	20	20	20	20	20	20	22	20	20	22	20	20	20	0.33
	20			20			20			20			20			20			20			
	20			40			20			20			20			20			20			
9/9/2003	20	38	24	20	20	21	20	20	20	20	20	20	20	20	20	20	25	23	20	20	20	0
	20			20			20			20			20			20			20			
	140			20			20			20			20			40			20			
9/16/2003	20	20	23	20	20	21	20	20	20	20	20	20	20	20	20	20	20	22	20	20	20	0.15
	20			20			20			20			20			20			20			
	20			20			20			20			20			20			20			
9/23/2003	100	34	25	20	20	21	20	20	20	20	20	20	20	20	20	20	20	22	20	20	20	0.02
	20			20			20			20			20			20			20			
	20			20			20			20			20			20			20			

Table 1b. Weekly *E. coli* sampling results (counts per 100 mL) from Metropolitan Beach sampling stations 1-7, May 1-October 31, 2004. Exceedances of the daily maximum and monthly geometric mean WQS are shaded gray.

	MET 1			MET 2			MET 3			MET 4			MET 5			MET 6			MET 7			Precipitation (inches)
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	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	SAMPLE RESULTS	DAILY G. MEAN	30- DAY G. MEAN	
5/14/2004	140	38	---	20	20	---	20	29	---	20	20	---	20	20	---	20	20	---	20	25	---	0.45
	20			20			60			20			20			20			20			
	20			20			20			20			20			20			40			
5/20/2004	20	20	---	20	20	---	20	20	---	20	20	---	20	20	---	20	20	---	20	20	---	0.03
	20			20			20			20			20			20			20			
	20			20			20			20			20			20			20			
5/27/2004	40	25	---	40	25	---	20	20	---	20	20	---	20	20	---	20	20	---	20	83	---	0.06
	20			20			20			20			20			20			120			
	20			20			20			20			20			20			240			
6/2/2003	20	20	---	20	20	---	20	20	---	20	20	---	20	20	---	20	20	---	20	20	---	0.17
	20			20			20			20			20			20			20			
	20			20			20			20			20			20			20			
6/9/2004	140	61	30	20	20	21	20	32	24	120	58	25	20	32	22	60	58	25	20	20	28	0.6
	20			20			80			20			20			160			20			
	80			20			20			80			80			20			20			
6/16/2004	60	52	32	20	110	29	80	82	29	320	282	42	200	166	33	300	49	30	20	36	30	0.58
	60			280			20			320			380			20			120			
	40			240			340			220			60			20			20			
6/24/2004	20	20	32	20	20	29	20	20	29	20	20	42	20	20	33	20	20	30	20	20	30	0.11
	20			20			20			20			20			20			20			
	20			20			20			20			20			20			20			
6/29/2004	20	43	35	100	78	37	20	48	35	40	32	46	20	20	33	80	32	32	20	36	25	0.08
	40			40			140			40			20			20			40			
	100			120			40			20			20			20			60			
7/7/2004	20	36	40	20	20	37	20	20	35	20	25	48	20	25	35	60	29	35	20	20	25	0.02
	60			20			20			20			20			20			20			
	40			20			20			40			40			20			20			

Table 1b continued.

	MET 1			MET 2			MET 3			MET 4			MET 5			MET 6			MET 7			Precipitation (inches)
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	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	SAMPLE RESULTS	DAILY G. MEAN	30- DAY G. MEAN	
7/14/2004	20	20	32	20	20	37	20	20	32	20	20	39	20	20	32	20	20	28	20	20	25	0.85
	20			20			20			20			20			20			20			
	20			20			20			20			20			20			20			
7/21/2004	20	46	31	160	63	33	80	32	26	20	25	24	180	52	25	20	29	25	60	142	33	0.01
	80			40			20			20			40			20			200			
	60			40			20			40			20			60			240			
7/28/2004	20	20	31	20	20	33	20	29	28	20	20	24	20	42	29	20	25	27	20	29	36	0.07
	20			20			60			20			60			40			60			
	20			20			20			20			60			20			20			
8/4/2004	340	300	46	20	29	27	160	123	34	20	20	22	80	50	35	20	42	28	20	32	35	1.27
	180			20			580			20			40			20			20			
	440			60			20			20			40			180			80			
8/11/2004	20	20	41	20	20	27	20	20	34	20	20	21	40	25	35	20	20	26	20	32	38	0.03
	20			20			20			20			20			20			20			
	20			20			20			20			20			20			80			
8/18/2004	260	191	64	40	48	32	20	40	39	160	145	31	20	78	46	540	154	39	120	46	45	0.02
	20			140			20			160			100			20			40			
	1340			20			160			120			240			340			20			
8/25/2004	660	64	68	20	143	38	1540	848	75	400	152	45	*	---	---	400	78	48	1300	1022	67	0.02
	20			1460			1800			440			1320			20			1140			
	20			100			220			20			1260			60			720			
9/1/2004	20	20	68	20	20	38	20	29	75	40	25	47	20	29	---	120	52	56	20	20	62	0
	20			20			60			20			20			20			20			
	20			20			20			20			60			60			20			
9/8/2004	20	20	40	20	20	35	20	20	52	20	20	47	20	20	---	20	20	48	20	20	57	0.76
	20			20			20			20			20			20			20			
	20			20			20			20			20			20			20			
9/15/2004	500	106	55	40	302	61	1000	1012	115	1600	1100	104	20	78	---	1420	420	88	20	229	84	0
	120			880			1400			540			1200			2600			600			
	20			780			740			1540			20			20			1000			

Table 2a. Weekly *E. coli* sampling results (counts per 100 mL) from the Clinton River near Metropolitan Beach (station CLT 1), May 1-October 31, 2003.

	CLT 1			Precipitation (inches)		CLT 1			Precipitation (inches)
DATE	SAMPLE RESULTS	DAILY G. MEAN	30- DAY G. MEAN		DATE	SAMPLE RESULTS	DAILY G. MEAN	30- DAY G. MEAN	
5/6/2003	20	43		0.79	**7/22/2003**	20	20	34	0.18
	200					20			
	20					20			
5/13/2003	20	20	---	0.26	**7/29/2003**	20	20	34	0
	20					20			
	20					20			
5/20/2003	20	20	---	0.49	**8/5/2003**	20	20	22	0.31
	20					20			
	20					20			
5/27/2003	20	40	---	0.24	**8/12/2003**	20	20	20	0
	20					20			
	160					20			
6/3/2003	20	20	---	0	**8/19/2003**	20	20	20	0
	20					20			
	20					20			
6/10/2003	20	25	24	0.27	**8/27/2003**	20	20	20	0.46
	40					20			
	20					20			
6/17/2003	20	20	24	0	**9/2/2003**	20	20	20	0.33
	20					20			
	20					20			
6/24/2003	20	20	24	0	**9/9/2003**	20	20	20	0
	20					20			
	20					20			
7/1/2003	20	160	32	0.19	**9/16/2003**	20	20	20	0.15
	380					20			
	540					20			
7/8/2003	100	34	35	0.21	**9/23/2003**	20	20	20	0.02
	20					20			
	20					20			
7/15/2003	20	20	34	0					
	20								
	20								

Table 2b. Weekly *E. coli* sampling results (counts per 100 mL) from the Clinton River near Metropolitan Beach (station CLT 1), May 1-October 31, 2004.

	CLT 1			Precipitation (inches)
DATE	SAMPLE RESULTS	DAILY G. MEAN	30- DAY G. MEAN	
7/7/2004	20 20 20	20		0.02
7/14/2004	20 20 20	20	---	0.85
7/21/2004	20 20 20	20	---	0.01
7/28/2004	20 20 20	20	---	0.07
8/4/2004	20 20 20	20	---	1.27
8/11/2004	20 20 20	20	20	0.03
8/18/2004	80 20 20	32	22	0.02
8/25/2004	20 20 20	20	22	0.02
9/1/2004	20 20 80	32	24	0
9/8/2004	20 20 20	20	24	0.76
9/15/2004	20 20 20	20	24	0
9/22/2004	20 20 20	20	24	0
9/29/2004	20 20 20	20	22	0

Table 3a. Weekly *E. coli* sampling results (counts per 100 mL) from Memorial Beach sampling stations 1-7, May 1-October 31, 2003. Exceedances of the daily maximum and monthly geometric mean WQS are shaded gray.

	MEM 1			MEM 2			MEM 3			MEM 4			Precipitation (inches)
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	SAMPLE RESULTS	DAILY G. MEAN	30- DAY G. MEAN	
5/6/2003	80	83	---	20	46	---	320	240	---	*	---	---	0.79
	120			40			120			*			
	60			120			360			*			
5/13/2003	80	32	---	20	20	---	20	20	---	*	---	---	0.26
	20			20			20			*			
	20			20			20			*			
5/20/2003	20	32	---	20	20	---	20	20	---	20	29	---	0.49
	80			20			20			20			
	20			20			20			60			
5/27/2003	20	20	---	20	20	---	20	20	---	20	20	---	0.24
	20			20			20			20			
	20			20			20			20			
6/3/2003	280	70	41	420	150	35	20	20	33	240	46	---	0
	20			400			20			20			
	60			20			20			20			
6/10/2003	20	20	31	20	20	30	20	20	20	40	36	---	0.27
	20			20			20			60			
	20			20			20			20			
6/17/2003	20	20	28	20	20	30	20	20	20	20	20	29	0
	20			20			20			20			
	20			20			20			20			
6/24/2003	20	20	26	20	20	30	20	20	20	20	20	27	0
	20			20			20			20			
	20			20			20			20			
7/1/2003	140	48	31	40	73	39	20	20	20	140	92	36	0.19
	40			80			20			40			
	20			120			20			140			
7/8/2003	20	20	24	20	20	26	20	20	20	20	77	40	0.21
	20			20			20			20			
	20			20			20			1160			

Table 3a continued.

	MEM 1			MEM 2			MEM 3			MEM 4			Precipitation (inches)
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	SAMPLE RESULTS	DAILY G. MEAN	30- DAY G. MEAN	
7/15/2003	40	25	25	20	34	29	40	25	21	20	20	36	0
	20			100			20			20			
	20			20			20			20			
7/22/2003	20	20	25	20	20	29	20	20	21	20	20	41	0.18
	20			20			20			20			
	20			20			20			20			
7/29/2003	20	20	25	20	20	29	20	20	21	20	20	36	0
	20			20			20			20			
	20			20			20			20			
8/5/2003	20	20	21	20	20	22	20	20	21	20	20	26	0.31
	20			20			20			20			
	20			20			20			20			
8/12/2003	80	32	23	40	25	23	20	20	21	40	86	27	0
	20			20			20			200			
	20			20			20			80			
8/19/2003	20	20	22	20	20	21	20	20	20	20	20	27	0
	20			20			20			20			
	20			20			20			20			
8/27/2003	20	20	22	80	32	23	20	20	20	*	---	---	0.46
	20			20			20			*			
	20			20			20			*			
9/2/2003	60	36	25	20	25	24	20	20	20	20	68	---	0.33
	20			20			20			20			
	40			40			20			800			
9/9/2003	20	20	25	20	20	24	20	20	20	20	20	---	0
	20			20			20			20			
	20			20			20			20			
9/16/2003	20	20	23	20	20	23	20	20	20	20	20	---	0.15
	20			20			20			20			
	20			20			20			20			
9/23/2003	320	50	27	20	50	28	20	136	29	1080	884	---	0.02
	20			320			520			160			
	20			20			240			4000			

Table 3b. Weekly *E. coli* sampling results (counts per 100 mL) from Memorial Beach sampling stations 1-7, May 1-October 31, 2004. Exceedances of the daily maximum and monthly geometric mean WQS are shaded gray.

	MEM 1			MEM 2			MEM 3			MEM 4			Precipitation (inches)
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	SAMPLE RESULTS	DAILY G. MEAN	30- DAY G. MEAN	
5/14/2004	20	32	---	60	46	---	20	20	---	20	---	---	0.45
	40			40			20			20			
	40			40			20			20			
5/20/2004	20	34	---	20	20	---	20	20	---	60	---	---	0.03
	100			20			20			40			
	20			20			20			80			
5/27/2004	20	234	---	340	340	---	200	117	---	80	54	---	0.06
	460			320			20			20			
	1400			360			400			100			
6/2/2004	100	34	---	20	20	---	20	43	---	20	20	---	0.17
	20			20			20			20			
	20			20			200			20			
6/9/2004	20	20	44	40	36	47	20	25	35	20	29	---	0.6
	20			20			20			60			
	20			60			40			20			
6/16/2004	620	390	73	440	144	59	1000	252	58	100	178	50	0.58
	200			20			800			140			
	480			340			20			400			
6/24/2004	20	20	66	20	20	59	20	20	58	*	---	---	0.11
	20			20			20			*			
	20			20			20			*			
6/29/2004	40	25	42	140	38	38	40	40	47	40	25	---	0.08
	20			20			20			20			
	20			20			80			20			
7/7/2004	20	32	42	20	34	42	20	68	51	20	20	---	0.02
	20			100			100			20			
	80			20			160			20			

Table 3b continued.

	MEM 1			MEM 2			MEM 3			MEM 4			Precipitation (inches)
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	SAMPLE RESULTS	DAILY G. MEAN	30- DAY G. MEAN	
7/14/2004	20	20	42	20	20	38	20	20	49	20	20	---	0.85
	20			20			20			20			
	20			20			20			20			
7/21/2004	20	20	23	20	36	29	20	20	29	20	20	---	0.01
	20			60			20			20			
	20			40			20			20			
7/28/2004	20	20	23	20	20	29	20	20	29	20	20	21	0.07
	20			20			20			20			
	20			20			20			20			
8/4/2004	780	411	40	40	84	33	80	108	36	20	20	20	1.27
	120			20			780			20			
	740			740			20			20			
8/11/2004	20	20	37	20	20	30	20	20	28	20	20	20	0.03
	20			20			20			20			
	20			20			20			20			
8/18/2004	20	25	38	20	20	30	40	25	29	20	29	22	0.02
	40			20			20			60			
	20			20			20			20			
8/25/2004	20	44	45	20	38	30	120	58	36	20	44	25	0.02
	20			140			20			220			
	220			20			80			20			
9/1/2004	20	70	58	20	32	33	20	20	36	20	20	25	0
	140			80			20			20			
	120			20			20			20			
9/8/2004	20	29	34	20	43	29	20	20	26	20	52	31	0.76
	60			200			20			20			
	20			20			20			360			
9/15/2004	120	83	45	80	268	49	280	77	34	20	64	39	0
	120			3000			80			220			
	40			80			20			60			

Table 4. Percent of land area in Lake St. Clair watershed (HUC-4090002) located within each municipality.

Name	Percent of Lake St. Clair Watershed
Clay Twp	17%
Casco Twp	13%
Chesterfield Twp	11%
Cottrellville Twp	10%
Lenox Twp	9%
Ira Twp	7%
Harrison Twp	6%
St Clair Shores	5%
Clinton Twp	3%
Roseville	3%
China Twp	3%
Eastpointe	2%
New Baltimore	2%
Grosse Pointe Woods	1%
Grosse Pointe Farms	1%
Harper Woods	1%
Grosse Pointe Park	1%
Algonac	1%
Marine City	1%
Macomb Twp	1%

Table 5. Individual permits, General Permits, and Notices of Coverage under permit-by-rule in the TMDL reach watershed. Source: MDEQ, Water Bureau's NPDES Permit Management System.

Permit Descriptions				
Permit No	Facility Name	Township Name	Latitude	Longitude
MI0000000- Individual Permits				
MI0023680	New Baltimore WWTP	Chesterfield	42.67833	-82.74972
MI0023906	Richmond WWTP	Lenox	42.79556	-82.75861
MI0025453	Martin RTB	Roseville	42.48528	-82.89139
MI0025500	Milk River CSO RTB	Grosse Pointe	42.44944	-82.88972
MI0025585	Chapaton RTB	Roseville	42.46500	-82.88028
MI0026077	Grosse Pointe Farms CSO	Grosse Pointe	42.40444	-82.88750
MI0026085	Grosse Pointe Shores CSO	Grosse Pointe	42.42639	-82.87861
MI0027073	Americana Estates of Casco MHP	Casco	42.73806	-82.73056
MI0055816	Millstone Pond MHP	Lenox	42.72722	-82.73917
MI0055948	US Army Tank Comm-R & D	Harrison	42.61000	-82.81167
MI0056472	Northampton Community MHP	Chesterfield	42.71060	-82.77095
MI0057364	MDOT- Statewide MS4	various	na	na
MI0057369	Mt Clemens WFP	Harrison	42.56528	-82.83750
MIG580000 - Wastewater Stabilization Lagoons				
MIG580026	MDOT-EB/NB Rest Area	Casco	42.79472	-82.66556
MIG580027	MDOT I-94 WB/SB RA	Casco	42.74472	-82.71833
MIG580328	Anchor Bay Schools-Casco	Casco	42.74583	-82.71250
MIG610000 - Municipal Separate Storm Sewer Systems (MS4)				
MIG610040	Wayne Co MS4	various	na	na
MIG610052	Macomb Co MS4	various	na	na
MIG610253	Ira Twp MS4-St Clair	various	na	na
MIG610255	Algonac MS4-St Clair	various	na	na
MIG610258	Cottrellville Twp MS4-St Clair	various	na	na
MIG610259	Casco Twp MS4-St Clair	various	na	na
MIG610260	St. Clair Twp MS4	various	na	na
MIG610296	Lakeview PS MS4-Macomb	various	na	na
MIG610297	Roseville MS4-Macomb	various	na	na
MIG610298	St. Clair Shores MS4	various	na	na
MIG610299	Clinton Twp MS4-Macomb	various	na	na
MIG610301	Lenox Twp MS4-Macomb	various	na	na
MIG610302	New Haven MS4-Macomb	various	na	na
MIG610303	New Baltimore MS4-Macomb	various	na	na
MIG610308	Fraser MS4-Macomb	various	na	na
MIG610310	Chesterfield Twp MS4-Macomb	various	na	na
MIG610313	Harrison Twp MS4-Macomb	various	na	na
MIG610316	Grosse Pointe MS4-Wayne	various	na	na
MIG610317	Grosse Pointe Farms MS4-Wayne	various	na	na
MIG610318	Grosse Pointe Shores MS4-Wayne	various	na	na
MIG610319	Grosse Pointe Park MS4-Wayne	various	na	na
MIG610320	Eastpointe MS4-Wayne	various	na	na
MIG640000 - Municipal Potable Water Supply Discharge				
MIG640240	US Army Tank Comm-R & D	Harrison	42.61000	-82.81167
MIS110000, MIS41000 and MIS51000 - Industrial Storm Water				
MIS110789	John Carlo-Rex Model S 926	Clinton	42.62722	-82.92444
MIS111120	Rite Machine Products	Clinton	42.62778	-82.91306
MIS410169	Sassy Marine-Algonac	Clay	42.62917	-82.61250
MIS410201	Algonac Harbour Club	Clay	42.62500	-82.58333
MIS410409	Monnier-Algonac	Clay	42.62500	-82.54167
MIS510010	Schaller Corp-Plant #3	Chesterfield	42.68330	-82.83750
MIS510082	Uni-Bond Extrusions LLC	Chesterfield	42.66670	-82.85000
MIS510087	Russell Breckenridge Company	Harrison	42.60861	-82.85500
MIS510096	Sun-Up Marina	Chesterfield	42.65833	-82.78333
MIS510097	EMP Manufacturing-Chesterfield	Chesterfield	42.67080	-82.83330
MIS510104	RSE-New Baltimore	Chesterfield	42.67920	-82.75000
MIS510105	Auburn Engineering	Chesterfield	42.66670	-82.84140

Table 5 (continued).

Permit Descriptions				
Permit No	Facility Name	Township Name	Latitude	Longitude
MIS110000 - Industrial Storm Water				
MIS510110	International Casting Corp	Chesterfield	42.75420	-82.72920
MIS510117	Shoreline Steel-New Haven	Lenox	42.72867	-82.79873
MIS510128	Schaller Corp-Plant #1	Chesterfield	42.66250	-82.84330
MIS510361	Mackie Marina-Algonac	Clay	42.62060	-82.56670
MIS510365	Mayea Boat Works-Fair Haven	Ira	42.68060	-82.66000
MIS510367	Algonac Cast Products	Clay	42.62920	-82.54170
MIS510427	AMP Industries-Harrison Twp	Harrison	42.60420	-82.85420
MIS510428	Auto Farm Inc-Ira	Ira	42.68750	-82.68750
MIS510430	IPEX USA-New Baltimore	Chesterfield	42.70000	-82.72920
MIS510435	Anchor Bay Marina-New Balt	Chesterfield	42.65000	-82.78330
MIS510436	Dajaco Industries Inc	Chesterfield	42.66610	-82.84360
MIS510437	H & B Auto Electric-New Haven	Lenox	42.73440	-82.78420
MIS510438	Temp-Rite Steel Treating	Clinton	42.60860	-82.85000
MIS510439	MacLean Maynard-Chesterfield	Chesterfield	42.66670	-82.83330
MIS510456	Michigan Marine Salvage	Harrison	42.59360	-82.78140
MIS510457	Mich Harbor Inc-Macomb	Roseville	42.47500	-82.89170
MIS510461	US Concrete Mich Region	Chesterfield	42.67500	-82.82920
MIS510462	Continental Plastics Company	Chesterfield	42.63330	-82.83330
MIS510464	Roura Iron Works-Clinton Twp	Clinton	42.55000	-82.86670
MIS510465	Pine Tree Acres-Lenox	Lenox	42.76390	-82.74899
MIS510466	Theut Products-Chesterfield	Chesterfield	42.64580	-82.85420
MIS510469	C & S Auto Parts-Lenox	Lenox	42.78333	-82.73333
MIS510471	Buds Garage & Auto Mortuary	Clay	42.62500	-82.55000
MIS510472	Bundy-Chesterfield	Chesterfield	42.66220	-82.84280
MIS510480	Selfridge Tech-Chesterfield	Shelby	42.50420	-82.79580
MIS510486	K-O-Fab & Machine	Chesterfield	42.66670	-82.84190
MIS510490	Blue Water Marine Inc	Harrison	42.59611	-82.81306
MIS510493	Emhart Automotive-Chesterfield	Chesterfield	42.66280	-82.85030
MIS510502	Jefferson Beach Marina	Roseville	42.47080	-82.88750
MIS510504	Sundog Marina-Harrison Twp	Harrison	42.59333	-82.79194
MIS510505	Miller Marina Incorporated	Roseville	42.47500	-82.89167
MIS510506	Heritage Mfg-Chesterfield Twp	Chesterfield	42.66670	-82.84170
MIS510508	TI Automotive-New Baltimore	Chesterfield	42.70940	-82.80610
MIS510511	Emerald City Harbor	Roseville	42.47083	-82.88750
MIS510512	Harry Major Machine & Tool	Clinton	42.62500	-82.85830
MIS510521	Kent Tool & Die-Chesterfield	Chesterfield	42.67110	-82.84940
MIS510522	Fisher Kellering-Chesterfield	Chesterfield	42.70920	-82.80610
MIS510523	Fabricating Engineers Company	Chesterfield	42.67080	-82.84170
MIS510527	Lionel LLC-Chesterfield	Chesterfield	42.67110	-82.84940
MIS510530	VCST Powertrain Components	Chesterfield	42.67360	-82.84330
MIS510538	Advanced Boring & Tool	Chesterfield	42.67500	-82.85420
MIS510539	Mich Metal Technologies	Chesterfield	42.66330	-82.85000
MIS510551	Smart-Clinton Twp	Clinton	42.55420	-82.88330
MIS510562	Island Harbor-St Clair Shores	Roseville	42.46670	-82.88610
MIS510566	National Precast Inc-Roseville	Roseville	42.51667	-82.90833
MIS510567	Plastech-St Clair Shores	Roseville	42.53810	-82.88390
MIS510570	Interstate Door Co	Chesterfield	42.66056	-82.85167
MIS510586	Drake Enterprises-Clinton Twp	Clinton	42.62330	-82.85830
MIS510587	Eagle Assemblies	Clinton	42.54080	-82.93360
MIS510589	Dunright Trailer Mfg-Clinton	Clinton	42.55472	-82.88583
MIS510592	Island Machine & Engineering	Cottrellville	42.72560	-82.50190
MIS510605	Fisher Dynmcs-St Clair Shores	Roseville	42.53800	-82.88700
MIS510612	Mich Metal Technologies Plt 2	Chesterfield	42.66540	-82.85030
MIS510621	US Army Garrison Michigan	Clinton	42.63170	-82.82440
MIS510624	Decker Gear Inc-Algonac	Clay	42.61830	-82.53140

Table 5 (continued).

Permit Descriptions				
Permit No	Facility Name	Township Name	Latitude	Longitude
MIS110000 - Industrial Storm Water				
MIS510587	Eagle Assemblies	Clinton	42.54080	-82.93360
MIS510589	Dunright Trailer Mfg-Clinton	Clinton	42.55472	-82.88583
MIS510592	Island Machine & Engineering	Cottrellville	42.72560	-82.50190
MIS510605	Fisher Dynmcs-St Clair Shores	Roseville	42.53800	-82.88700
MIS510612	Mich Metal Technologies Plt 2	Chesterfield	42.66540	-82.85030
MIS510621	US Army Garrison Michigan	Clinton	42.63170	-82.82440
MIS510624	Decker Gear Inc-Algonac	Clay	42.61830	-82.53140
MIS510625	Decker Gear Inc-Fruit Rd	Clay	42.62390	-82.54500
MIS510626	Ajax Materials Corp-Plant 1	Lenox	42.72120	-82.80350
MIS510633	Beacon Marine-Harrison Twp	Harrison	42.56580	-82.84280
MIS510636	Beacon Cove Marina Inc	Harrison	42.56530	-82.84310
MIS510640	G & T Auto & Truck Parts	Chesterfield	42.65780	-82.84640
MIS510641	Four Seasons Concrete Prod	Roseville	42.50808	-82.92576
MIS510643	Compass Pointe Marina	Ira	42.67722	-82.64333
MIS510650	Belle Maer Harbor	Harrison	42.61500	-82.79167
MIS510654	Sunsation Products Inc	Clay	42.62139	-82.57083
MIS510659	Precision Boring Company	Clinton	42.62783	-82.86273
MIS510664	Hideaway Harbor	Harrison	42.56472	-82.84389
MIS510681	Global Advanced Products LLC	Chesterfield	42.70992	-82.80135
MIS510689	Burtek Inc	Chesterfield	42.67312	-82.84083
MIR100000 - Notice of Coverage				
MIR106118	WLC-Willow Ridge Farms	Clinton Township	na	na
MIR106132	Bluffs of Beaufait Farms	Clinton Township	na	na
MIR106229	Ahepa 371 Addition	Harrison Township	na	na
MIR106399	Mt Elliot-New Mansoleum	Clinton Township	na	na
MIR106408	Seville-Whispering Pines #2	Clinton Township	na	na
MIR106492	DAlasandro-Brookside Villas	Clinton Township	na	na
MIR106616	Weber-Bluffs of Beaufait 2	Clinton Township	na	na
MIR106674	Webber Dev-Parcel B	Clinton Township	na	na
MIR106833	Mlm-Lia Industrial	Clinton Township	na	na
MIR106917	Trinity Territory	Clinton Township	na	na
MIR106939	Ag-B&A Steel Parcel A	Clinton Township	na	na
MIR107299	Mitigation Solutions-33 North	Grosse Pointe Park	na	na
MIR107300	Mitigation Solutions-33/30	Grosse Pointe Park	na	na
MIR107386	Lanse Cruese-Atwood Elem	Harrison Township	na	na
MIR107394	Catenacci-Siena Gardens Sub	Clinton Township	na	na
MIR107421	R & D-King of The Wld Frms	Clinton Township	na	na
MIR107550	GTR Bldrs-Parkview Estates	Clinton Township	na	na
MIR108129	Icon Building-Stratford Plaza	Clinton Township	na	na
MIR109493	Harper Woods School	Harper Woods	na	na