

**Michigan Department of Environmental Quality
Water Bureau
August 2006**

**Total Maximum Daily Load for *E. coli* for
Red Run Drain and Bear Creek
Macomb and Oakland Counties**

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 Red Run Drain and Bear Creek. Bear Creek is a tributary to Red Run Drain and both are tributaries of the Clinton River, located in Oakland and Macomb Counties, Michigan (Figure 1). A list of acronyms used within this document is provided in Appendix B.

PROBLEM STATEMENT

This TMDL addresses two listings: Red Run Drain and Bear Creek. The TMDL reaches for Red Run Drain and Bear Creek appear on the Section 303(d) list as:

RED RUN DRAIN

County: MACOMB

Location: Clinton River confluence upstream including all tributaries to Warren, Center Line, Madison Heights, Troy, and Clawson.

HUC: 4090003

RF3RchID: 4090003 0.00

Problem: CSO, pathogens (Rule 100).

TMDL YEAR(s): 2006

WBID#: 061402A

Size: 6 M

BEAR CREEK

County: MACOMB

Location: Red Run Drain confluence u/s to Mound Road in the vicinity of Warren.

HUC: 4090003

RF3RchID: 4090003 525 0.00

Problem: CSO, pathogens (Rule 100).

TMDL Year(s): 2005

WBID#: 061402B

Size: 3 M

Red Run Drain and Bear Creek were 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 2004, documented exceedances of the WQS for *E. coli* at all but one sampling location during the total body contact recreational season of May 1 through October 31 (Tables 1-3).

NUMERIC TARGET

The impaired designated use addressed by this TMDL is total body contact recreation. The designated use rule (Rule 100 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 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 milliliters (ml) if their National Pollutant Discharge Elimination System (NPDES) permit limit of 200 fecal coliform per 100 ml as a monthly average is met. 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 2004 monitoring data indicated exceedances of both WQS at all locations sampled, with the exception of Plum Brook always meeting the 30-day geometric mean.

DATA DISCUSSION

Red Run Drain, Bear Creek, and two additional tributaries (Big Beaver Creek and Plum Brook) were sampled at a total of ten locations in the vicinity of Warren to address this TMDL listing (Figures 1 and 2). Plum Brook was the only location that did not have an exceedance of the 30-day geometric mean (Tables 1-3). All other stations exceeded the 30-day geometric mean WQS on multiple occasions. In Red Run Drain, 30-day geometric mean *E. coli* concentrations ranged from 43 *E. coli* per 100 ml in June at Ryan and Mound Roads to 988 *E. coli* per 100 ml in September at Van Dyke Avenue (Figure 3, Table 1). In Bear Creek, 30-day geometric mean *E. coli* concentrations ranged from 77 *E. coli* per 100 ml in July at Old 13-Mile Road to 1046 *E. coli* per 100 ml in August at Mound Road (Figure 4, Table 2). The 30-day geometric mean was exceeded 15 times in Bear Creek at 12-Mile Road (Figure 4, Table 2). In Big Beaver Creek at Van Dyke Avenue, 30-day geometric mean *E. coli* concentrations ranged from 39 *E. coli* per 100 ml in September to 211 *E. coli* per 100 ml in August (Figure 5, Table 3). In Plum Brook at Schoenherr Road, 30-day geometric mean *E. coli* concentrations ranged from 47 *E. coli* per 100 ml in August to 126 *E. coli* per 100 ml in June (Figure 6, Table 3).

The daily geometric mean was exceeded at all sampling locations. In Red Run Drain, daily geometric mean *E. coli* concentrations ranged from 20 *E. coli* per 100 ml at several locations to 4898 *E. coli* per 100 ml in August at Schoenherr Road (Figure 7, Table 1). In Bear Creek, daily geometric mean *E. coli* concentrations ranged from 20 *E. coli* per 100 ml in July at Old 13-Mile Road to 4252 *E. coli* per 100 ml in July at 12-Mile Road (Figure 8, Table 2). The daily geometric mean was exceeded 12 times in Bear Creek at 12-Mile Road (Figure 8, Table 2). In Big Beaver Creek at Van Dyke Avenue, daily geometric mean *E. coli* concentrations ranged from 20 *E. coli* per 100 ml in August and September to 1657 *E. coli* per 100 ml in August (Figure 9, Table 3). In Plum Brook at Schoenherr Road, daily geometric mean *E. coli* concentrations ranged from 20 *E. coli* per 100 ml in June and July to 526 *E. coli* per 100 ml in June (Figure 10, Table 3).

The Macomb County Health Department (MCHD) conducts weekly monitoring at 11 stations in the Red Run Drain watershed. MCHD data collected at these stations in 2004, 2005, and 2006 indicates that *E. coli* levels exceeded WQS (MCHD, 2004; 2005; 2006).

SOURCE ASSESSMENT

The official listed reach for the Red Run Drain watershed is the entire watershed beginning at the confluence with the Clinton River. Bear Creek is included in this listing but is also separately listed as the confluence with Red Run Drain upstream approximately three miles to Mound Road. There are several municipalities making up the TMDL watershed including the cities of Warren, Troy, Sterling Heights, Royal Oak, Madison Heights, Rochester Hills, Oak Park, Ferndale, Hazel Park, Southfield, Berkley, Clawson, Birmingham, Center Line, Huntington Woods, and Pleasant Ridge, the Village of Beverly Hills, and the Charter Townships of Shelby, Royal Oak, and Clinton (Table 4). The watershed lies in Macomb and Oakland counties. The municipalities in the TMDL watershed are represented by the shaded area in Figure 2. The watershed area is approximately 142 square miles and contains approximately 54 miles of open channel. Land use is primarily residential, commercial, or industrial (Clinton River Watershed Council, 2006; Red Run Drain Subwatershed Group, 2006). Possible sources of *E. coli* include illicit connections to storm sewers, wildlife and/or pet waste, leaking septic or sanitary sewers, Combined Sewer Overflows (CSOs), Sanitary Sewer Overflows (SSOs), the Warren Wastewater Treatment Plant (WWTP), and nonpoint source runoff.

There are 475 NPDES permitted discharges to Red Run Drain or its tributaries in the TMDL reach (Tables 5 and 6, Figure 11), including 5 individual permits, 219 certificates of coverage (COCs) under 3 general permits, and 251 notices of coverage under 1 permit-by-rule. Table 7 contains information on each of the general permits and the permit-by-rule.

The Red Run Drain watershed has one permitted CSO discharge named the Oakland County George W. Kuhn Retention Basin, under Permit #MI0026115. Five overflows occurred during the 2004 recreational season due to rain events (MDEQ, 2006). Approximately 370 million gallons of partially treated sewage (partial treatment consists of primary settling, screening, and disinfection) was released to Red Run Drain. Sampling stations 1, 2, 3, 4, and 5 are downstream of the CSO discharge location (Figure 11). The exceedances of the *E. coli* WQS noted on August 4, 2004, at sampling stations 1-5 (Figure 2) could be attributed in part to CSO discharges that occurred August 3 and 4 (Figures 12 and 13). Although the facility was in compliance with their NPDES permit limits (200 fecal coliform per 100 ml as a monthly geometric mean, and 400 fecal coliform per 100 ml as a 7-day geometric mean), fecal coliform numbers in the CSO discharge were as high as 14,600 per 100 ml on August 3, 2004 (Figure 12). As noted above, *E. coli* are a subset of fecal coliform (American Public Health Association, 1995). Fecal coliform concentrations are substantially higher than *E. coli* concentrations when the wastewater of concern is sewage (Whitman, 2001). However, a study by the United States Geological Survey (USGS) Kansas Water Center indicates that more than 60 percent of fecal coliform was *E. coli* in several Kansas streams (Rasmussen and Ziegler,

2003). Therefore, if fecal coliform levels are elevated as high as 14,600 per 100 ml, it may be assumed that *E. coli* levels are elevated and exceeding the WQS as well.

The Red Run Drain watershed has one permitted WWTP discharge under Permit #MI0024295, the Warren WWTP, which is a blending facility. A flow equalization retention basin holds any water that can not be processed by the facility due to rain events that cause influent rates to exceed the hydraulic capacity of the WWTP. Following primary treatment (settling), the retention basin water is mixed or blended with the treated effluent and chlorinated when the basin overflows its capacity. The facility was in compliance with their NPDES permit limits for fecal coliform (200 fecal coliform per 100 ml as a monthly geometric mean, and 400 fecal coliform per 100 ml as a 7-day geometric mean at the point of final discharge) for January 2004 through April 2006, with the exception of January 2005, when the 7-day geometric mean was exceeded (474 fecal coliform per 100 ml). Although the 7-day geometric mean and the 30-day geometric mean WQS were almost always met, individual single sample fecal coliform measurements exceeded 200 fecal coliform per 100 ml several times (e.g., fecal coliform numbers were reported to be 1300 per 100 ml on August 4, 2004). The exceedances of the *E. coli* WQS at stations 3, 4, and 5 in Red Run Drain (Figure 11) could be attributed in part to the Warren WWTP discharges in that same time period (Figure 13).

The Municipal Separate Storm Sewer System (MS4) permittees (MIG61900), and the three individual stormwater permits (city of Sterling Heights, city of Warren, and Michigan Department of Transportation (MDOT) - statewide permit) are prohibited from having discharges that may cause or contribute to a violation of WQS. The general storm water permittees (MIS110000) must develop a Storm Water Pollution Prevention Plan (SWPPP). The SWPPP requires the permittee to complete an evaluation of the reasonable potential for contribution of significant materials to runoff, such as pollutants from areas where animals are known to congregate. If a source of pollutant (including *E. coli*) is found, the permittee is required to address the pollutant in their SWPPP. This information is used by the permittee to estimate the annual load of pollutants to the water body and identify the level of control necessary to comply with any established TMDL. The noncontact cooling water permits (MIG250000) allow for the discharge of only uncontaminated water and are not expected to be a source of *E. coli*. The permits-by-rule (MIR100000) involve earthwork in the TMDL watershed and are not considered a significant source of *E. coli*. There are no Concentrated Animal Feeding Operations in the Red Run Drain and Bear Creek TMDL watersheds.

The city of Center Line has had 11 SSOs to Lorraine Drain, a tributary of Bear Creek, since July 2000. These SSOs are a source of *E. coli* to the watershed. Center Line entered into an Administrative Consent Order with the MDEQ in August 2001, that requires the elimination of the SSO by September 30, 2009. This order was amended in August 2002 and October 2004. There has been only one SSO since January 2004. On July 16, 2005, 1.6 million gallons of raw sewage entered into Lorraine Drain from a lift station. This overflow was due to a heavy rain event and an electrical storm that damaged a pump. Center Line Department of Public Works personnel manually operated the station until the pump was on line. Previous overflows were primarily due to heavy rain events and wet weather inflow and infiltration.

Illicit discharges are most likely a significant source of *E. coli* in the Red Run Drain watershed. Illicit connections can be a source of *E. coli* during both wet and dry weather. The watershed is entirely within a highly populated urban area. Several illicit connections, including those that drain subdivisions, business parks, public schools, an industrial building, and an apartment complex have been identified in the Schoenherr Relief Drain. In May and June 2005, Lincoln High School, the stadium and maintenance buildings; Lincoln Middle School; and Lincoln Elementary School were dye tested by the MCHD to search for illicit connections. A section of the high school and elementary school sanitary systems were found to be connected to the storm drainage system and the problem is being corrected (MCHD, 2005). In the winter of 2005, the MCHD conducted 855 investigations of illicit discharges in Warren and Center Line

through the facility dye testing program. Sixty-six problems were found and were corrected or are in the process of being corrected (MCHD, 2005).

Several illicit discharges have also been found in the Bear Creek watershed and are under correction. The Bear Creek subwatershed is approximately 19 square miles and consists of 29 tributaries, which drain a concentrated urban area (MCPWO, 2006). One example of an illicit discharge was found in Lorraine Drain at Stephens and Hoover Roads where there was a direct sanitary connection to the storm drain from over 230 homes (MCHD, 2005). The Bear Creek Clean Water Initiative (BCCWI) was formed to improve water quality in Bear Creek. Water quality data collected by the BCCWI noted exceedances of the *E. coli* WQS at several stations in Bear Creek and its tributaries between 1998 and 2000 (MCPWO, 2006). Data collected by the MCHD has also documented exceedances of the *E. coli* WQS in Bear Creek. The Lorraine Drain, an enclosed tributary of Bear Creek, contains particularly high concentrations of *E. coli*; often orders of magnitude above WQS (MCHD, 2006).

LINKAGE ANALYSIS

Determining the link between the *E. coli* concentrations in the Red Run Drain watershed and the potential sources is necessary to develop the TMDL. This link provides the basis for estimating the total assimilative capacity of the water body and any needed load reductions. For this TMDL, the loading of pathogens appears to enter the Red Run Drain watershed during all weather conditions (i.e., wet and dry weather events), but the largest exceedances occur primarily during or soon after wet weather events (Tables 1-3, Figures 7-10). Precipitation data for the two days prior to each MDEQ sampling event were obtained from a weather station in Hazel Park, Michigan (Weather Underground, 2006).

To further investigate the potential sources mentioned in the Source Assessment section above, a load duration curve analysis was developed for each sampling station as outlined in a paper by Cleland (2002). A load duration curve is a relatively new method utilized in TMDL development and considers how flow conditions relate to a variety of pollutant sources (point and nonpoint sources).

The load duration curves for each station sampled on Red Run Drain, Bear Creek, Big Beaver Creek, and Plum Brook are included in Appendix A. The USGS gage used to determine the load duration curves discussed here is located on Plum Brook, in the vicinity of Utica (Gage #04163400). The other streams did not have gages with the period of record necessary to calculate average flows. Therefore, the flows of Plum Brook were used to develop load duration curves for Red Run Drain and Bear Creek. The data indicate that exceedances of the WQS are observed during wet and dry weather events. Note that dots above the curve on the left side of the figure are indicative of WQS exceedances during wet weather conditions (higher flows) and dots above the curve to the right side of the figure indicate *E. coli* WQS exceedances during dry weather conditions (lower flows). The *E. coli* WQS exceedances at the most upstream station of Bear Creek [Mound Road (Station 0, Figure 1)] appear to be influenced by mid to higher flow events (A-1). The more downstream stations at 12-Mile Road and Old 13-Mile Road (Stations 1A and 2A, Figure 1) experience WQS exceedances during all flow conditions (Appendices A-2 and A-3). With the exceptions of Station 6 on Big Beaver Creek and Stations 5 on Red Run Drain (Figure 1), *E. coli* WQS exceedances in Red Run Drain and Plum Brook occurred most often under moist to high flow events (Appendices A-4 through A-10). In Figures 7-10 the prior two-day precipitation total is graphed along with the daily geometric mean for *E. coli* at the MDEQ 2004 sampling stations. As noted in the Source Assessment section, exceedances of the *E. coli* WQS during wet weather (and thus high flow), could be partially attributed to discharges from the G.W. Kuhn Retention basin CSO and discharges from the Warren WWTP. Illicit discharges could occur during any range of flows.

The guiding water quality management principle used to develop the TMDL was that compliance with the numeric pathogen target in the Red Run Drain and Bear Creek watersheds 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 these watersheds 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 30-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 (Mixing Zones) and R 323.1090 (Applicability of WQS). In general, the lowest monthly 95 percent 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 Red Run Drain watershed arise from a mixture of wet and dry weather-driven 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. 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 geometric mean during the recreation season. 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

Tables 5 and 6 outline the 475 permitted point source discharges to the Red Run Drain watershed. The discharges include 5 individual permits, 219 COCs under 3 general permits, and 251 notices of coverage under 1 permit-by-rule. The WWTP discharge contains treated human waste and although the discharge is in compliance with the NPDES fecal coliform limit, the single sample fecal coliform numbers suggest that the discharge could be a possible source of *E. coli* to Red Run Drain at levels that exceed WQS (Figure 12). The individual permit for the Goerge W. Kuhn CSO authorizes the discharge of sanitary waste via a retention basin during wet weather events. Again, although the discharge is in compliance with the NPDES fecal coliform limit, single sample fecal coliform numbers suggest that the discharges could be a possible source of *E. coli* to Red Run Drain at levels that exceed WQS. The general permitted discharges are not considered significant sources of *E. coli* to the Red Run Drain due to Best Management Practices (BMPs) required in the permit. The remaining permits-by-rule involve earthwork in the watershed and, due to the nature of the permit, are not considered a significant source of *E. coli* to the TMDL watershed. The WLA for the above mentioned permits is equal to 130 *E. coli* per 100 ml as a 30-day average and 300 *E. coli* per 100 ml as a daily average 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 geometric mean. 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. This TMDL reach is located in 20 municipalities and 2 counties (Table 4). The municipalities making up the largest portion of the watershed are the cities of Warren (24.2 percent), Troy (19.5 percent), and Sterling Heights (18.2 percent).

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 a 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 geometric mean 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. It is expected that there is no total body contact during the remainder of the year due to cold weather; however, there is a separate WQS of a maximum of 1000 *E. coli*/100 ml for the partial

body contact season. Because this is a concentration-based TMDL, WQS will be met regardless of flow conditions in the applicable season.

MONITORING

Pathogens were monitored weekly at five stations on Red Run Drain, three stations on Bear Creek, and one station each on Big Beaver Creek and Plum Brook, which are tributaries to Red Run Drain. Monitoring occurred from May through September 2004. Future monitoring will take place as resources allow, 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 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 Warren WWTP is responsible for meeting their NPDES permit limits for fecal coliform. Compliance is determined based on review of Discharge Monitoring Report data by the MDEQ. The WWTP is presently meeting their permit limits for fecal coliform; however, as noted above, during rain events single sample fecal coliform data collected by the WWTP indicates that the WWTP may be a possible source of *E. coli* at levels that exceed WQS (Figure 12). It is during the rain events that the facility experiences influent flow amounts that exceed the capacity of the WWTP. The WWTP is working on reducing the excess inflow and infiltration to their collection system within approximately ten years. The goal of the plan is to decrease the amount of excess water to the wastewater system, ultimately eliminating the need for overflows of sewage from the retention basin that is blended with the effluent before discharging to Red Run Drain. A reduction in overflows may lead to a reduction in fecal coliform and *E. coli* levels present in the final discharge.

The Oakland County George W. Kuhn Retention Basin is currently implementing a Long-Term CSO Control Program. As part of the control program the permittee constructed a new inlet weir structure to provide 30 million gallons of additional storage, which will result in fewer overflows to Red Run Drain. The chlorination system has also been upgraded to allow for more contact time to provide improved disinfection. The city of Madison Heights has also separated parts of their storm sewers that originally were directed to the retention basin. This will reduce the amount of storm water that the retention basin needs to hold, freeing up hydraulic capacity for sanitary inputs, and thus leading to fewer instances of overflow of partially treated sewage to Red Run Drain. The facility is also starting an upgrade of the flushing system in the retention basin so that the basin can be cleaned more efficiently after an overflow. The flushed water along with the settled solids from the bottom of the retention pond are treated by the Detroit WWTP and thus would not enter Red Run Drain.

The city of Center Line and the MDEQ have signed an Administrative Consent Order dated August 24, 2001, and most recently amended October 29, 2004, to resolve the SSOs to Lorraine Drain. This agreement contains activities for flow monitoring, negotiations for obtaining additional treatment capacity from the Detroit Water and Sewerage Department, and structural improvements to the sewer system that shall be completed by September 30, 2008. Since signing of the agreement, the number of SSOs has been significantly reduced. The main goal of the agreement is a plan that includes the closure of the SSO by September 30, 2009.

The industrial storm water permits identified in Table 6 require that if there is a TMDL established by the MDEQ for the receiving water that restricts a material that could impair or degrade water quality, then the required storm water pollution prevention plan shall identify the level of control for those materials necessary to comply with the TMDL and an estimate of the current annual load of those materials via storm water discharges to the receiving stream.

The cities of Warren and Sterling Heights are under a Phase I storm water permit. A Phase I storm water permit is issued when an individual community's MS4 serves a population greater than 100,000. This permit contains multiple requirements that have a positive impact on water quality, such as education and outreach programs regarding storm water impacts, the development and implementation of an illicit discharge elimination program, the development and implementation of a program to address storm water from new and redevelopment projects, and the development of good housekeeping practices at municipal facilities. The MDOT is also under a Phase I storm water permit. This is a statewide permit that requires the permittee to reduce the discharge of pollutants to the maximum extent practicable and employ BMPs to comply with TMDL requirements.

The municipalities including the cities of Troy, Hazel Park, Rochester Hills, Madison Heights, and Center Line, townships of Shelby and Clinton, and counties of Macomb and Oakland are under NPDES Phase 2 MS4 storm water permits. These permits also require activities that reduce pollutant inputs (including *E. coli*) to surface waters through public education, a storm water management plan, and illicit connection identification and elimination requirements.

Macomb County is in the fourth year of required MS4 permit activities. A partnership between Macomb County and individual municipalities (several are listed above) has resulted in countywide efforts to identify all outfalls within county boundaries that discharge to waters of the state. Part of the identification process includes taking one time samples for *E. coli* to identify illicit connections. 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. The MCHD conducts weekly *E. coli* monitoring at 11 locations within the Red Run Drain watershed. This data is entered into a database and is available to the public at the following link: <http://macombcountymi.gov/publichealth/surfacesamples.asp>. The MDEQ works with the MCHD to identify *E. coli* sampling locations and share data. The MCPWO is also required to sample outfalls to legally established county drains to locate illicit discharges. Numerous outfalls in the Red Run and Bear Creek watershed were sampled in 2005. Follow-up investigations of the greatest exceedances throughout the county will continue in 2006 (Macomb County, 2005).

The MCPWO and MCHD each have Clean Michigan Initiative-Clean Water Fund (CMI-CWF) projects as part of the Macomb County Illicit Connection Elimination project. The Macomb County Illicit Connection Elimination project is part of the Macomb County MS4 SWPPP. The goal of the project is to improve the quality of storm water that enters the Clinton River watershed by identifying and eliminating illicit discharges to the storm water drainage system discharging to the Red Run Drain watershed. The project includes identifying and performing dry weather surveys of all outlets to enclosed drains (MCPWO) and to open waterways (MCHD) and to provide assistance to local units of government for follow-up investigations to locate the source of any discovered illicit discharges. These follow-up investigations include repeat sampling and televising drains. The Sterling Relief Drain and Schoenherr Relief Drain (which transports storm flow from the city of Warren to the Red Run Drain) were among several drains included in the MCPWO project. During the time period of July 2005 through March 2006, the MCHD surveyed more than 100 miles of open water drains. They identified more than 1000 outfalls and found 126 outfalls that showed evidence of an illicit connection. At least 50 of those outfalls have been fully investigated and corrected while the remaining are still under investigation (MCPWO, 2005 and MCHD, 2005b)

The Oakland County Drain Commissioner (OCDC) has also received a CMI-CWF grant to do similar illicit connection elimination in the Clinton River watershed, including tributaries that discharge to the Red Run Drain (OCDC, 2006). The grant started in September 2004. In the most recent quarterly report (December 2005) the OCDC indicated that investigations of the large enclosed drains that drain to Bear Creek in Madison Heights and Hazel Park are

scheduled for the summer of 2006. The OCDC has also applied for USEPA funds to investigate wet and dry weather illicit discharge sampling.

Another project funded by the CMI-CWF that is part of the Macomb County Illicit Discharge Elimination Program, explained above, began in January 2005. It is also part of the Illicit Discharge Elimination Program for the cities of Warren and Center Line, both of which discharge storm water to Bear Creek. The MCPWO reported that 35 percent of the drains sampled in dry weather had exceedances of the WQS of 300 *E. coli* 100 ml. In wet weather, 95 percent had exceedances of the WQS and 66 percent of these exceedances had counts greater than 3000 *E. coli* per 100ml (MCHD, 2005c). The goal of this project is also to improve the quality of the storm water entering Red Run Drain. Dye testing is the primary tool used in the project to identify illicit discharges from industrial, commercial, and institutional buildings. Dye test studies, which use nontoxic dyes to trace the pathway of sanitary water, are used on a regular basis to find illicit connections of sanitary systems to storm drains and/or surface waters of the state. As of March 2006, 32 percent of facilities tested had illicit connections identified and corrected. Work is continuing along the 9-Mile Road corridor and drain, where many illicit connections have been found (MCHD, 2005).

In September 2005, the MCHD received a CMI-CWF grant to begin facility and residential dye testing in several cities including Warren and Center Line. A surface water improvement and monitoring team was formed to address the failing septic systems in the county and was charged with monitoring the storm water quality. Plans for this project have been completed and they are starting implementation (MCHD, 2005d)

A point of sale regulation will continue to be enforced throughout Macomb County (Macomb County, 2005). This regulation requires that on-site sewage disposal and/or on-site water supply systems be evaluated prior to property transfer. In 2004 and 2005, 726 septic repair permits were issued throughout Macomb County (Macomb County, 2005). Although most sanitary discharges are connected to a municipal sanitary system, those few that are not would be affected by this program. These types of identification and repair activities may lead to reduced *E. coli* concentrations.

The Red Run Drain has a subwatershed advisory group that consists of representatives from all communities, departments, schools, and organizations that are located in the watershed. Efforts made by this advisory group for the period of October 1, 2004 to September 30, 2005, included holding two community forums to allow residents the opportunity to share ideas on the development of a watershed management plan for the Red Run Drain watershed. The plan is currently being developed and should be ready by November 2006.

A stakeholder meeting for this TMDL was held on July 26, 2006, at the MDEQ Southeast District office in Warren, Michigan. Stakeholders were determined by identifying municipalities (i.e., counties, townships, and cities) and watershed groups (i.e., Clinton River Watershed Council and the local soil conservation district) within the TMDL watershed. Copies of the draft TMDL were available upon request, at the stakeholder meeting, and posted on the MDEQ Web site.

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Michigan Department of Environmental Quality
August 25, 2006

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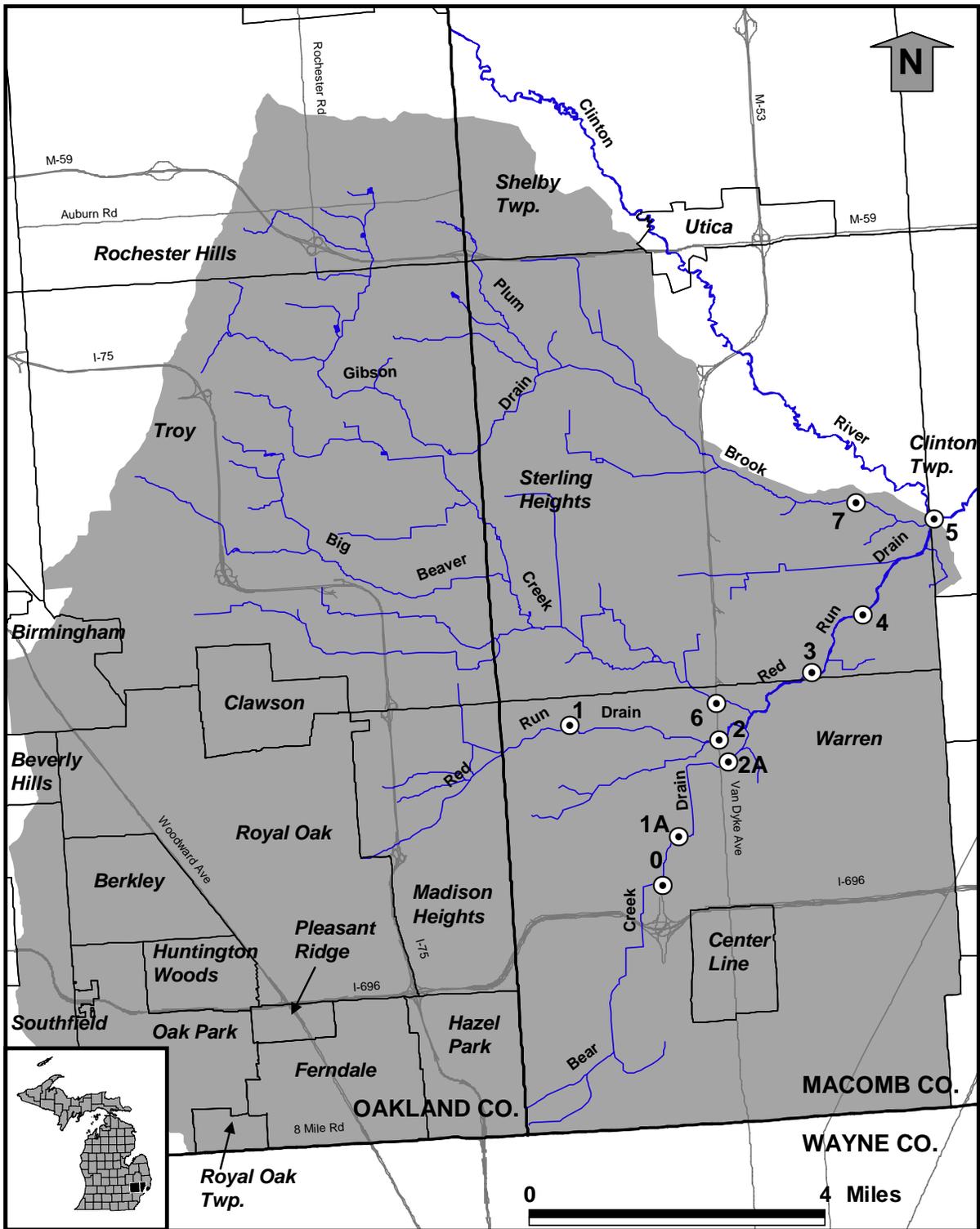


Figure 1. Red Run Drain watershed and *E. coli* sampling locations, Macomb and Oakland Counties, Michigan, 2004.

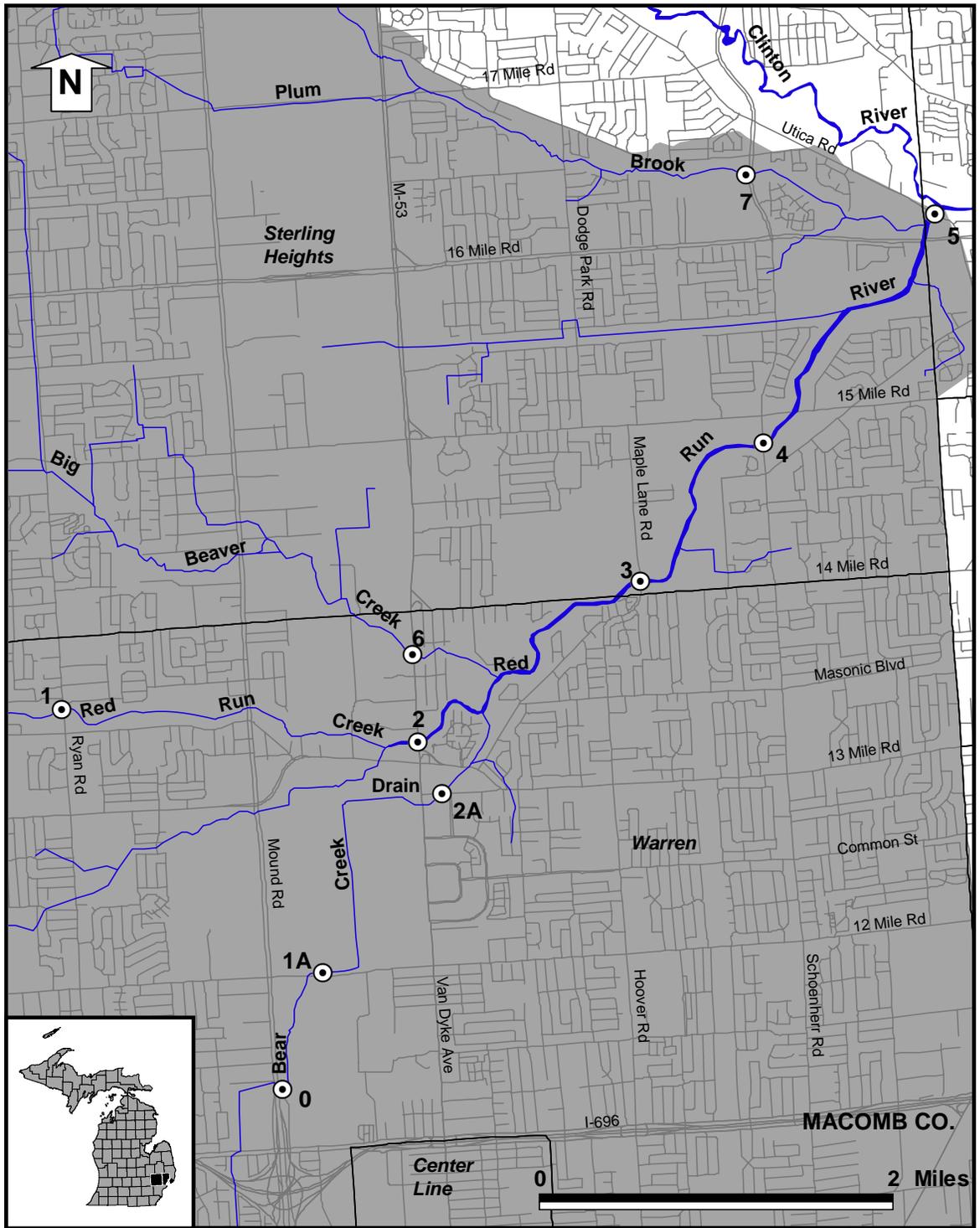


Figure 2. Red Run Drain watershed *E. coli* sampling locations, Macomb County, Michigan, 2004.

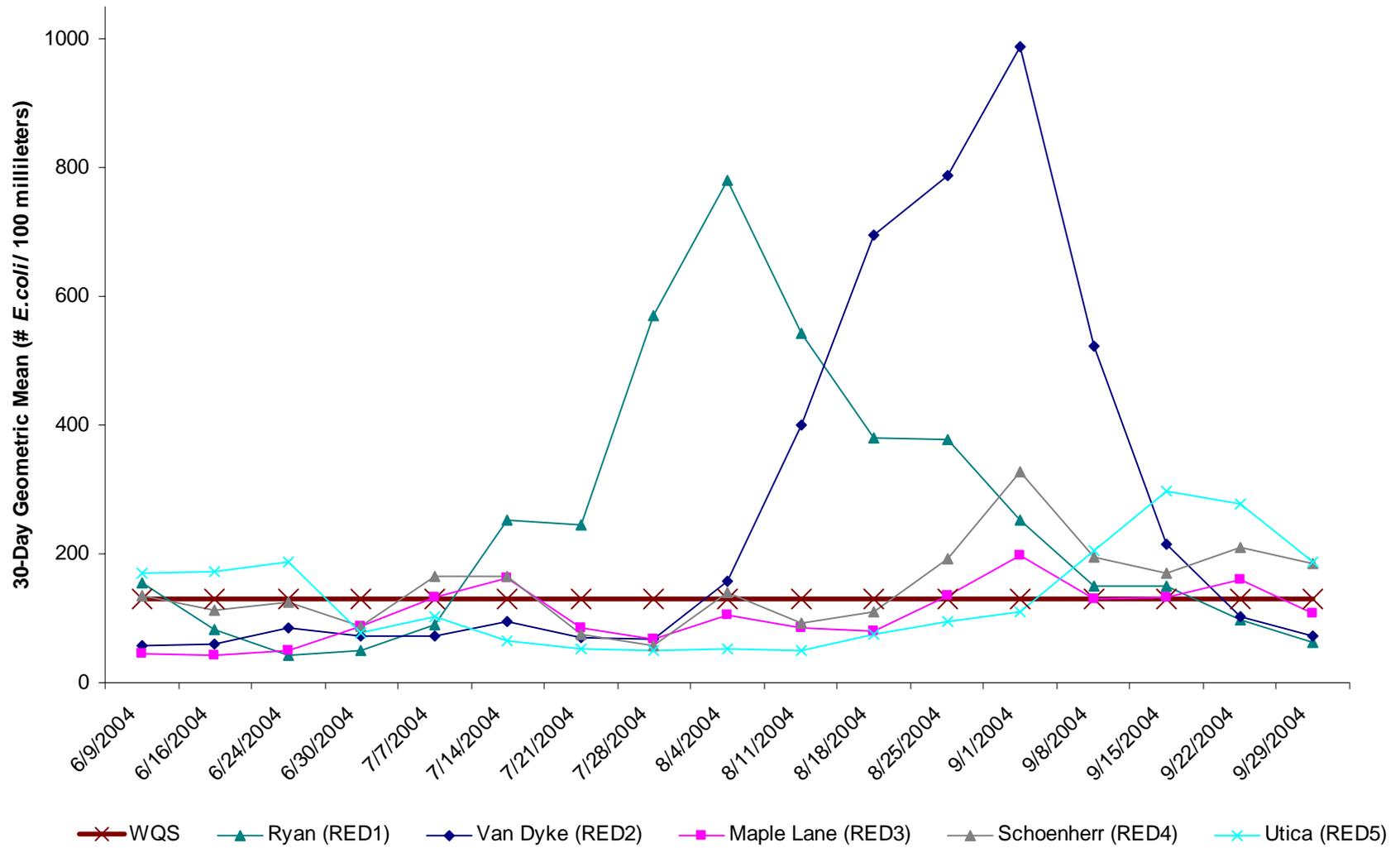


Figure 3. 30-day geometric mean for *E. coli* in Red Run Drain, Macomb County, Michigan, 2004. Stations are listed from upstream to downstream location.

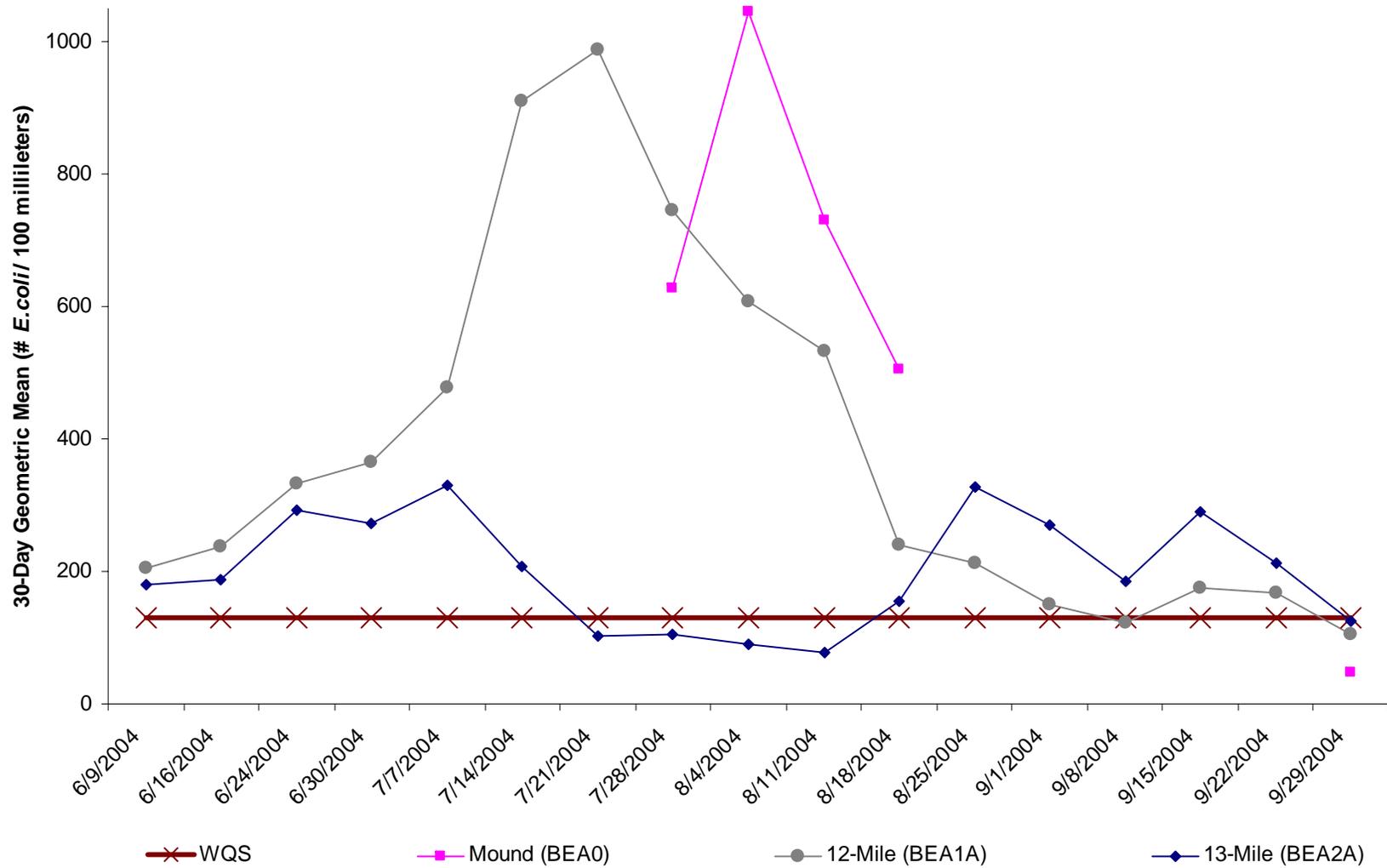


Figure 4. 30-day geometric mean for *E. coli* in Bear Creek, Macomb County, Michigan, 2004.

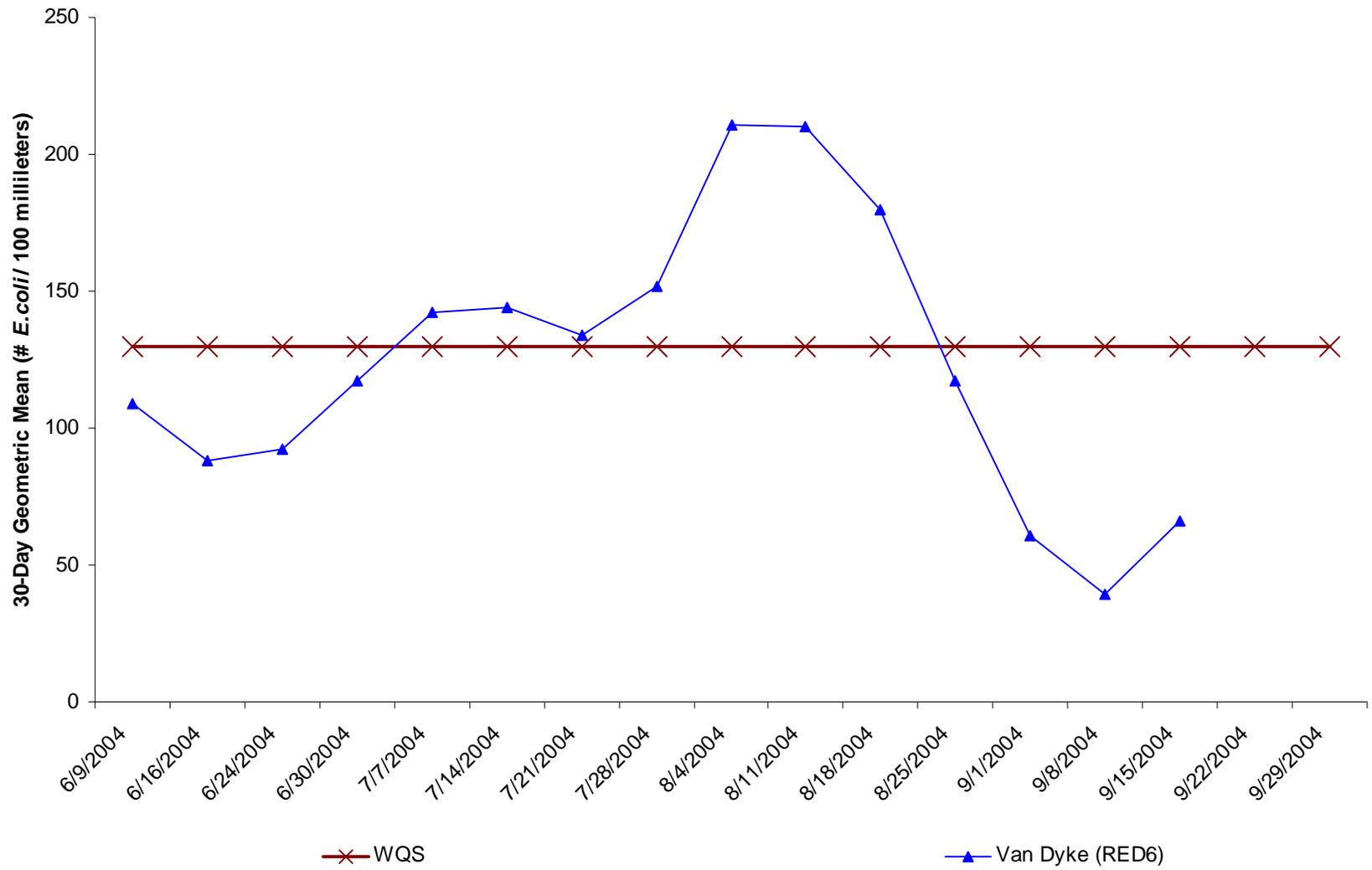


Figure 5. 30-day geometric mean for *E. coli* in Big Beaver Creek, Macomb County, Michigan, 2004.

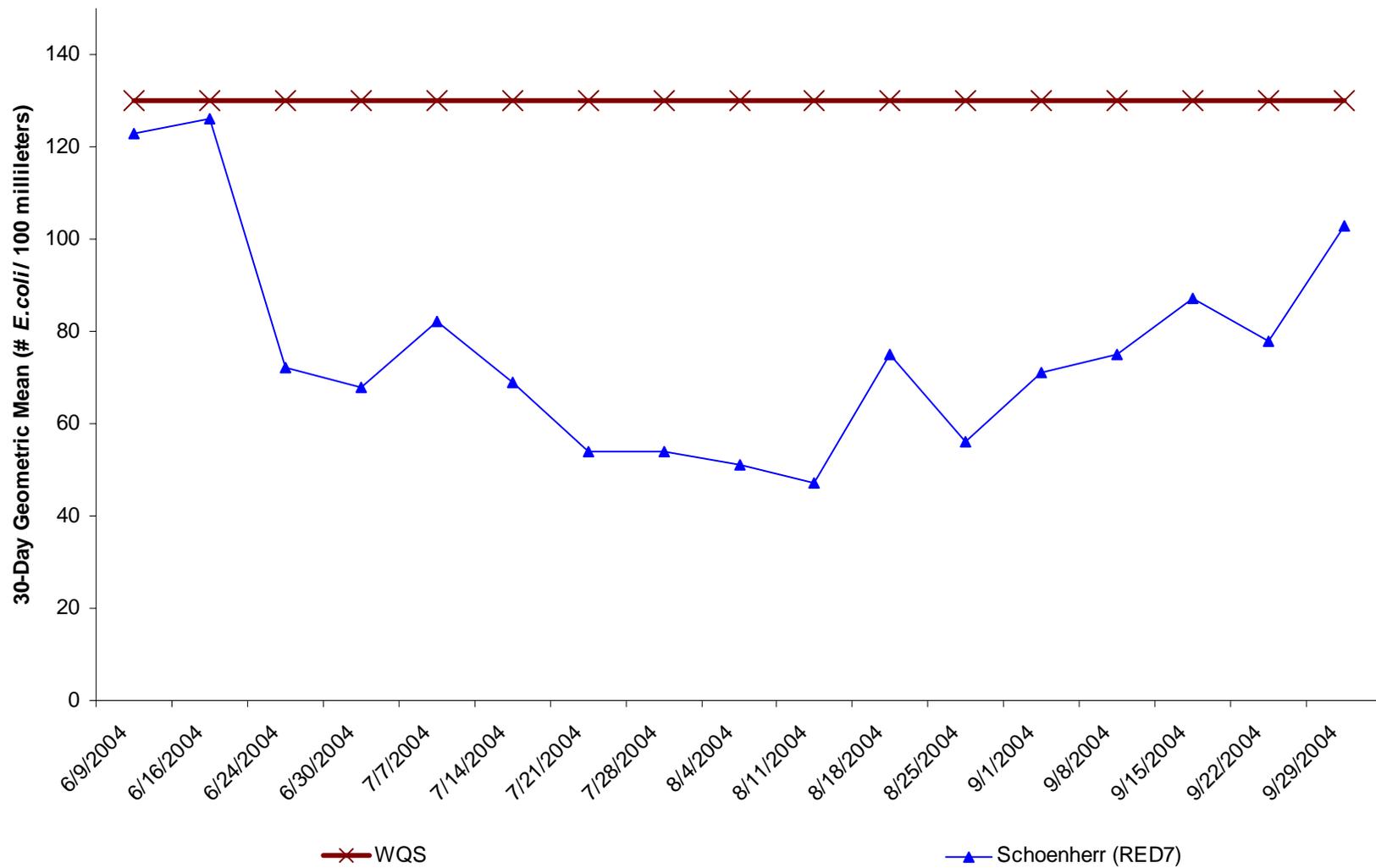


Figure 6. 30-day geometric mean for *E. coli* in Plum Brook, Macomb County, Michigan, 2004.

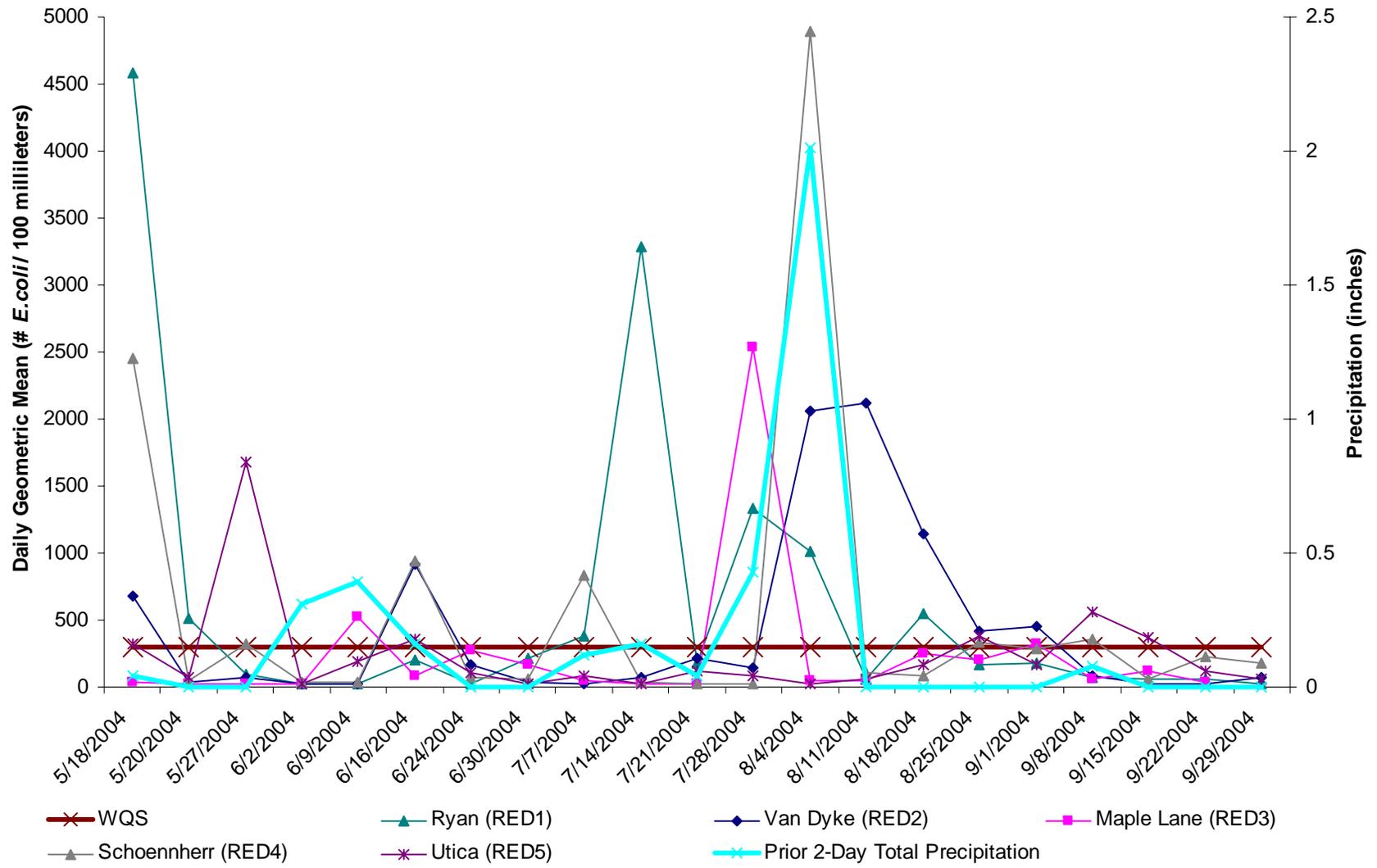


Figure 7. Daily geometric mean for *E. coli* in Red Run Drain, Macomb County, Michigan, 2004.

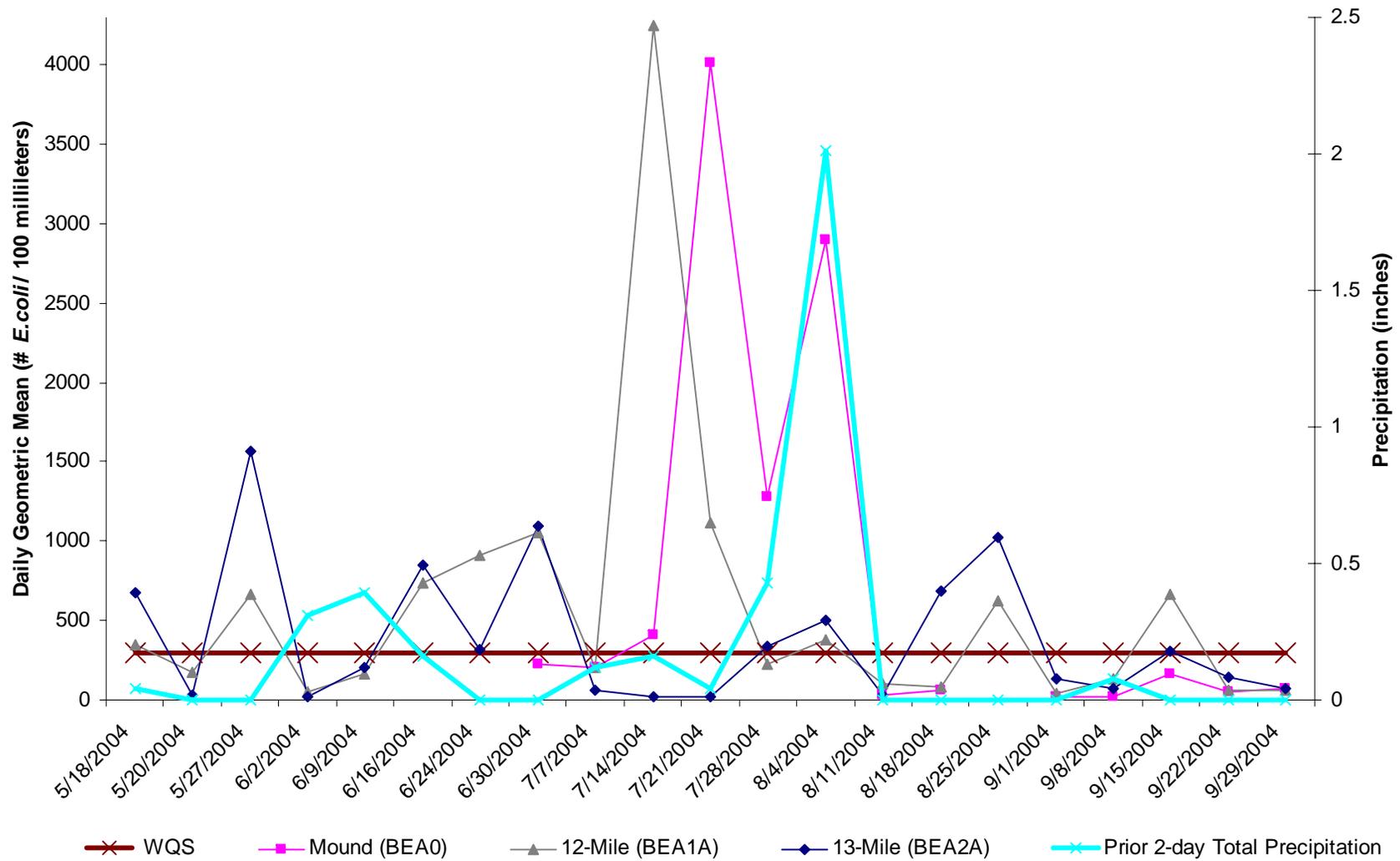


Figure 8. Daily geometric mean for *E. coli* in Bear Creek, Macomb County, Michigan, 2004.

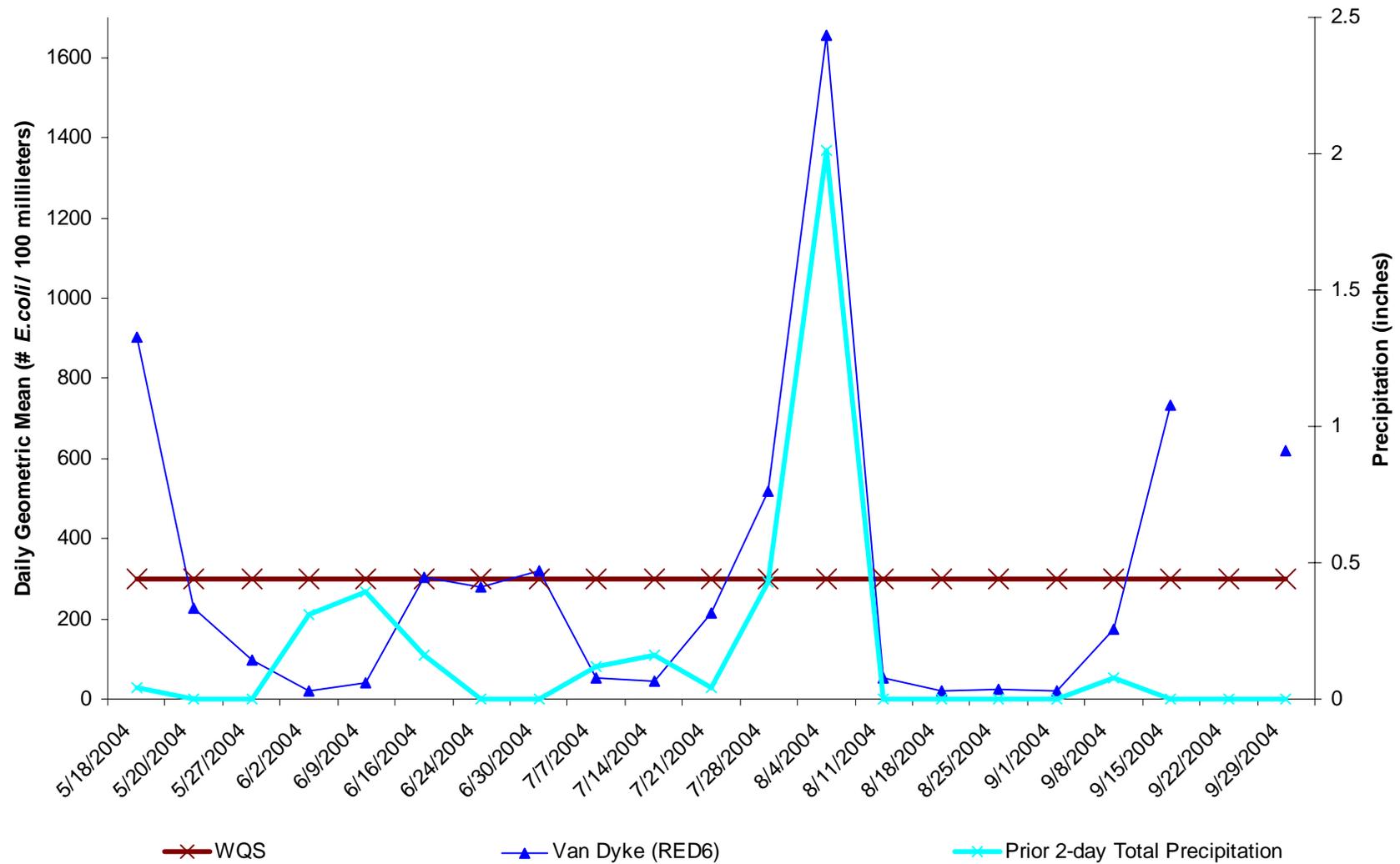


Figure 9. Daily geometric mean for *E. coli* in Big Beaver Creek, Macomb County, Michigan, 2004.

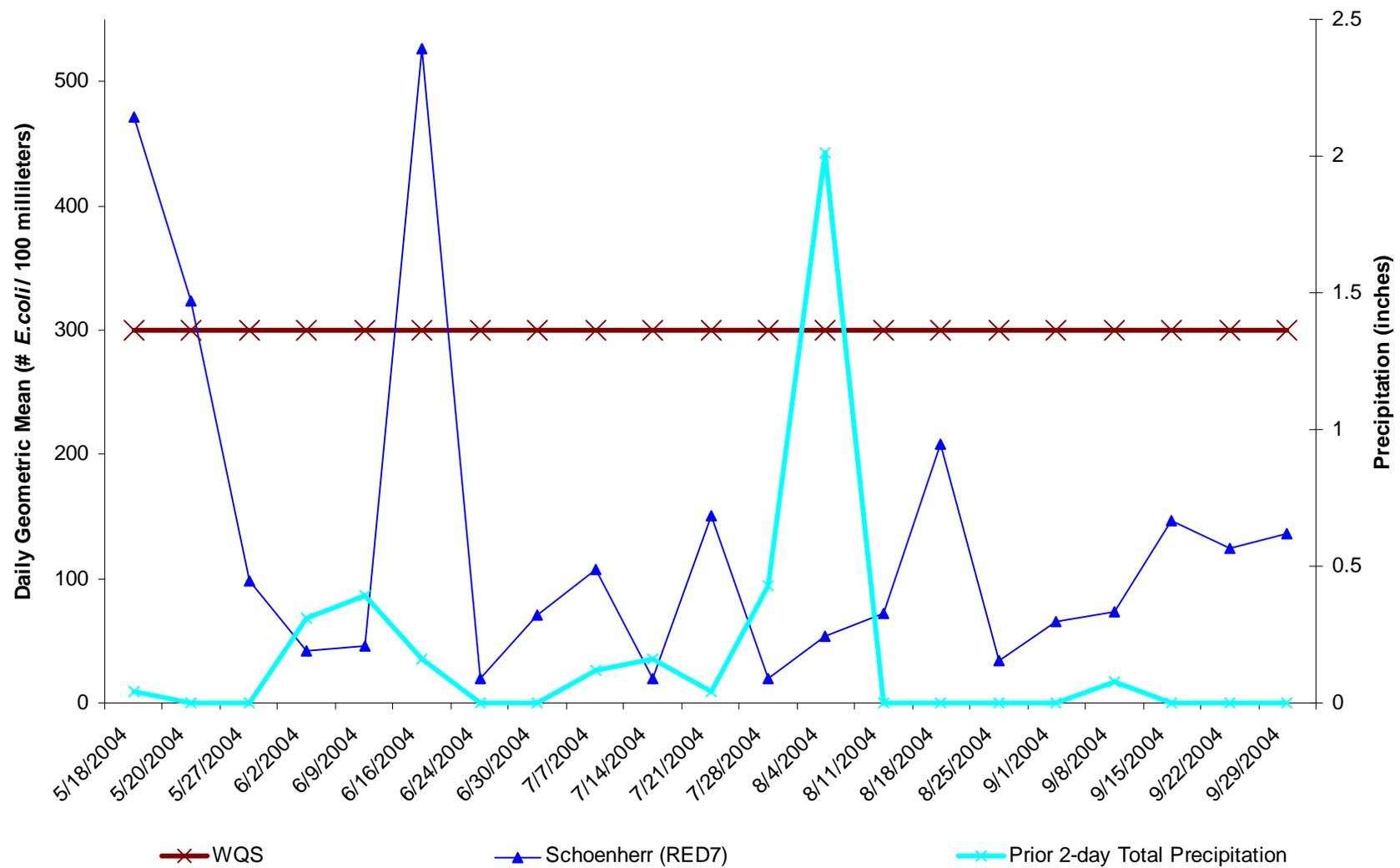


Figure 10. Daily geometric mean for *E. coli* in Plum Brook, Macomb County, Michigan, 2004.

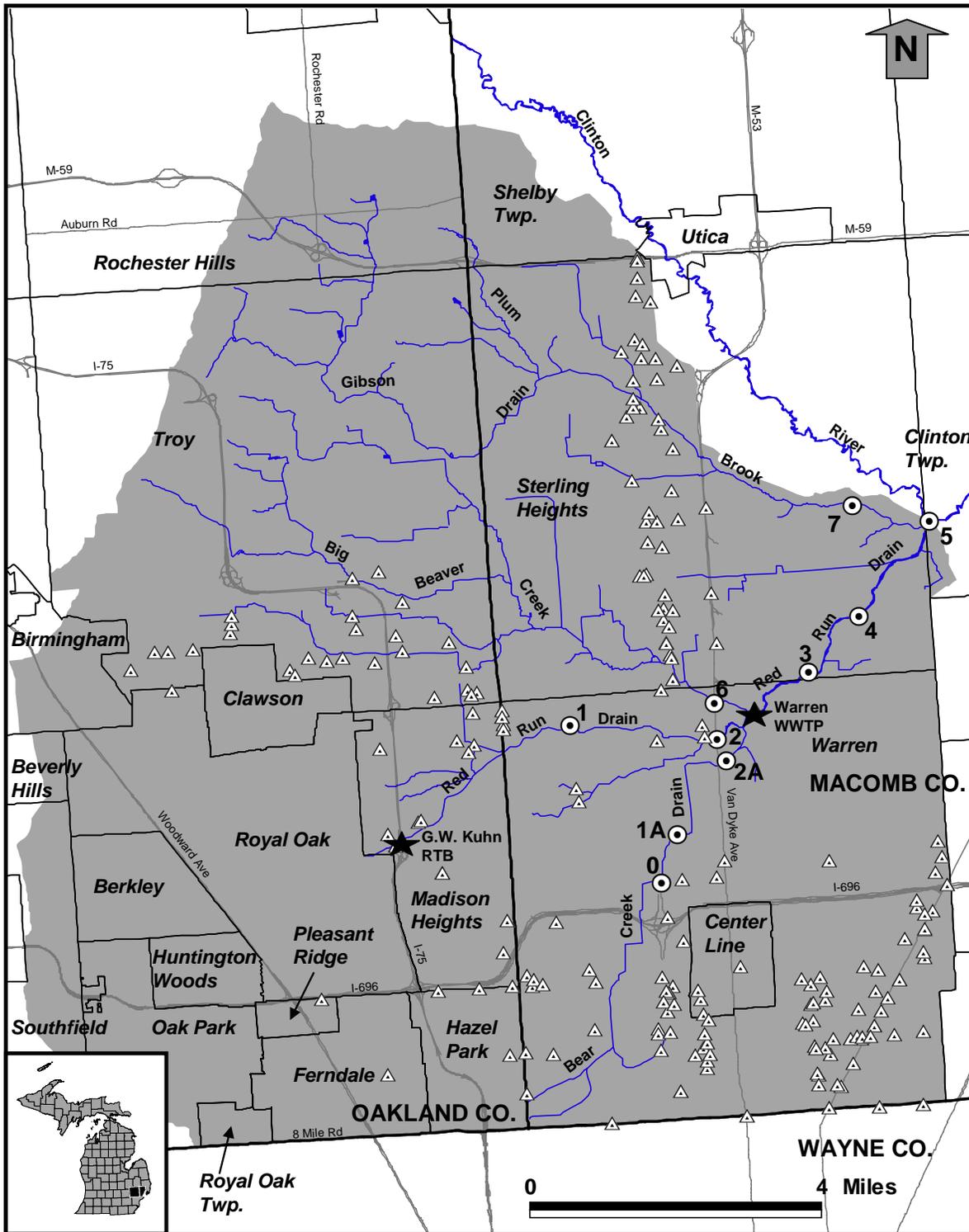


Figure 11. NPDES permitted discharges to the Red Run Drain/Bear Creek TMDL reach, Macomb and Oakland Counties, Michigan, 2004. (Note: figure does not contain MS4 permits or permits-by-rule).

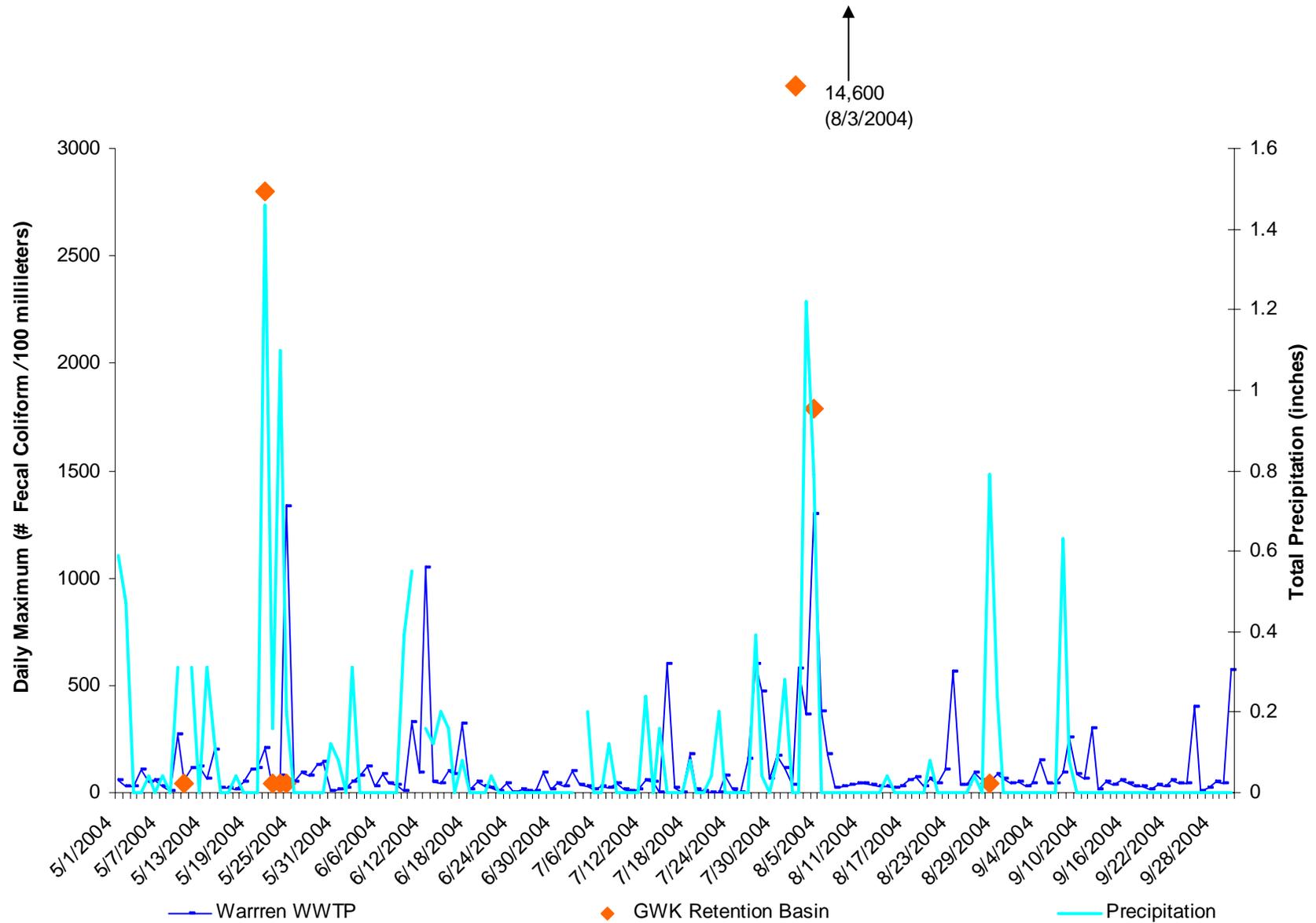


Figure 12. Daily maximum fecal coliform numbers discharged to Red Run Drain and total precipitation data for two facilities in Oakland and Macomb Counties, Michigan, 2004. Precipitation Data is from Hazel Park, Michigan.

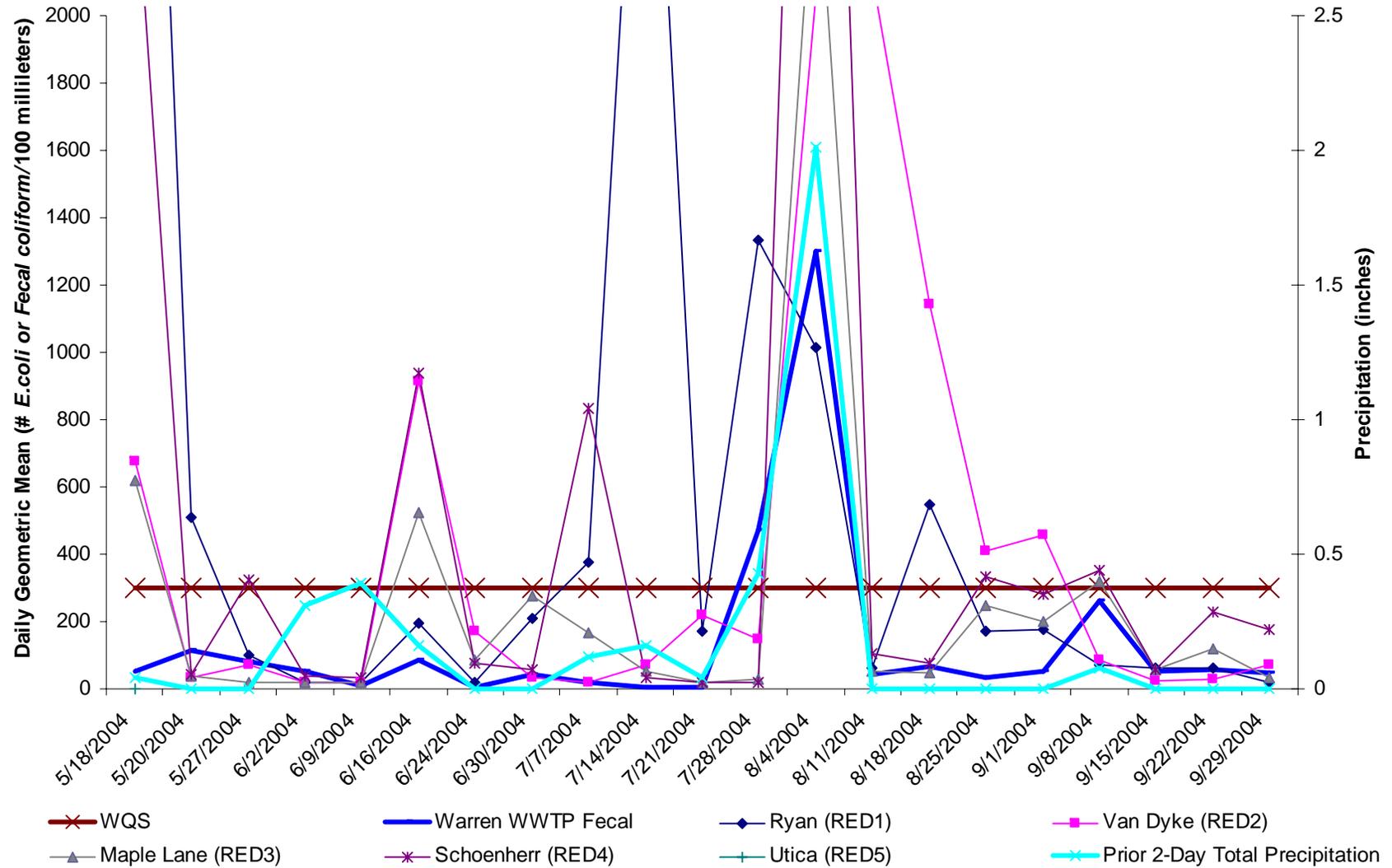


Figure 13. Daily geometric mean for *E. coli* numbers present in Red Run Drain and total fecal coliform numbers discharged from Warren WWTP, Macomb County, Michigan, 2004. Precipitation Data is from Hazel Park, Michigan.

Table 1. MDEQ 2004 *E. coli* monitoring data (*E. coli*/100 ml) for Red Run Drain. Shaded areas indicate exceedances of the WQS. Data are presented upstream to downstream.

DATE	Red Run Drain @ Ryan Road (RED 1)			Red Run Drain @ Van Dyke (RED 2)			Red Run Drain @ Maple Lane (RED 3)			Red Run Drain @ Schoenherr (RED 4)			Red Run Drain @ Utica Road (RED 5)			Prior 2-Day Precipitation in inches
	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	
5/18/2004	6800 8400 1680	4578	---	1240 1380 180	675	---	300 1000 800	621	---	980 1440 10400	2448	---	960 1800 20	326	---	0.04"
5/20/2004	20 980 6800	511	---	20 80 20	32	---	40 20 60	36	---	220 20 20	44	---	820 20 20	69	---	0.0"
5/27/2004	20 400 120	99	---	280 60 20	70	---	20 20 20	20	---	20 1200 1440	326	---	20 11600 20400	1679	---	0.0"
6/2/2004	20 20 20	20	---	20 20 20	20	---	20 20 20	20	---	20 140 20	38	---	20 20 20	20	---	0.31"
6/9/2004	20 20 20	20	156	20 20 20	20	57	20 20 20	20	45	100 20 20	34	136	400 160 100	186	170	0.39 "
6/16/2004	1200 80 80	197	83	960 800 1000	916	60	640 380 600	526	43	2000 540 760	936	112	200 500 480	363	173	0.16"
6/24/2004	20 20 20	20	43	140 200 180	171	85	220 140 20	85	51	560 20 40	77	125	560 100 20	104	188	0.0"
6/30/2004	80 360 320	210	51	20 40 40	32	72	180 320 360	275	87	80 60 40	58	88	20 20 20	20	78	0.0"
7/7/2004	1440 20 1840	376	91	20 20 20	20	72	340 700 20	168	133	5800 5000 20	834	164	20 1240 20	79	102	0.12"
7/14/2004	5400 2200 3000	3291	252	20 940 20	72	94	20 380 20	53	162	100 20 20	34	164	20 20 20	20	65	0.16"
7/21/2004	20 540 480	173	246	340 260 120	220	70	20 20 20	20	84	20 20 20	20	76	100 20 820	118	52	0.04"

Table 1 Continued:

DATE	Red Run Drain @ Ryan Road (RED 1)			Red Run Drain @ Van Dyke (RED 2)			Red Run Drain @ Maple Lane (RED 3)			Red Run Drain @ Schoenherr (RED 4)			Red Run Drain @ Utica Road (RED 5)			Prior 2-Day Precipitation in inches	30-Day Total Precipitation in inches
	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		
7/28/2004	600	1332	569	400	147	68	60	29	68	20	20	58	20	82	50	0.43"	1.47"
	4800			20			20			20			60				
	820			400			20			20			460				
8/4/2004	810	1016	780	3600	2060	157	3600	2541	106	12600	4898	141	40	25	52	2.01"	3.84"
	2400			1500			7600			12600			20				
	540			1620			600			740			20				
8/11/2004	280	61	542	2000	2125	400	20	53	84	100	106	93	520	59	49	0.0"	3.52"
	40			1200			20			120			20				
	20			4000			380			100			20				
8/18/2004	60	546	379	20	1141	695	20	46	81	20	78	110	360	166	75	0.0"	3.16"
	1720			12800			20			1180			640				
	1580			5800			240			20			20				
8/25/2004	520	171	378	260	411	787	680	248	135	620	334	193	1400	383	95	0.0"	2.92"
	20			580			140			200			2000				
	480			460			160			300			20				
9/1/2004	20	178	252	2400	458	988	180	199	198	2400	281	328	20	171	110	0.0"	3.20"
	2800			20			440			20			12600				
	100			2000			100			460			20				
9/8/2004	20	72	149	40	85	523	2800	319	131	20	352	194	1260	565	205	0.08"	1.90"
	20			780			580			1600			340				
	940			20			20			1360			420				
9/15/2004	20	64	150	20	25	215	40	56	132	20	56	170	200	373	297	0.0"	1.86"
	20			40			20			40			1000				
	660			20			220			220			260				
9/22/2004	80	61	97	20	29	103	40	120	160	940	229	211	700	119	277	0.0"	1.82"
	20			60			360			20			60				
	140			20			120			640			40				
9/29/2004	20	20	63	20	71	73	20	34	108	320	178	186	20	54	188	0.0"	0.99"
	20			220			100			20			20				
	20			80			20			880			400				

Table 2. MDEQ 2004 *E. coli* monitoring data (# *E. coli*/100ml) for Bear Creek. Shaded areas indicate exceedances of the WQS. Data are presented upstream to downstream. (“No Sample” due to delayed start date for Bear Creek).

DATE	Bear Creek @ Mound Road (BEA 0)			Bear Creek @ 12-Mile Road (BEA 1A)			Bear Creek @ Old 13-Mile Road (BEA 2A)			Prior 2-Day Precipitation in inches
	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	
5/18/2004	No sample	---	---	600	351	---	1160	674	---	0.04"
	No sample			40			440			
	No sample			1800			600			
5/20/2004	No sample	---	---	280	171	---	100	34	---	0.0"
	No sample			100			20			
	No sample			180			20			
5/27/2004	No sample	---	---	600	665	---	20	1563	---	0.0"
	No sample			720			12400			
	No sample			680			15400			
6/2/2004	No sample	---	---	140	55	---	40	25	---	0.31"
	No sample			60			20			
	No sample			20			20			
6/9/2004	No sample	---	---	720	166	206	280	204	179	0.39 "
	No sample			20			20			
	No sample			320			1520			
6/16/2004	No sample	---	---	800	741	239	620	850	188	0.16"
	No sample			620			620			
	No sample			820			1600			
6/24/2004	No sample	---	---	260	908	333	20	317	293	0.0"
	No sample			1600			1080			
	No sample			1800			1480			
6/30/2004	320	227	---	800	1055	365	1240	1100	273	0.0"
	140			1360			1220			
	260			1080			880			
7/7/2004	21400	205	---	22400	208	476	20	65	331	0.12"
	20			20			20			
	20			20			700			
7/14/2004	20	410	---	4200	4252	911	20	20	208	0.16"
	1080			11440			20			
	3200			1600			20			
7/21/2004	1480	4010	---	1400	1111	988	20	25	103	0.04"
	6600			1400			40			
	6600			700			20			

Table 2 Continued: ("No Sample" due to laboratory error)

DATE	Bear Creek @ Mound Road (BEA 0)			Bear Creek @ 12-Mile Road (BEA 1A)			Bear Creek @ Old 13-Mile Road (BEA 2A)			Prior 2-Day Precipitation in inches
	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	
7/28/2004	12800	1280	628	80	222	745	780	337	104	0.43"
	20			200			60			
	8200			680			820			
8/4/2004	1220	2900	1046	6200	379	607	40	504	89	2.01"
	4000			20			400			
	5000			440			8000			
8/11/2004	20	34	731	20	107	532	40	32	77	0.0"
	100			340			40			
	20			180			20			
8/18/2004	40	65	505	20	78	239	4200	683	156	0.0"
	340			20			20			
	20			1200			3800			
8/25/2004	220	---	---	1060	628	213	660	1024	328	0.0"
	500			260			740			
	No sample			900			2200			
9/1/2004	20	20	---	20	38	150	760	129	270	0.0"
	20			140			20			
	20			20			140			
9/8/2004	20	20	---	5600	131	121	20	76	185	0.08"
	20			20			1080			
	20			20			20			
9/15/2004	20	164	---	580	666	175	700	303	290	0.0"
	460			880			220			
	480			580			180			
9/22/2004	180	52	---	80	61	166	360	147	213	0.0"
	40			140			20			
	20			20			440			
9/29/2004	280	77	48	600	62	105	240	73	126	0.0"
	80			20			80			
	20			20			20			

Table 3. MDEQ 2004 *E. coli* monitoring data (*E. coli*/100 ml) for Big Beaver Creek and Plum Brook. Shaded areas indicate exceedances of the WQS. Data are presented upstream to downstream.

DATE	Big Beaver Creek @ Van Dyke (RED 6)			Plum Brook @ Schoenherr (RED 7)			2-Day Precipitation in inches
	SAMPLE RESULTS	DAILY G. MEAN	30-day G. MEAN	SAMPLE RESULTS	DAILY G. MEAN	30-day G. MEAN	
5/18/2004	1440	903	---	140	472	---	0.04"
	640			660			
	800			1140			
5/20/2004	1260	226	---	440	323	---	0.0"
	460			320			
	20			240			
5/27/2004	440	96	---	340	98	---	0.0"
	20			140			
	100			20			
6/2/2004	20	20	---	20	42	---	0.31"
	20			20			
	20			180			
6/9/2004	20	40	109	20	46	123	0.39 "
	20			240			
	160			20			
6/16/2004	800	304	88	560	526	126	0.16"
	880			480			
	40			540			
6/24/2004	220	281	92	20	20	72	0.0"
	180			20			
	560			20			
6/30/2004	420	318	117	100	71	68	0.0"
	640			180			
	120			20			
7/7/2004	360	52	142	60	107	82	0.12"
	20			1020			
	20			20			
7/14/2004	20	43	144	20	20	69	0.16"
	20			20			
	200			20			
7/21/2004	240	214	134	20	151	54	0.04"
	340			280			
	120			620			
7/28/2004	1400	519	152	20	20	54	0.43"
	20			20			
	5000			20			

Table 3 Continued: ("No Sample" due to stagnant conditions.)

DATE	Big Beaver Creek @ Van Dyke (RED 6)			Plum Brook @ Schoenherr (RED 7)			2-Day Precipitation in inches
	SAMPLE RESULTS	DAILY G. MEAN	30-day G. MEAN	SAMPLE RESULTS	DAILY G. MEAN	30-day G. MEAN	
8/4/2004	2060	1657	211	400	54	51	2.01"
	1840			20			
	1200			20			
8/11/2004	20	51	210	20	72	47	0.0"
	20			40			
	340			460			
8/18/2004	20	20	180	460	208	75	0.0"
	20			980			
	20			20			
8/25/2004	40	25	117	20	34	56	0.0"
	20			20			
	20			100			
9/1/2004	20	20	61	700	65	71	0.0"
	20			20			
	20			20			
9/8/2004	280	173	39	40	73	75	0.08"
	920			120			
	20			80			
9/15/2004	780	734	66	20	147	87	0.0"
	940			440			
	540			360			
9/22/2004	No Sample	---	---	20	124	78	0.0"
	No Sample			120			
	No Sample			800			
9/29/2004	860	620	---	20	136	103	0.0"
	220			420			
	1260			300			

Table 4. Distribution of land for each municipality in the Red Run Drain /Bear Creek TMDL reach, Oakland and Macomb Counties, MI, 2006.

Municipality	Square Miles in Watershed	Percent in Watershed
City of Warren	34.44	24.2
City of Troy	27.8	19.5
City of Sterling Heights	25.93	18.2
City of Royal Oak	11.83	8.3
City of Madison Heights	7.12	5.0
City of Rochester Hills	6.82	4.8
City of Oak Park	4.45	3.1
City of Ferndale	3.86	2.7
Charter Township of Shelby	2.92	2.0
City of Hazel Park	2.83	2.0
City of Southfield	2.59	1.8
City of Berkley	2.59	1.8
City of Clawson	2.21	1.6
City of Birmingham	2.02	1.4
City of Center Line	1.72	1.2
City of Huntington Woods	1.47	1.0
Charter Township of Royal Oak	0.69	0.5
City of Pleasant Ridge	0.56	0.4
Village of Beverly Hills	0.36	0.3
Charter Township of Clinton	0.27	0.2
TOTAL	142.48	100

Table 5. Notice of Coverage permits in the Red Run Drain/Bear Creek TMDL watershed. Source: MDEQ, Water Bureau's NPDES Permit Management System.

Designated Name	Permit No.	Facility Location City
19 Holdings Office Park	MIR109220	Clinton Township
21 Mile Sanitary Sewer	MIR108301	Shelby Township
2400 E-Kenning Sq Condos	MIR109106	Birmingham
A-1 Home Inv-Highwood Subdiv	MIR107773	Southfield
Admiral Dev-Admirals Cove Cond	MIR107603	Sterling Heights
Admiral-Windmill Pond Condo	MIR108031	Shelby Township
Ag-B&A Steel Parcel A	MIR106939	Clinton Township
Albert Weine & Sons-Huron Crk	MIR107617	Southfield
Almar Homes-Plum River Estates	MIR109425	Sterling Heights
Almar-Forest Creek # 3	MIR107407	Sterling Heights
Almar-Hidden Meadow	MIR106389	Sterling Heights
Ambassador-Timbers Edge	MIR106275	Shelby Township
Amer Land-Harvard Village Condo	MIR109219	Madison Heights
Angelina Estates Sub 2	MIR108214	Shelby Township
Aspen/Auburn-Northbrooke Condo	MIR107217	Southfield
Aspen-Atwater Commons	MIR106559	Southfield
BIK Co-Mulberry Meadows Condo	MIR109540	Shelby Township
Bluffs of Beaufait Farms	MIR106132	Clinton Township
Brandenburg-Lakeview Est	MIR106709	Shelby Township
Brandenburg-Secluded Woods	MIR106710	Shelby Township
Brentwood-Sherwood Est Sub	MIR108177	Sterling Heights
Brg-Dutton Corporate Ctr	MIR107237	Royal Oak
Brookshire Office Plaza	MIR109198	Sterling Heights
Brookwood Counen & Homeowner	MIR107303	Rochester Hills
C/M-Fev Engine Tech Warehouse	MIR106787	Southfield
Catenacci-Siena Gardens Sub	MIR107394	Clinton Township
Cavaliere-Reg Commerce Ctr #2	MIR107530	Hazel Park

Table 5 Continued:

Designated Name	Permit No.	Facility Location City
Cavaliere-Shoppes at The Trail	MIR107480	Warren
Centex Homes-Spring Haven	MIR109226	Southfield
Centex-Elmhurst Site Condo	MIR108071	Sterling Heights
Chaldean Comm Cultural Ctr	MIR106460	Southfield
Chawney-Hampton Woods	MIR107274	Beverly Hills
Chesterfield Commons	MIR106878	Shelby Township
Chippewa Valley High School	MIR109562	Clinton Township
Chippewa-Wyandot Middle School	MIR109466	Clinton Township
Choice Dev-Wattles Pk Condo	MIR106280	Troy
City of Troy-Maplelawn Rd Rec	MIR107514	Troy
Ck-Kirkway Ravines Condo	MIR106852	Southfield
Coda-Birchcrest Condo	MIR106847	Clinton Township
Const Solutions-Bradford Acad	MIR109536	Southfield
CPD-Mollertech Expansion	MIR109559	Shelby Township
Creekside Vill of Shelby #3	MIR105646	Troy
Crystal Commons Retail Center	MIR107982	Clinton Township
Ctry Club Vill of Rh Ph I	MIR107188	Southfield
Cueter Prop-Toussaint Farms	MIR109268	Sterling Heights
Cueter-Avalon Meadows	MIR107402	Sterling Heights
Curtis Prop-Papa Joes Dev	MIR108610	Rochester Hills
Daj-Estates @ Cambridge	MIR106620	Troy
DAlasandro-Brookside Villas	MIR106492	Clinton Township
Deflorio Home-Rhode Island Est	MIR107636	Troy
DeLaura-Crystal Pines Condos	MIR108880	Shelby Township
DeSano-Village at Shelby	MIR108090	Sterling Heights
DESCO-Sterling Heights West	MIR109482	Sterling Heights
Dilorenzo Towncenter	MIR105322	Clinton Township
Dilorenzo-Emerald Ck Ph III/IV	MIR105607	Clinton Township
Dilorenzo-Twin Rivers Sub Ph I	MIR105452	Clinton Township

Table 5 Continued:

Designated Name	Permit No.	Facility Location City
Dimercurio-Brookfield Condos	MIR105825	Shelby Township
Eagle Creek Condominiums	MIR107986	Shelby Township
Ecro Corp-Partridge Creek Vill	MIR107622	Troy
Elro-Fallbrooke Farms	MIR106920	Troy
Eltel-Pontiac Woods/Tech Park	MIR105993	Southfield
Fairview Estates Condo	MIR106461	Rochester Hills
Fairview Village-Pontiac	MIR106848	Rochester Hills
Ferndale HS/MS Activity Field	MIR108634	Ferndale
Fieldstone Golf & Tennis #1	MIR105905	Birmingham
Fieldstone Village # 2	MIR106781	Birmingham
Fifth Third Bank-Rochester H	MIR108982	Rochester Hills
Fisher Co Stamping Facility	MIR107460	Troy
Forester Square	MIR105477	Troy
Frank Karam Emerald Green	MIR105285	Sterling Heights
Froling-Palmer Woods Est	MIR105650	Sterling Heights
G & V-Eddington Woods	MIR105402	Rochester Hills
Gardens at Clinton	MIR108379	Clinton Township
Garrett-Spring Lk Sub #3	MIR106083	Troy
Gateway Village	MIR105838	Southfield
GFA Dev-Hidden Forest	MIR108013	Troy
Gh-Colleen Meadows Condo	MIR106845	Shelby Township
Ginzinger-Wyndridge Est	MIR105777	Rochester Hills
Golden Park Condos	MIR106021	Shelby Township
Grand/Sakwa Prop-M-59/Adam Dev	MIR109203	Rochester Hills
Grand/Sakwa-Central Pk North	MIR109496	Shelby Township
Grand/Sakwa-Heritage Village	MIR108458	Warren
Grandview Site Condo-Rochester	MIR108132	Rochester Hills
Grt-Adrienne Estates Sub #2	MIR105942	Clinton Township
Gst II-Macomb Corp Ctr #2	MIR105352	Madison Heights

Table 5 Continued:

Designated Name	Permit No.	Facility Location City
GTR Bldrs-Parkview Estates	MIR107550	Clinton Township
Gtr-Brook Run Sub	MIR106016	Clinton Township
Gtr-Chesterfield Ind & Tech	MIR107619	Clinton Township
GTR-Rose Gardens Estates	MIR108938	Clinton Township
Gulf-Meadow Creek Condos	MIR105560	Southfield
Gvc-Pine Creek Condo	MIR106494	Shelby Township
H & C-Rochester Maples Condo	MIR109505	Troy
Hall Meadows Condominiums	MIR106077	Clinton Township
Hall-Partridge Ck Commercial	MIR109168	Clinton Township
Hamlin-Avon Lk Vill # 4	MIR107286	Troy
Hazel Park Jr High School	MIR106184	Hazel Park
Hbf-Bay Winds Townhomes	MIR105726	Sterling Heights
Heritage Vill Senior Housing	MIR109279	Warren
Heritage Village Duplex A	MIR109280	Warren
Heritage Village Duplex B	MIR109281	Warren
Heritage Village Single Fam C	MIR109282	Warren
Hickory Highland-Cobblestone 3	MIR105497	Troy
Hickory Ridge Site Condo	MIR109382	Rochester Hills
Hrn-Liberty Techne Ctr	MIR105671	Southfield
Icon Bldg-Garwood Est Condos	MIR105985	Clinton Township
Icon-Lakes Professional Bldg	MIR107127	Clinton Township
Ionia Prop-Plumcreek Est	MIR106284	Birmingham
Izzi-Plymouth Village	MIR105415	Clinton Township
JBD-Crooks and Auburn Dev	MIR108101	Rochester Hills
John Carlo Dev-Clinton Twp	MIR109156	Clinton Township
Joslyn Commerce Park	MIR106300	Southfield
Kaplan-Stonegate Condos	MIR105547	Sylvan Lake
Kayto-24 Mile Commercial	MIR109071	Shelby Township
Kirco Medical Office Bldg	MIR106175	Troy

Table 5 Continued:

Designated Name	Permit No.	Facility Location City
Lakeside Budget Storage	MIR108064	Sterling Heights
Ld Angelo-Wingate Lk Est Ph I	MIR106370	Southfield
Lear Corp-New Headquarters	MIR108311	Southfield
Lincoln Center/Villa Bella	MIR108017	Clinton Township
Lo Chirco-Windemere Multi	MIR106855	Shelby Township
Lochirco-Birchfield Condo	MIR106422	Shelby Township
Lochmoor Homes-Southfield	MIR108052	Southfield
Lombardo Roch Hills-Sheffield	MIR109537	Rochester Hills
Lowes of Madison Heights	MIR108716	Madison Heights
Maas-Silver Pines Vill Condos	MIR106147	Sterling Heights
Macomb Co New Public Works	MIR108619	Clinton Township
Macomb Co-Jewell Road	MIR108199	Shelby Township
Macomb CRC-Metro Pky	MIR108725	Clinton Township
Macomb Emergency Serv Training	MIR109561	Clinton Township
Mancini-Bellagio Subdivision	MIR107571	Shelby Township
Maple Lake Farms Sub	MIR105411	Troy
Marcast-Castle Mar Subdivision	MIR105378	Shelby Township
Market Place Center	MIR108955	Sterling Heights
Mccomb-Peacock Farms	MIR105939	Troy
MDOT-I696/M10 Interchange Mod	MIR108989	Southfield
MDOT-M-10 Beck and Lahser	MIR108423	Southfield
MDOT-M-59 at Adams Rd	MIR109565	Rochester Hills
Meadowbrook Village	MIR105349	Troy
Meram-Angelina Estates	MIR106912	Shelby Township
Meridian Homes-Lochaven Woods	MIR108507	Troy
Middlecreek Estates	MIR106802	Sterling Heights
Misd-Ed Service Ctr Addition	MIR106024	Clinton Township
MJC-Ashford Crossing	MIR108853	Shelby Township
Mlm-Lia Industrial	MIR106833	Clinton Township

Table 5 Continued:

Designated Name	Permit No.	Facility Location City
Modena-Orchard Golf Est	MIR106971	Shelby Township
Mondrian-Chesapeake Grove Cond	MIR109193	Troy
Moravian-Bella Court Condo	MIR108549	Sterling Heights
Mt Elliot-New Mansoleum	MIR106399	Clinton Township
Munaco-Sheldon Court Est	MIR105831	Shelby Township
Neumann Homes-Sterling Woods	MIR109105	Sterling Heights
Nino Homes-Briarwood Condo	MIR108124	Shelby Township
Nino Homes-Oakview Est Sub	MIR108386	Shelby Township
Nino Homes-Whispering Hill Sub	MIR108509	Shelby Township
Nino-Oakwood Condominiums	MIR108145	Shelby Township
North Pointe Condominiums 3	MIR108650	Sterling Heights
Northampton Community	MIR107297	Southfield
Northwood-Pinewood Est Sub #3	MIR106187	Shelby Township
Oakland Co-47051-Rochester Rd	MIR108362	Rochester Hills
Oakland Co-Dequindre Rd	MIR106312	Beverly Hills
Oakland Co-Milford Rd 3r Proj	MIR105990	Beverly Hills
Oakland Co-Nine Mile Rd	MIR106011	Beverly Hills
Oakland Co-Walton Blvd	MIR106012	Beverly Hills
Oakland CRC-Maple Road	MIR107513	Beverly Hills
Oakland Mall-Lord and Taylor	MIR107575	Troy
OCRC-Crooks Rd Reconstruction	MIR109278	Rochester Hills
Old Orchard-Windsong W Condo	MIR106566	Beverly Hills
Oliver-Cranberry Meadows Sub	MIR106550	Sterling Heights
Orco-Birchcrest Condos	MIR106282	Troy
P & D-Tall Oaks Condo	MIR108746	Clinton Township
Palazzolo Bro-Wellington Green	MIR107937	Sterling Heights
Palazzolo-Preserves No 2	MIR105641	Sterling Heights
Park Place of Oak Park Condo	MIR109435	Oak Park
Park South-Oxford Est Condos	MIR105599	Southfield

Table 5 Continued:

Designated Name	Permit No.	Facility Location City
Partridge Creek Fashion Pk	MIR109307	Clinton Township
Partridge Creek Golf-M-59 Conn	MIR108436	Clinton Township
Peg-Hadsell/Bloomfield H-Lands	MIR106380	Rochester Hills
Pine Ridge Senior Village	MIR109319	Clinton Township
Pinewood Plaza	MIR107680	Shelby Township
Plute-Strathmore Sub	MIR107169	Royal Oak
Professional Med Prop-Sterling	MIR108161	Sterling Heights
Providence Park-24 Mile Rd	MIR108003	Shelby Township
Pulte Land-Hills at Indianwood	MIR107728	Royal Oak
Pulte-Arcadia Park	MIR106225	Royal Oak
Pulte-Canterbury Woods	MIR106685	Royal Oak
Pulte-Carrington Garden	MIR106452	Royal Oak
Pulte-Silvercreek/belmonte	MIR106440	Royal Oak
Pulte-Wyngate of Troy	MIR108035	Troy
R & D-King of The Wld Frms	MIR107421	Clinton Township
Rau-Rauhorn Electric Company	MIR107521	Shelby Township
Realistic Builders-Prescot Wds	MIR108494	Sterling Heights
Regency Commerce Ctr #2	MIR105864	Sterling Heights
Regency Commerce Ctr No 2	MIR105840	Sterling Heights
Reserve at Tull Lake	MIR106102	Southfield
Riley-Parkway Chrysler/Jeep	MIR108976	Clinton Township
Rochester Hill-Hitchmans Haven	MIR106779	Rochester Hills
Rochester Hill-Rochdale Water	MIR106780	Rochester Hills
Rochester Klem Gardens	MIR105276	Rochester Hills
Rochester Tienken Shelden	MIR105269	Rochester Hills
Rochester Wal-Mart 2354-01	MIR109410	Rochester Hills
Rochester-ACE School	MIR108852	Rochester Hills
Rochester-Reuther MiddleSch	MIR108849	Rochester Hills
Rochester-Support Service Bldg	MIR108851	Rochester Hills

Table 5 Continued:

Designated Name	Permit No.	Facility Location City
Rochester-Van Hoosen MiddleSch	MIR108893	Rochester Hills
Roncelli Inv-J H Hart Facility	MIR108137	Sterling Heights
Roscommon-Butler Ridge Ph II	MIR106897	Troy
Rwt-Crestwood Condo	MIR107096	Troy
Ryan Rd Shelby-Glen Arbor Cond	MIR108850	Shelby Township
Sable Realty-Central Pk Ph II	MIR109488	Shelby Township
Sable-Manors @ Central Park	MIR107001	Sterling Heights
Samohin-Lakeside Industrial	MIR106907	Sterling Heights
Scalabrino-Hidden Woods Condos	MIR107880	Shelby Township
Sd-Country Club Vill of RH	MIR107765	Southfield
Sd-Golf Highlands 2-5	MIR106929	Southfield
Selective Delaware-Brookstone	MIR105736	Southfield
Seville-Whispering Pines #2	MIR106408	Clinton Township
Shelby Prop Invest-Willow Ck	MIR108889	Shelby Township
Shelby Ridge Estates	MIR108102	Shelby Township
Shelby-23 Mile Rd San Sewer	MIR108727	Shelby Township
Silver Pines Village Condo II	MIR106697	Sterling Heights
Singh Dev-Waltonwood Lakeside	MIR108845	Sterling Heights
Soccer City-Shelby Township	MIR109385	Shelby Township
Soulliere-Elk Horn Est Condos	MIR105834	Oak Park
Sterling Creek Condo	MIR106671	Sterling Heights
Sterling Hgths-19 Mile Rd Blvd	MIR109499	Sterling Heights
Tadian-Pineridge Estates	MIR105602	Troy
Target Store T-2207	MIR109471	Southfield
Ten/Ten Southfield-Mixed Use	MIR109403	Southfield
Terraces at Rose Gardens Est	MIR109348	Clinton Township
Terrance Les-Les Site	MIR108354	Clinton Township
Tienken-City Walk	MIR109223	Rochester Hills
Towncenter Shoppes-Shelby Twp	MIR108480	Shelby Township

Table 5 Continued:

Designated Name	Permit No.	Facility Location City
Trinity Territory	MIR106917	Clinton Township
Troy-Baker New Middle School	MIR109250	Troy
Unity Properties-Chelsea Court	MIR107522	Sterling Heights
Utica Schools-Aux Serv Complex	MIR107963	Sterling Heights
V & M-Tesner Park Sub	MIR106203	Shelby Township
Ventimiglia Retail Center	MIR109346	Shelby Township
Ventimiglia-Gloede Park Subdiv	MIR107581	Warren
Vesper Const-Creekside Manor	MIR107843	Clinton Township
Village @ Cornerstone	MIR105740	Troy
Vitale-Vitale Plaza	MIR108465	Shelby Township
Wake Pratt-Cedar Pines Est	MIR108116	Troy
Warren Community Center	MIR105592	Warren
Warren-City Ctr Infrastructure	MIR107811	Warren
Warren-Detroit Testing Labs	MIR109367	Warren
Washington Twp-Bradbury Condo	MIR107813	Troy
Washington Woods Sub	MIR105416	Shelby Township
Waterstone-Shelby Woods North	MIR109152	Shelby Township
Webber Dev-Parcel B	MIR106674	Clinton Township
Weber-Bluffs of Beaufait 2	MIR106616	Clinton Township
WLC-Willow Ridge Farms	MIR106118	Clinton Township
Woodside Bible Church-Troy	MIR107482	Troy

Table 6. Individual permits and Certificates of Coverage in the Red Run Drain/Bear Creek TMDL watershed. Source: MDEQ, Water Bureau's NPDES Permit Management System.

Permit #	Facility Name	Latitude	Longitude	Receiving Water	CITY
MI0024295	Warren WWTP	42.53167	-83.01833	Red Run Drain	Warren
MI0026115	George W Kuhn RTB CSO	42.50583	-83.11639	Red Run Drain	Madison Heights
MI0057364	MDOT MS4			Statewide	
MI0053881	Warren MS4			Red Run Drain, Bear Creek, Beaver Creek	
MI0053899	Sterling Heights MS4			Clinton River, Red Run Drain, Beaver Creek, Plum Brook Creek	
MIG610042	Oakland Co MS4			Clinton River, Flint River, Huron River, Shiawassee River, Rouge River	
MIG610052	Macomb Co MS4			Clinton River, Lake St. Clair, Stony Creek, Red Run	
MIG610053	Troy MS4-Oakland			Shanahan Drain, Nelson Drain, Big Beaver Creek, Sturgis Drain, Spencer/Bernard Drain, Sprague Drain, Lane Drain, Olson Drain, Fetterly Drain, Renshaw Drain, Ferry Drain	
MIG610115	Shelby Twp MS4-Macomb			Clinton River, Longstaff Drain, Stokes Drain, Bannister Drain	
MIG610251	Hazel Park MS4-Oakland			Bear Creek, Kutchey Drain	
MIG610283	Rochester Hills MS4-Oakland			Clinton River, Rouge River, Paint Creek, Gibson Drain, Galloway Drain, Stony Creek, Sargent Creek	
MIG610295	Madison Heights MS4-Oakland			Bear Creek, McCoy Drain, Red Run, Sharkey Drain	
MIG610299	Clinton Twp MS4-Macomb			Clinton River, North Branch Clinton River	
MIG610304	Center Line MS4-Macomb			Center Line Tile Drain, Center Line Relief Drain, Lorraine Drain	
MIG250009	Weyerhaeuser Co-Warren	42.4633	-82.9933	Red Run Drain	Warren
MIG250015	Wolverine Die Cast-Hoover Rd	42.4614	-83.0053	Red Run Drain	Warren
MIG250062	DaimlerChrysler-Dodge City	42.4536	-83.0422	Bear Creek	Warren
MIS110048	Warren Recycling Center	42.4833	-82.9806	Red Run Drain	Warren
MIS110049	Mayco Plastics-Sterling Hts	42.60444	-83.04556	Plum Brook Creek	Sterling Heights
MIS110054	BAE Industries-Centerline	42.4725	-83.0358	Bear Creek	Center Line

Table 6 Continued:

Permit #	Facility Name	Latitude	Longitude	Receiving Water	CITY
MIS110060	Levy-Clawson Concrete-Plt 16	42.58972	-83.04111	Plum Brook Creek	Sterling Heights
MIS110062	Curtis Metal Finishing	42.59167	-83.04167	Plum Brook	Sterling Heights
MIS110063	American & Import Auto Parts	42.56528	-83.04167	Plum Brook	Sterling Heights
MIS110064	Amplas Compounding Inc	42.54583	-83.04167	Clinton River	Sterling Heights
MIS110065	Luckmarr Plastics Inc	42.55556	-83.04167	Big Beaver Creek	Sterling Heights
MIS110068	Orlandi Gear-Sterling Heights	42.54333	-83.04056	Big Beaver Creek	Sterling Heights
MIS110076	Leonard Tool & Die-Warren	42.4619	-83.0056	Red Run Drain	Warren
MIS110079	CPS Process Systems Inc	42.46667	-83.04750	Bear Creek	Warren
MIS110081	Schwartz Machine Co-Warren	42.44750	-83.06111	Bear Creek	Warren
MIS110082	Apex Broaching Systems-Warren	42.4619	-83.0056	Red Run Drain	Warren
MIS110088	Cook Industries-Warren	42.46556	-83.04750	Bear Creek	Warren
MIS110089	Sturdy Broaching Service	42.5000	-82.9697	Red Run Drain	Warren
MIS110093	Classic Tool & Boring Inc	42.57083	-83.04583	Moore Drain	Sterling Heights
MIS110095	Valiant Industries Inc	42.56000	-83.04639	Big Beaver Creek	Sterling Heights
MIS110097	GM-Powertrain Div-Warren	42.46583	-83.04444	Bear Creek	Warren
MIS110100	Cadillac Plating-Warren	42.4714	-82.9858	Red Run Drain	Warren
MIS110102	Nor-Cote Inc-Warren	42.4667	-83.0089	Bear Creek	Warren
MIS110103	Parton and Preble Mix-Warren	42.4689	-82.9875	Red Run Drain	Warren
MIS110106	Ring Screw Works-Screw Div	42.4583	-83.0347	Bear Creek	Warren
MIS110107	Super Steal Treating Co	42.47538	-83.04328	Clinton River	Warren
MIS110112	Mich Metal Fabricators-Warren	42.4747	-83.0061	Bear Creek	Warren
MIS110117	Capri Tube Inc	42.4762	-83.0037	Red Run Drain	Warren
MIS110127	Metallurgical Processing Co	42.46222	-83.07583	Bear Creek	Warren
MIS110128	Tank Truck Mfg	42.47833	-83.08226	Bear Creek	Warren
MIS110148	Moore Flame Cutting	42.59250	-83.05000	Plum Brook Creek	Sterling Heights
MIS110149	Ex-Cell-O Machine Tools Inc	42.55972	-83.04806	Beaver Creek	Sterling Heights
MIS110164	Wear-Ever Surface Treating	42.4644	-82.9764	Red Run Drain	Warren
MIS110165	FJ Manufacturing-Troy	42.54278	-83.14306	Spencer Drain	Troy
MIS110166	Plating Specialties	42.47639	-83.08639	Red Run Drain	Madison Heights
MIS110167	National Induction Heating	42.47500	-83.13750	Bear Creek	Hazel Park
MIS110170	Atlas Gear	42.53276	-83.09437	Red Run Drain	Madison Heights
MIS110171	UPS-Madison Heights	42.52611	-83.09417	Red Run Drain	Madison Heights
MIS110175	DuPont-Troy	42.54361	-83.12028	Spencer Drain	Troy
MIS110176	Controlled Power-Troy	42.55333	-83.12583	Spencer Drain	Troy
MIS110177	Sulzer Metco-Troy	42.53944	-83.17500	Spencer Drain	Troy
MIS110178	Adaptive Technologies-Troy	42.54167	-83.14167	Spencer Drain	Troy
MIS110182	Birmingham Hydraulics-Troy	42.54917	-83.11417	Hawthorn Drain	Troy
MIS110183	Compound Technologies-Troy	42.54444	-83.13306	Spencer Drain	Troy
MIS110194	Yarema Die & Engineering	42.53750	-83.09556	Spencer Drain	Troy
MIS110197	Bokum Tool-Madison Heights	42.53028	-83.08639	Red Run Drain	Madison Heights

Table 6 Continued:

Permit #	Facility Name	Latitude	Longitude	Receiving Water	CITY
MIS110198	Howard Finishing-Madison Hts	42.53194	-83.08639	Red Run Drain	Madison Heights
MIS110199	KC Jones Plating-Hazel Park	42.47583	-83.10639	Red Run Drain	Hazel Park
MIS110200	ND Industries-Troy	42.55083	-83.15861	Spencer Drain	Troy
MIS110211	Smart-Troy	42.55250	-83.15833	Spencer Drain	Troy
MIS110212	Ogura Corp-Madison Hgts	42.51083	-83.11000	Red Run Drain	Madison Heights
MIS110217	Inergy Automotive Sys-Troy	42.54722	-83.17917	Spencer Drain	Troy
MIS110219	H & L Tool-Madison Hgts	42.53306	-83.08639	Red Run Drain	Madison Heights
MIS110222	Duramic Abrasive Product	42.4714	-83.0025	Red Run Drain	Warren
MIS110230	Manufacturers Products Co	42.48444	-83.04000	Red Run Drain	Warren
MIS110234	Paslin Co-Warren	42.47917	-83.06556	Red Run Drain	Warren
MIS110235	Sur-Flo Plastics-Warren	42.4750	-82.9825	Sweeny Drain	Warren
MIS110242	Doan Companies-Warren Plt	42.4658	-82.9897	Red Run Drain	Warren
MIS110251	J & J Burning & Fabricating	42.47389	-83.04444	Bear Creek	Warren
MIS110254	Sheridan Auto Parts-Groesbeck	42.4536	-82.9989	Red Run Drain	Warren
MIS110257	Sheridan Auto Parts-Edom	42.4539	-83.0000	Red Run Drain	Warren
MIS110260	Harry & Sons Auto Parts-Warren	42.4897	-82.9769	Sweeny Drain	Warren
MIS110264	DaimlerChrysler-Sterling Stamp	42.55556	-83.02889	Red Run Drain	Sterling Heights
MIS110274	Warner Elect Formsprag Clutch	42.4672	-83.0058	Bear Creek	Warren
MIS110279	Warren WWTP	42.53167	-83.01833	Red Run Drain	Warren
MIS110303	Flex-N-Gate Stamping-Warren 1	42.4942	-82.9686	Red Run Drain	Warren
MIS110305	Plymouth Shafting Corp-Nagel	42.4603	-83.0017	Red Run Drain	Warren
MIS110306	Plymouth Shafting Corp-Hoover	42.4561	-83.0050	Red Run Drain	Warren
MIS110308	M & W Manufacturing Co	42.4636	-82.9844	Clinton River	Warren
MIS110309	Vac-Met Inc-Warren	42.52861	-83.03278	Red Run Drain	Warren
MIS110310	Nitro-Vac Heat Treat-Warren	42.46250	-83.08333	Bear Creek	Warren
MIS110328	Carboloy Inc	42.4492	-83.0025	Red Run Drain	Warren
MIS110329	Weyerhaeuser Co-Warren	42.4633	-82.9933	Red Run Drain	Warren
MIS110330	A G Simpson Inc	42.54278	-83.04028	Beaver Creek	Sterling Heights
MIS110335	Milco Manufacturing Co-Warren	42.47639	-83.08083	Bear Creek	Warren
MIS110336	Valley Industries-Madison Hgts	42.53167	-83.08639	Clinton River	Madison Heights
MIS110339	Welform Electrodes Inc-Warren	42.47750	-83.08056	Bear Creek	Warren
MIS110342	Tonys Die & Machine-Warren	42.4750	-82.9825	Seeny Drain	Warren
MIS110353	Fini Finish Products-Warren	42.47417	-83.04500	Bear Creek	Warren
MIS110357	Conway Central Express-XPN	42.52917	-83.08639	Red Run Drain	Warren
MIS110373	Flex-N-Gate Stamping-Warren 2	42.46222	-83.04694	Bear Creek	Warren
MIS110376	TRW Automotive US-Sterling Hts	42.54528	-83.02833	Big Beaver Creek	Sterling Heights
MIS110380	Experi-Metal-Sterling Hts	42.57056	-83.04278	Moore Drain	Sterling Heights
MIS110387	Warhoops Auto & Truck Parts	42.60000	-83.04167	Clinton River	Sterling Heights
MIS110388	Automotive Plastic Tech	42.55028	-83.04222	Clinton River	Sterling Heights
MIS110392	Ace Finishing-Warren	42.4494	-82.9772	Red Run Drain	Warren

Table 6 Continued:

Permit #	Facility Name	Latitude	Longitude	Receiving Water	CITY
MIS110393	PPG Industries-Sterling Height	42.55278	-83.04222	Big Beaver Creek	Sterling Heights
MIS110402	Deluxe Stamping & Die Co	42.54556	-83.04167	Big Beaver Creek	Sterling Heights
MIS110406	Ultimate Hydroforming Inc	42.60250	-83.03611	Clinton River	Sterling Heights
MIS110412	Regal Prototypes Inc	42.62083	-83.04583	Clinton River	Sterling Heights
MIS110413	IMPCO	42.54902	-83.04077	Clinton River	Sterling Heights
MIS110416	USPS-Royal Oak Processing	42.55583	-83.11222	Sturgis Drain	Troy
MIS110418	Fisher Corp-Troy	42.54750	-83.16889	Spencer Drain	Troy
MIS110454	Norbert Industries Inc	42.57250	-83.04500	Plum Brook	Sterling Heights
MIS110464	DaimlerChrysler-Sterling Hgths	42.57333	-83.02972	Moore Drain	Sterling Heights
MIS110734	Mich Tile & Marble Co	42.58750	-83.05417	Plum Brook Creek	Sterling Heights
MIS110740	Central Metal Products-Warren	42.4492	-82.9889	Red Run Drain	Warren
MIS110755	Tool-Dex Inc-Warren	42.4617	-83.0028	Red Run Drain	Warren
MIS110762	AMCOL CORP-Hazel Park	42.45417	-83.08333	Bear Creek	Hazel Park
MIS110771	Metaldyne-Troy	42.54722	-83.17556	Spencer Drain	Troy
MIS110781	Visteon Corp-Sterling	42.57917	-83.04917	Moore Drain	Sterling Heights
MIS110794	Hi-Tech Coatings Inc	42.4772	-82.9878	Red Run Drain	Warren
MIS110796	Everfresh/LaCroix Beverages	42.46250	-83.03583	Bear Creek	Warren
MIS110798	Hercules Welding Products	42.4664	-83.0081	Bear Creek	Warren
MIS110831	Raybestos Auto Components Co	42.62500	-83.04583	Clinton River	Sterling Heights
MIS110882	Inalfa/SSI Roof Syst-Warren	42.4633	-82.9961	Red Run Drain	Warren
MIS110888	Acco Systems-Warren	42.4636	-82.9942	Bear Creek	Warren
MIS110889	AL-Craft-Troy	42.54222	-83.09556	Spencer Drain	Troy
MIS110900	Barrett Paving Materials-Troy	42.55417	-83.15833	Spencer Drain	Troy
MIS110902	Best Block Co-Warren	42.4583	-82.9956	Red Run Drain	Warren
MIS110904	Castall Products-Troy	42.53694	-83.09306	Spencer Drain	Troy
MIS110905	DaimlerChrysler-Dodge City	42.4536	-83.0422	Bear Creek	Warren
MIS110908	Conrail-Warren	42.4597	-83.0347	Red Run Drain	Warren
MIS110909	Consolidated Rail-Sterling Hts	42.57694	-83.03889	Moore Drain	Sterling Heights
MIS110912	Fettes Mfg-Sterling Heights	42.58750	-83.05444	Moore Drain	Sterling Heights
MIS110915	Ceratizit Michigan	42.4760	-83.0087	Red Run Drain	Warren
MIS110917	Detroit Hoist & Crane	42.54556	-83.04167	Big Beaver Creek	Sterling Heights
MIS110918	E & E Engineering-Warren	42.52611	-83.03222	Red Run Drain	Warren
MIS110924	Gentz Industries-Warren	42.4850	-82.9750	Red Run Drain	Warren
MIS110925	Proto Gage Inc	42.55250	-83.03972	Gamble Drain	Sterling Heights
MIS110927	Scott Specialty Gases-Troy	42.54528	-83.13778	Spencer Drain	Troy
MIS110934	Red Industries	42.46222	-83.08750	Bear Creek	Hazel Park
MIS110937	J & N Fabrication-Warren	42.51389	-83.06667	Red Run Drain	Warren
MIS110938	Modern Broaching Serv-Warren	42.4731	-83.0019	Bear Creek	Warren
MIS110944	Warren Abrasives Inc	42.4853	-82.9750	Red Run Drain	Warren
MIS110948	Keo Cutters-Warren	42.4792	-82.9753	Red Run Drain	Warren

Table 6 Continued:

Permit #	Facility Name	Latitude	Longitude	Receiving Water	CITY
MIS110949	Mark Engineering Co	42.60833	-83.04722	Chrissman Drain	Sterling Heights
MIS110953	Punchcraft Co-Warren	42.51639	-83.06722	Red Run Drain	Warren
MIS110954	Modern Hard Chrome Service Co	42.4633	-82.9928	Red Run Drain	Warren
MIS110955	Wolverine Die Cast-Hoover Rd	42.4614	-83.0053	Red Run Drain	Warren
MIS110959	Sterling Concrete-Sterling Hgt	42.56667	-83.04583	Moore Drain	Sterling Heights
MIS110960	Shuert Industries-Sterling Hts	42.62444	-83.04583	Clinton River	Sterling Heights
MIS110964	Wyatt Services-Sterling Hts	42.58564	-83.03776	Plumbrook Drain	Sterling Heights
MIS110967	Invecast Corp-Warren	42.4611	-83.0339	Bear Creek	Warren
MIS110970	Soramatic Precision Machining	42.47639	-83.07806	Bear Creek	Warren
MIS110973	Proficient Products Inc	42.55250	-83.04361	Big Beaver Creek	Sterling Heights
MIS110978	Metro Technologies-Troy	42.56250	-83.11833	Sturgis Drain	Troy
MIS110985	Zimmerman Handling Systems	42.50833	-83.11833	Red Run Drain	Madison Heights
MIS110999	Ajax Paving-M-430	42.50000	-83.10417	various	Madison Heights
MIS111000	Ajax Paving-M-522	42.50000	-83.10417	various	Madison Heights
MIS111001	Ajax Paving-M-482	42.50000	-83.10417	various	Madison Heights
MIS111002	Ajax Paving-M-400	42.50000	-83.10417	various	Madison Heights
MIS111003	Ajax Paving-M-524	42.50000	-83.10417	various	Madison Heights
MIS111013	Grosse Tool & Machine-Warren	42.4658	-82.9894	Red Run Drain	Warren
MIS111020	Universal Trim-Madison Heights	42.48333	-83.08861	Bear Creek	Madison Heights
MIS111023	Cape Industries-Warren	42.47000	-83.04500	Bear Creek	Warren
MIS111025	Inland Diamond Products Co	42.52722	-83.09889	Red Run Drain	Madison Heights
MIS111035	Precision Mold & Engineering	42.4636	-82.9906	Bear Creek	Warren
MIS111045	Macomb Auto Salvage-Warren	42.4911	-82.9769	Bear Creek	Warren
MIS111046	Wolverine Die Cast-Nagel Ave	42.48925	-83.07404	Bear Creek	Warren
MIS111064	Flex-N-Gate Forming-Warren	42.4889	-82.9728	Red Run Drain	Warren
MIS111073	Central Gear-Madison Hgts	42.51111	-83.10944	Red Run Drain	Madison Heights
MIS111074	DHL Express-Troy	42.54500	-83.12861	Spencer Drain	Troy
MIS111085	Weldaloy Products Company	42.4706	-83.0064	Bear Creek	Warren
MIS111086	Distel Tool & Machine-Warren	42.4778	-82.9917	Red Run Drain	Warren
MIS111087	Wico Metal Products-Warren	42.4636	-83.0347	Bear Creek	Warren
MIS111088	Reska Spline Products-Warren	42.4806	-82.9758	Red Run Drain	Warren
MIS111089	Eleven Mile Truck Frame & Axle	42.49000	-83.08694	McCoy Drain	Madison Heights
MIS111099	Troy Aggregate-Sterling Hgts	42.59417	-83.04639	Plum Brook	Sterling Heights
MIS111112	Express Coat Corp-Warren	42.4969	-82.9717	Red Run Drain	Warren
MIS111113	Wico Metal Products-Ryan Rd	42.46694	-83.06472	Bear Creek	Warren
MIS111117	Commodore Cartage-Donegal Prop	42.47722	-83.04611	Bear Creek	Warren
MIS111118	Wico Metal Products-Centerline	42.4742	-83.0364	Bear Creek	Warren
MIS111121	GM-Technical Center-Warren	42.52583	-83.04500	Red Run Drain	Warren
MIS111124	Textron Fastening-Sterling Hts	42.59417	-83.04806	Plumbrook Drain	Sterling Heights

Table 6 Continued:

Permit #	Facility Name	Latitude	Longitude	Receiving Water	CITY
MIS111142	Ajax Metal Processing-Cold	42.4564	-83.0053	Bear Creek	Warren
MIS111153	Venture Corp-Mound Facility	42.60556	-83.05083	Chrissman Drain	Sterling Heights
MIS111157	SLC Recycling Industries Inc	42.4483	-83.0247	Bear Creek	Warren
MIS111166	AZ Automotive-Warren	42.4789	-83.0250	Red Run Drain	Warren
MIS111170	Advanced Assembly-Madison Hts	42.47611	-83.09528	Clinton River	Madison Heights
MIS111175	Tesma Sterling Heights	42.53611	-83.04361	Beaver Creek	Sterling Heights
MIS111185	Ajax Paving-M-604	42.50000	-83.10417	various	Madison Heights
MIS111186	Magna International Inc-Vehma	42.54583	-83.11250	Spencer Drain	Troy
MIS111194	Tool Dex Inc	42.47667	-83.06389	Bear Creek	Warren
MIS111206	Vehma International Amer	42.54389	-83.18556	Spencer Drain	Troy
MIS111215	J G Kern Enterprises Inc	42.61722	-83.04639	Chrissman Drain	Sterling Heights
MIS111220	Comtrex LLC-Warren	42.4708	-83.0056	Red Run Drain	Warren
MIS111224	Charter Steel Detroit	42.4694	-83.0353	Red Run Drain	Center Line
MIS111228	Hi-Tech Tool-Sterling Heights	42.55972	-83.04694	Gamble Drain	Sterling Heights
MIS111232	Midwest Gear & Tool Inc	42.4633	-83.0006	Red Run Drain	Warren
MIS111234	Machining Enterprises Inc	42.4539	-83.0050	Red Run Drain	Warren
MIS111236	AZ Automotive-Sterling Heights	42.60722	-83.04528	Chrissman Drain	Sterling Heights
MIS111245	Casadei Structural Steel Inc	42.61583	-83.04250	Clinton River	Sterling Heights
MIS111249	DE-STA-CO Industries	42.52472	-83.09583	Red Run Creek	Madison Heights
MIS111251	Radar Industries Inc-Warren	42.5032	-82.9705	Harrington Drain	Warren
MIS111253	PPI Aerospace Acquisition	42.4729	-82.9890	Red Run Drain	Warren
MIS111254	SET Enterprise Inc	42.50083	-83.02833	Bear Creek	Warren
MIS111257	Noble Metal Processing Inc	42.49707	-83.03960	Bear Creek	Warren
MIS111258	AZ Automotive-Mound Rd	42.47222	-83.04583	Bear Creek	Warren
MIS111270	AZ Automotive-Centerline	42.4683	-83.0338	Clinton River	Center Line
MIS111274	InveCast Corp-Dodge St-Warren	42.46095	-83.03795	Bear Creek	Warren
MIS111275	Yarema Die & Engineering-Troy	42.55064	-83.12475	Spencer Drain	Troy
MIS111278	HP Pelzer-Sterling Heights	42.59623	-83.04795	trib to Clinton River	Sterling Heights
MIS111302	Overhead Conveyor Co-Ferndale	42.45916	-83.12045	Red Run Drain	Ferndale
MIS111307	American MSC Inc-Troy	42.53618	-83.10457	Lake St. Clair	Troy
MIS111309	SportRack Auto-Sterling Hts	42.59986	-83.04813	Chrissman Drain	Sterling Heights
MIS111315	Yarema Die & Eng-Troy 2	42.53648	-83.09458	Henry Graham Drain	Troy
MIS111322	TransForm Auto-Sterling Hts	42.53817	-83.04021	Red Run	Sterling Heights
MIS111324	Cadillac Products Auto-Warren	42.4882	-82.9748	Red Run Drain	Warren
MIS111331	Ajax Materials Corp-Plant 7-W	42.48957	-83.04394	Bear Creek	Warren
MIS111334	MW Scott Machine Products Co	42.52611	-83.11944	Red Run Drain	Madison Heights
MIS111343	Visteon Sterling II Plt	42.60417	-83.04167	Chrissman Drain	Sterling Heights
MIS111349	SMW Automotive-Warren	42.4692	-82.9937	Red Run Drain	Warren
MIS111357	Frito-Lay-Sterling Hts	42.57106	-83.03708	Plum Brook	Sterling Heights
MIS111358	Wico Metal Prod-Sherwood Ave	42.47174	-83.04312	Red Run Drain	Warren

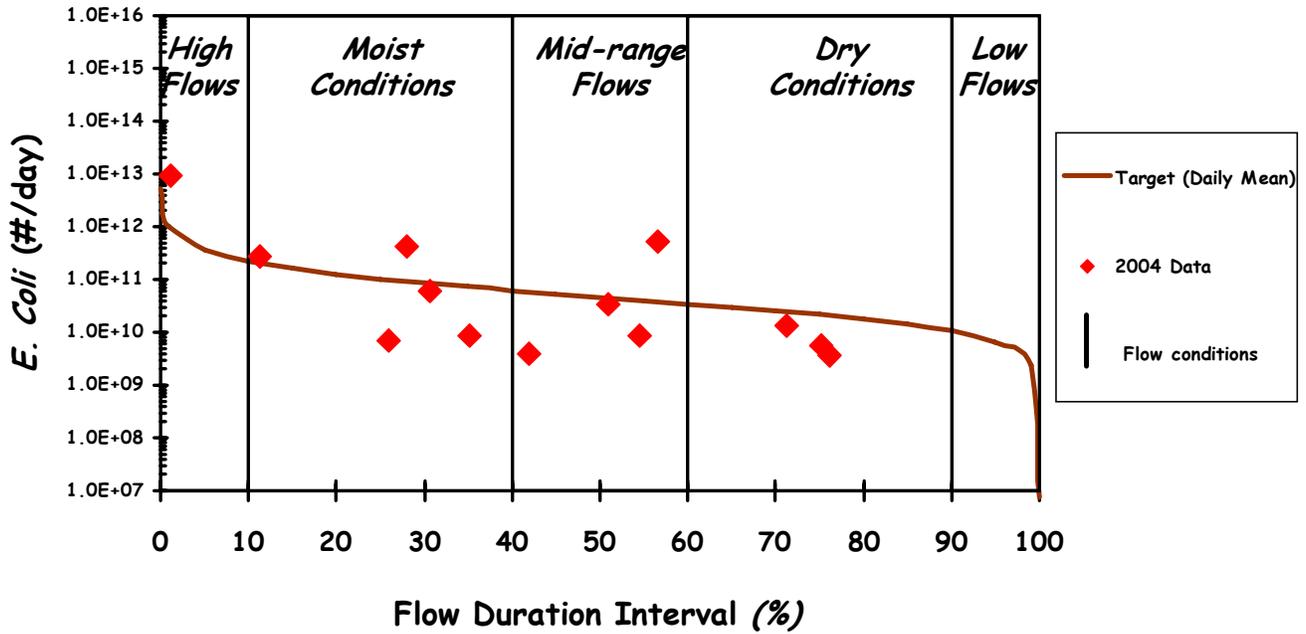
Table 6 Continued:

Permit #	Facility Name	Latitude	Longitude	Receiving Water	CITY
MIS111378	US Mfg Corp-Warren	42.49735	-83.03037	Clinton River	Warren
MIS111401	Vehma Int-Bellingham Road	42.54754	-83.10021	Hawthorn Drain	Troy
MIS111403	Diversified Industries	42.49076	-83.03040	Clinton River	Center Line
MIS111409	Horiba ATS	42.56125	-83.12531	Big Beaver Creek	Troy
MIS120006	Henkel Surface Technologies	42.4653	-83.0353	Bear Creek	Warren

Table 7. Types of General Permits and Permits by Rule

Permit Number	Description
General Permit	
MIS110000, MIS120006	Stormwater from industrial activities
MIG619000	Storm water discharges from Municipal Separate Storm Sewer Systems (MS4) subject to watershed plan requirements
MIG250000	Non-contact cooling water discharge
Permits-by-Rule	
MIR100000	Storm water discharges from construction activities

APPENDIX A

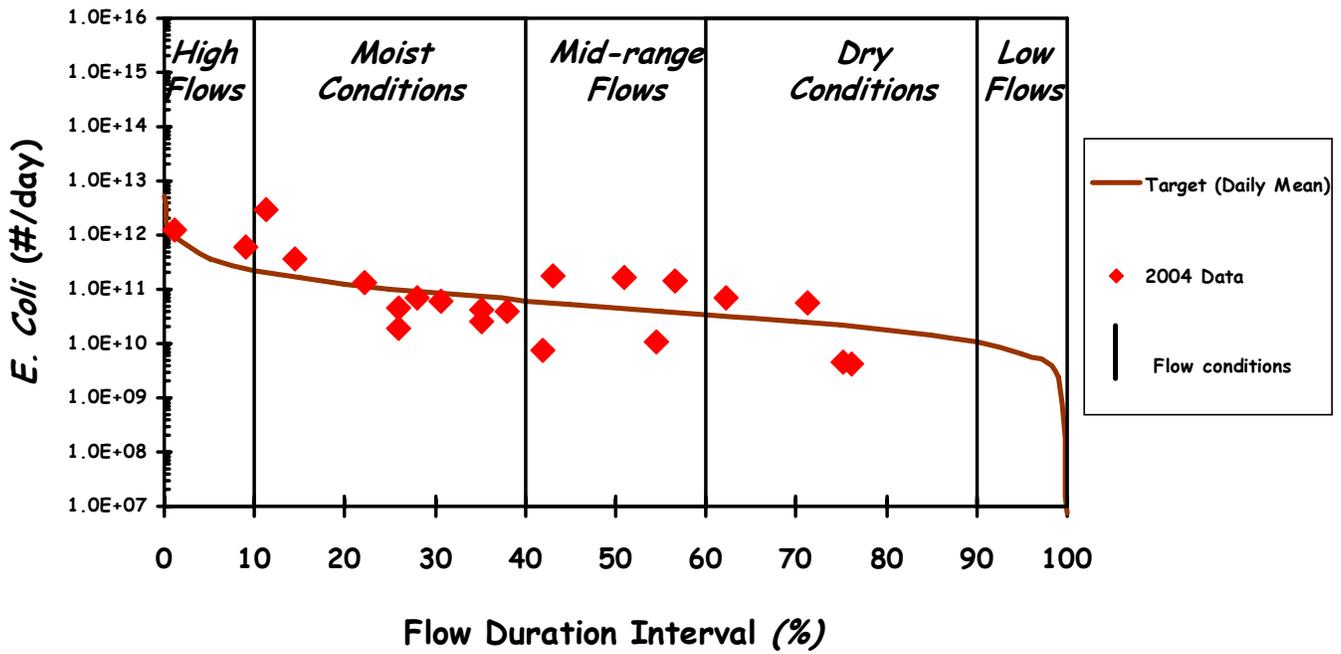


E. Coli Data & USGS Gage Duration Interval

16.5 square miles

A-1. Bear Creek at Mound Road (BEA 0). Load duration curve based on daily geometric mean.

Appendix A Continued:

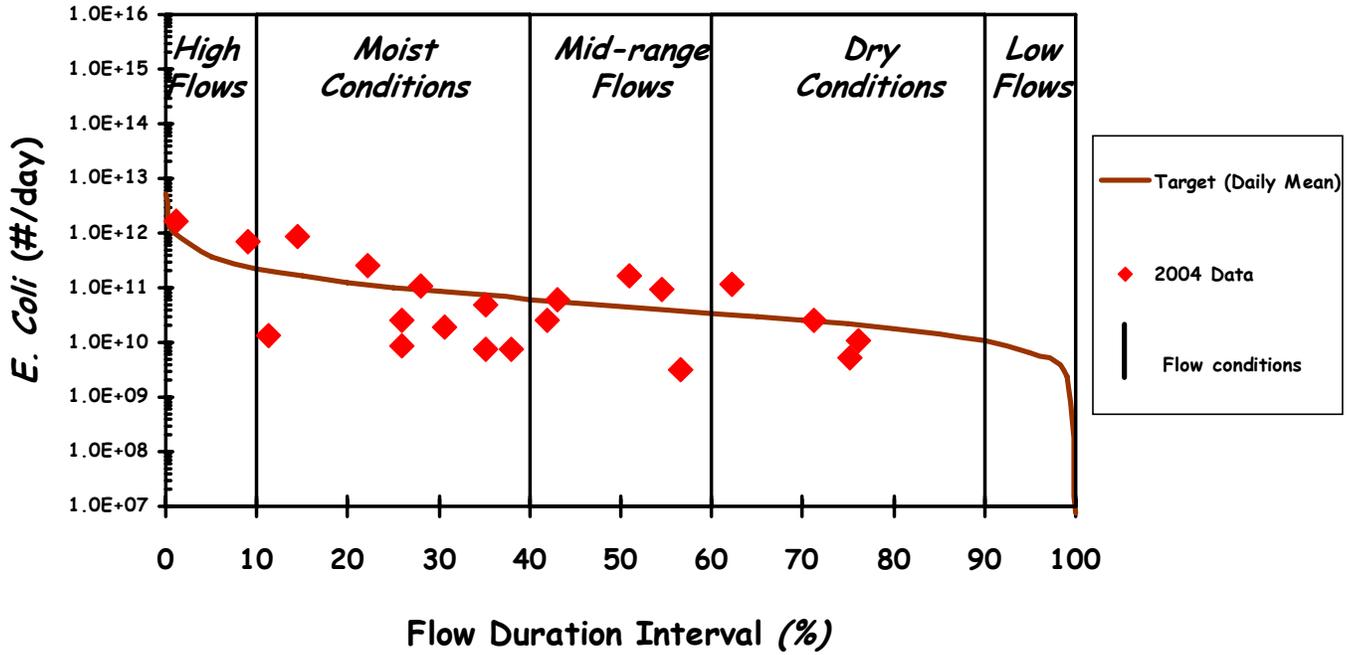


E. Coli Data & USGS Gage Duration Interval

16.5 square miles

A-2. Bear Creek at 12-Mile Road (BEA 1A). Load duration curve based on daily geometric mean.

Appendix A Continued:

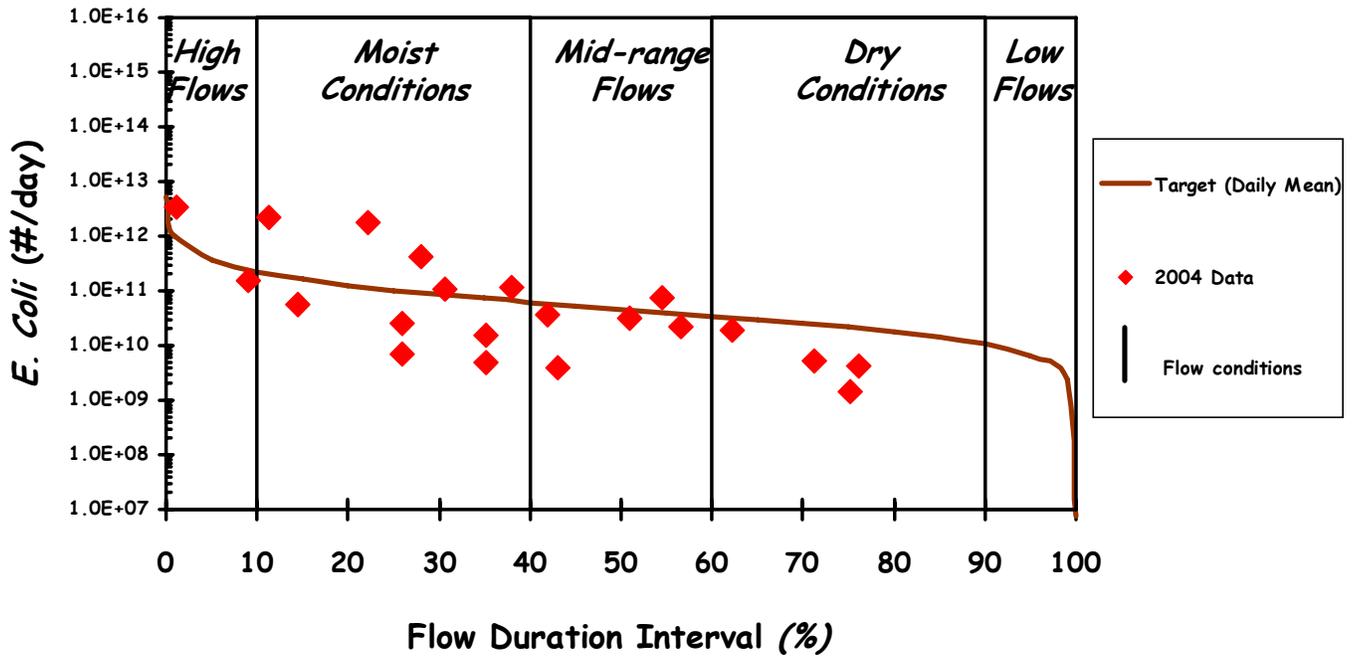


E. Coli Data & USGS Gage Duration Interval

16.5 square miles

A-3. Bear Creek at Old 13-Mile Road (BEA 2A). Load duration curve based on daily geometric mean.

Appendix A Continued:

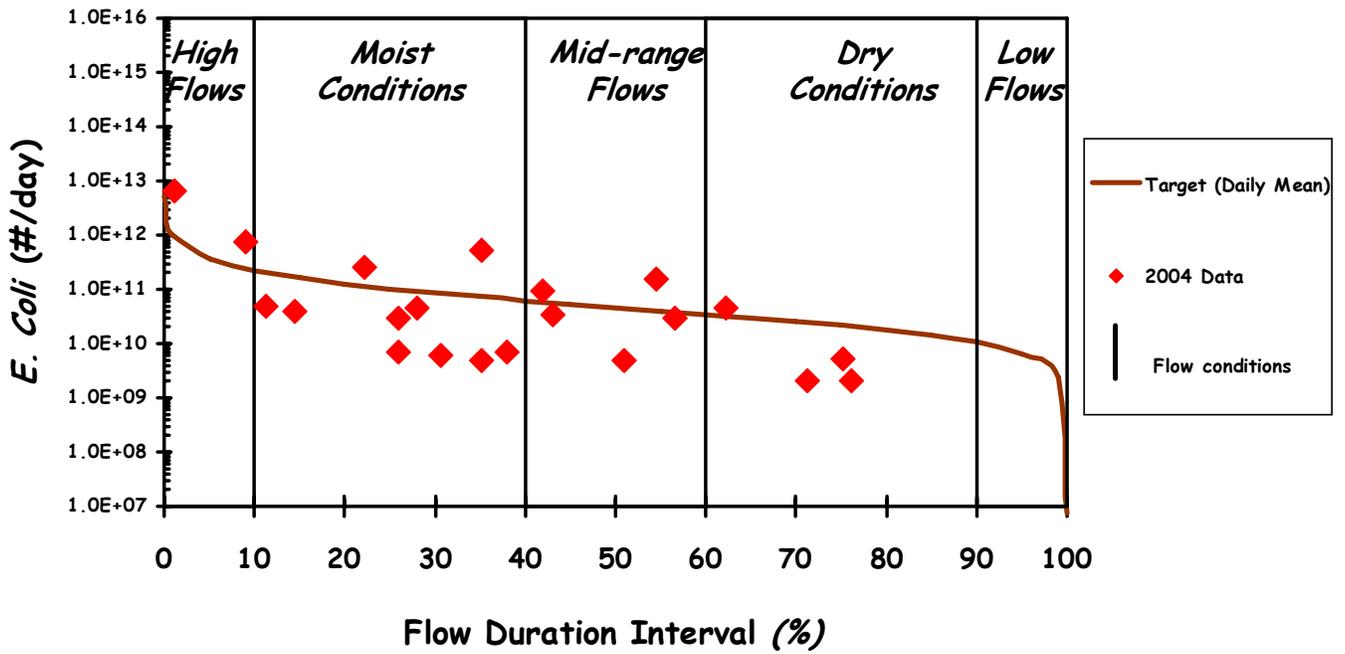


E. Coli Data & USGS Gage Duration Interval

16.5 square miles

A-4. Red Run Drain at Ryan Road (RED 1). Load duration curve based on daily geometric mean.

Appendix A Continued:

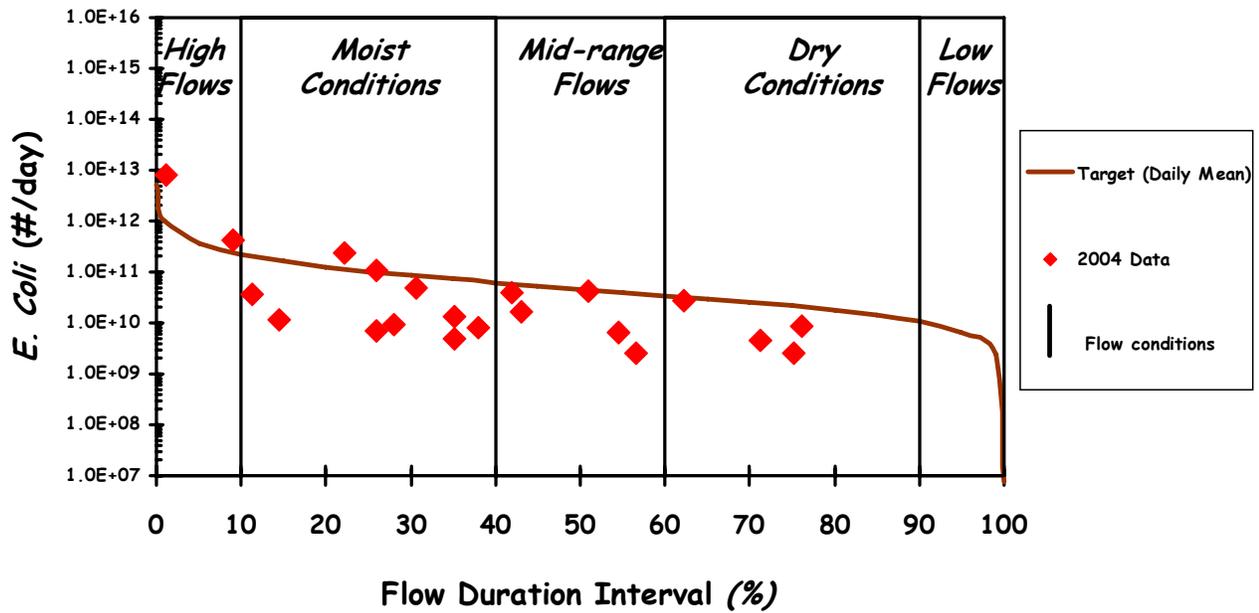


E. Coli Data & USGS Gage Duration Interval

16.5 square miles

A-5. Red Run at Van Dyke Road (RED 2). Load duration curve based on daily geometric mean.

Appendix A Continued:

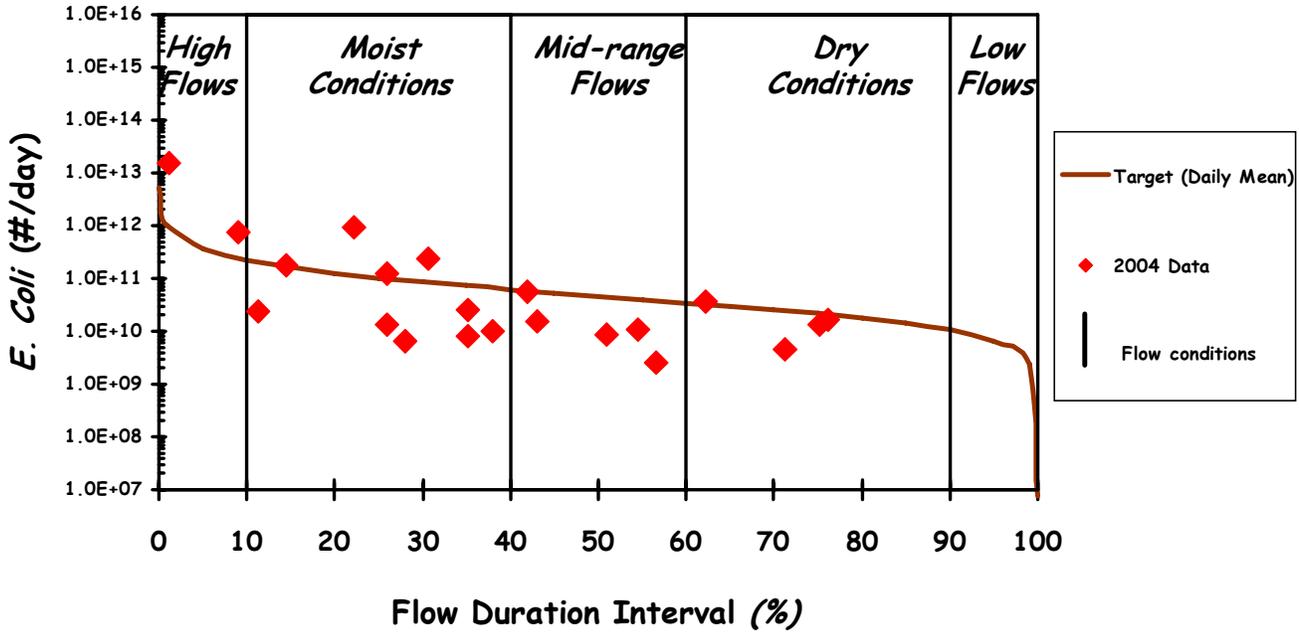


E. Coli Data & USGS Gage Duration Interval

16.5 square miles

A-6. Red Run at Maple Lane (RED 3). Load duration curve based on daily geometric mean.

Appendix A Continued:

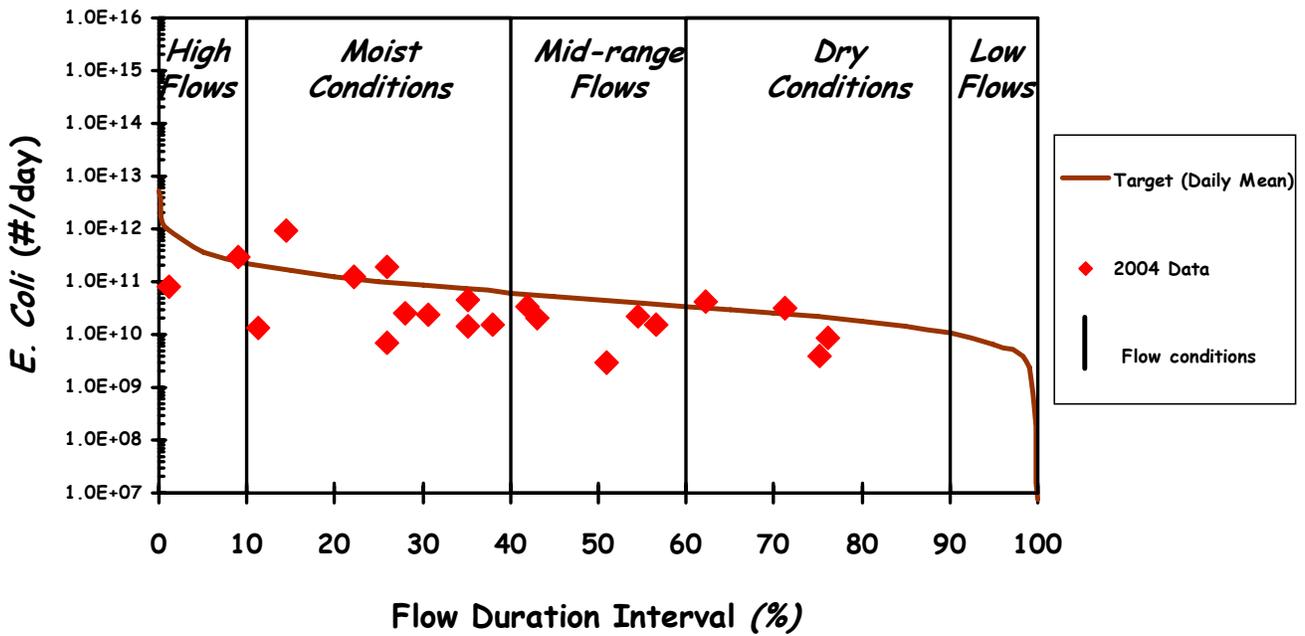


E. Coli Data & USGS Gage Duration Interval

16.5 square miles

A-7. Red Run at Schoenherr Road (RED 4). Load duration curve based on daily geometric mean.

Appendix A Continued:

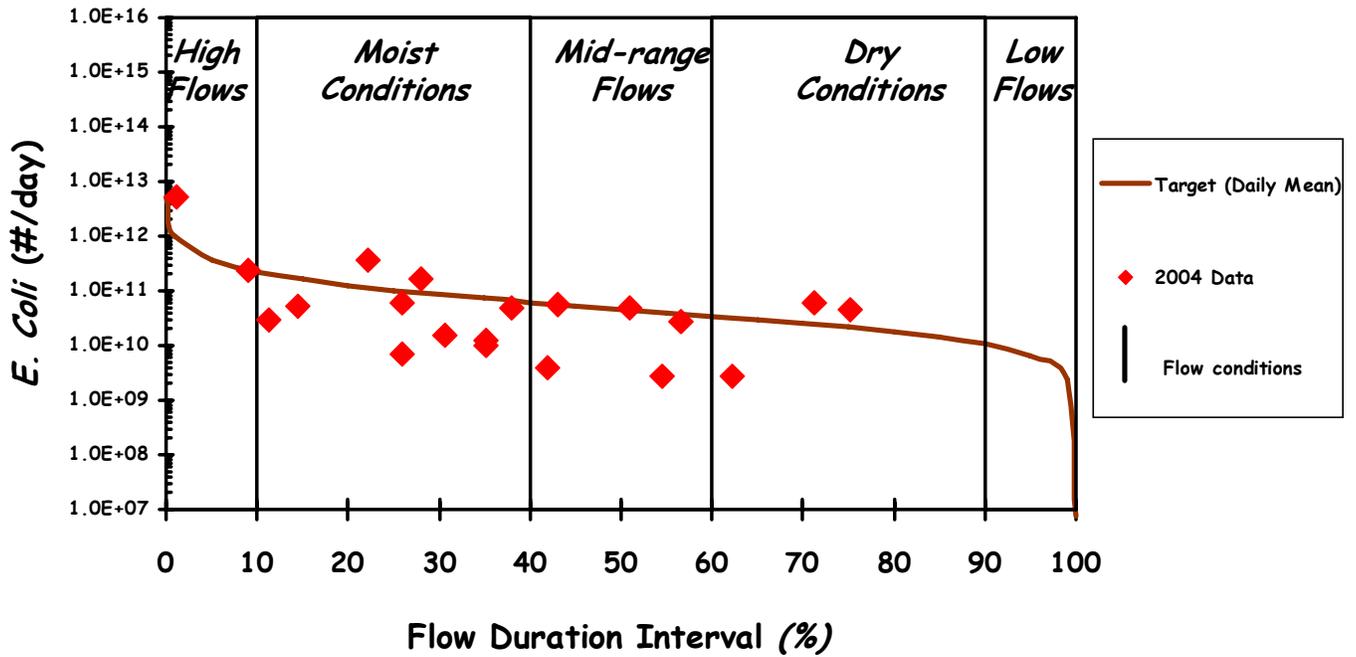


E. Coli Data & USGS Gage Duration Interval

16.5 square miles

A-8. Red Run at Utica Road (RED 5). Load duration curve based on daily geometric mean.

Appendix A Continued:

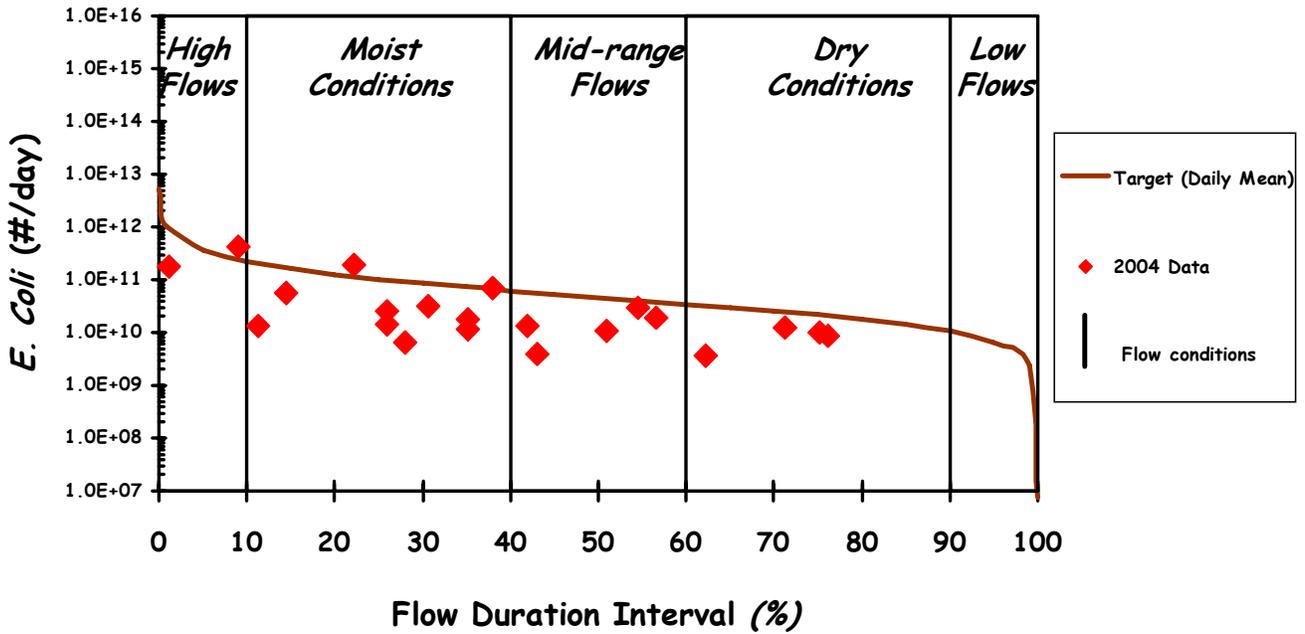


E. Coli Data & USGS Gage Duration Interval

16.5 square miles

A-9. Big Beaver Creek at Van Dyke Avenue (RED 6). Load duration curve based on daily geometric mean.

Appendix A Continued:



E. Coli Data & USGS Gage Duration Interval

16.5 square miles

A-10. Plum Brook at Schoenherr Road (RED 7) Load duration curve based on daily geometric mean.

APPENDIX B

List of Acronyms for Red Run Drain and Bear Creek Total Maximum Daily Load for *E. coli*.

Bear Creek Clean Water Initiative	BCCWI
Best Management Practices	BMP
Certificate of Coverage	COC
Clean Michigan Initiative-Clean Water Fund	CMI-CWF
Code of Federal Regulations	CFR
Combined Sewer Overflow	CSO
Escherichia coli	<i>E. coli</i>
Load Allocation	LA
Macomb County Health Department	MCHD
Macomb County Public Works Office	MCPWO
Margin of Safety	MOS
Michigan Department of Environmental Quality	MDEQ
Michigan Department of Transportation	MDOT
Milliliters	ml
Municipal Separate Storm Sewer System	MS4
National Pollutant Discharge Elimination System	NPDES
Oakland County Drain Commissioner	OCDC
Sanitary Sewer Overflow	SSO
Storm Water Pollution Prevention Plan	SWPPP
Total Maximum Daily Load	TMDL
United States Environmental Protection Agency	USEPA
United States Geological Survey	USGS
Waste Load Allocation	WLA
Wastewater Treatment Plant	WWTP
Water Quality Standards	WQS