Michigan Department of Environmental Quality
Water Bureau
August 2007

Total Maximum Daily Load for Biota for the River Rouge Watershed, Including Bishop and Tonquish Creeks Washtenaw, Wayne, 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 appropriate actions to achieve the biological (fish and macroinvertebrate) community targets that will result in WQS attainment, specifically through reduction in sediment loadings from sources in the Rouge River watershed, including Bishop and Tonquish Creeks, thereby addressing in-stream habitat loss and hydrologic changes. Three separate Section 303(d) listings for poor fish and macroinvertebrate communities appear in the Rouge River watershed (explained below); all three are addressed herein due to their proximity and the similarity in both their TMDL goals and the impacts on those listed reaches (Figure 1). This TMDL encompasses the entire Rouge River watershed because of the inability to separate the drainage-wide impacts of land use and storm water runoff on the specific listed reaches and to recognize the necessity of watershed-wide efforts to address water quality, habitat quality, and hydrologic modification.

PROBLEM STATEMENT

The TMDL reach for River Rouge appears on the Section 303(d) list as:

River Rouge WBID#: 061305G
(Main Br., Upper Br., Middle Br., Lower Br., Bell Br., Franklin Br., Evans Ditch)
County: Oakland/Wayne Size: 91 M
Location: River Rouge Detroit River confluence u/s to include the Main Br. River Rouge (u/s to Big Beaver Road), Upper River Rouge (u/s to Rt. 696), Middle Br. River Rouge (u/s to 8 Mile Rd.), Lower Br. (u/s to Beck Road), Bell Br. (u/s to 7 Mile Rd.), Evans Ditch (u/s to Lahser Rd.), and the Franklin Br. (u/s to Big Beaver Rd.).
NHD Reach Code: 04090004000014
Problem Summary: Fish and Macroinvertebrate Communities rated poor.
TMDL YEAR(s): 2007

The River Rouge was placed on the Section 303(d) list due to poor macroinvertebrate and fish communities throughout the watershed based on data collected in the 1980s and early 1990s. More current monitoring in 2000 found acceptable macroinvertebrate communities at all 14 sites sampled and four poor fish communities out of four sites in the TMDL reach. Monitoring in 2005 found one poor macroinvertebrate community out of 18 sites and an acceptable fish community at the only site sampled in the TMDL reach. While information from the 2000 and 2005 surveys indicate that the listed reaches are generally achieving acceptable community ratings for macroinvertebrates, the scores continue to be at the lowest end of the range for an acceptable rating indicating the continued threatened status of the listed reaches and the need for the TMDL.

The TMDL reach for Tonquish Creek appears on the Section 303(d) list as:

Tonquish Creek WBID#: 061304H
County: Wayne Size: 10 M
Location: Middle River Rouge confluence u/s. Vicinity of Nankin Mills.
NHD Reach Code: 04090004000503
Problem Summary: Fish and Macroinvertebrate Communities rated poor.
TMDL YEAR(s): 2007

Tonquish Creek was placed on the Section 303(d) list due to poor fish and macroinvertebrate community data collected in the 1980s and early 1990s. Monitoring in 2000 found poor fish and macroinvertebrate communities at the one station surveyed. Surveys conducted in 2005 found poor macroinvertebrates at two of five stations and poor fish at two out of two stations in the TMDL reach.

The TMDL reach for Bishop Creek appears on the Section 303(d) list as:

Bishop Creek WBID#: 061304O
County: Wayne Size: 4 M
Location: Middle Br. River Rouge confluence u/s (including Ingersoll Creek).
NHD Reach Code: 04090004000071
Problem Summary: Macroinvertebrate community rated poor.
TMDL YEAR(s): 2007

Bishop Creek was placed on the Section 303(d) list due to poor macroinvertebrate communities at two sites in biological surveys conducted in 2000. Surveys conducted in 2005 found poor macroinvertebrates at two of four stations sampled in the TMDL reach. The two poor stations were uppermost in the watershed.

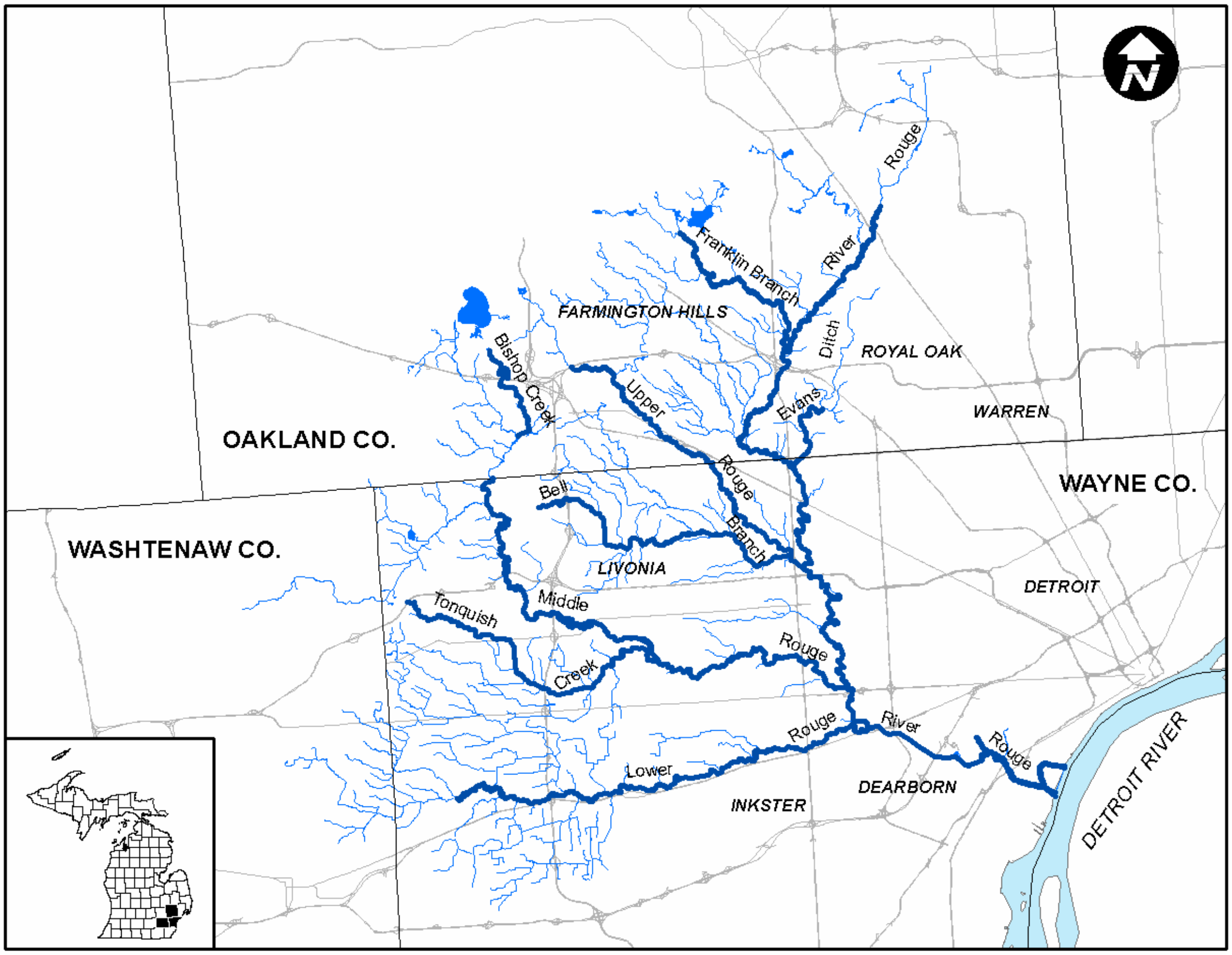

Figure 1. Rouge River Watershed 303(d) listed biota TMDL reaches (in bold).

NUMERIC TARGET

The impaired designated uses addressed by this TMDL for the Rouge River, and Bishop and Tonquish Creeks are related to the poor fish and macroinvertebrate communities found in these reaches. 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) requires the protection of, among other things and specific to this TMDL, the warmwater fishery and other indigenous aquatic life and wildlife (R 323.1100(1)(d) and (e)).

The primary numeric target is based on the Procedure 51 biological community assessment protocol (MDEQ, 1990). This biota TMDL target is the reestablishment of fish and macroinvertebrate communities that, when monitored, result in a consistent ‘acceptable’ or ‘excellent’ rating. Macroinvertebrate and fish communities will be evaluated based on a minimum of two Procedure 51 biological assessments conducted in successive years, following the implementation of efforts like Best Management Practices (BMPs) to stabilize runoff discharges and extremes in stream flow conditions, and minimize sediment loadings to the watershed.

A secondary numeric target based on Suspended Solids (SS) concentration will be used to assess improvements in the Rouge River watershed. This secondary target is a mean annual in-stream SS concentration of 80 milligrams per liter (mg/L) for wet weather events. Achievement of the biological target will override this secondary target; however, if the SS target is met, but the biological target not achieved, then the secondary target may be reevaluated.

The secondary numeric target is intended to help guide proper control over excessive SS loads from runoff, as well as the runoff discharge rates and volumes that affect increased stream flow instability, stream bank erosion, and increased SS concentrations. The secondary numeric target is intended to link a measurable in-stream parameter to the hydrologic changes in the watershed and the resultant habitat changes that are heavily impacting the biological communities in this system. A report titled, *Ecological Targets for the Rehabilitation of the Rouge River*, concluded, in part, that "Significant, basin-wide reductions in storm runoff are necessary to achieve fisheries rehabilitation targets" (Wiley et al., 1998).

The mean annual target concentration of 80 mg/L SS is based on a review of existing conditions and published literature on the effects of SS to aquatic life. Vohs et al., (1993) indicated that a chemically inert SS concentration of 100 mg/L appears to separate those streams with a fish population from those without. Gammon (1970) demonstrated decreases in the standing crop of both fishes and macroinvertebrates in river reaches continuously receiving SS loadings below 40 mg/L. The European Inland Fisheries Advisory Commission stated that, in the absence of other pollution, a fishery would not be harmed at SS concentrations less than 25 mg/L (EIFAC, 1980).

Alabaster and Lloyd (1982) provided the following water quality goals for SS for the protection of fish communities:

Optimum	=	≤ 25 mg/L
Good to Moderate	=	> 25 to 80 mg/L
Less than Moderate	=	> 80 to 400 mg/L
Poor	=	> 400 mg/L

Because the purpose of this TMDL is to identify possible steps to restore the biological community to an acceptable condition, thereby working toward attaining WQS, a value of 80 mg/L as a mean annual target for wet weather events was chosen for the Rouge River watershed as a secondary target.

It should be noted that it is not expected that the approximately three mile long concrete-lined portion of the Main Branch Rouge River will have the other indigenous aquatic life and warmwater fishery designated uses fully restored regardless of these numeric targets due to impacts in that reach that are nonpollutant based.

DATA DISCUSSION

Recent Rouge River watershed biological assessments have demonstrated a continued impact to the biological communities throughout the drainage. Macroinvertebrate community assessments, although generally rating at the low end of acceptable in the listed Rouge River and Bishop Creek TMDL reaches, continue to produce poor community scores in nonlisted portions of the watershed and throughout the Tonquish Creek listed TMDL reach. Twenty stations were sampled outside the TMDL reaches in 2005, six of which rated poor for macroinvertebrate communities. Fish community monitoring has continued to produce poor scores at all but a few stations during recent monitoring efforts.

Monitoring in 2000 in the Rouge River TMDL reach did not produce any poor ratings for the 14 macroinvertebrate communities assessed (Goodwin, 2002). Four stations sampled for fish communities in the same year in the TMDL reach all scored poor. Two stations sampled in the Bishop Creek TMDL reach for macroinvertebrates both scored poor and no fish monitoring was conducted in this reach. Similarly, one station was sampled in the Tonquish Creek TMDL reach in 2000, rating poor for both macroinvertebrate and fish communities. Twenty-five stations were sampled outside the TMDL reaches in 2000, all of which rated acceptable for macroinvertebrate communities; one also included fish sampling, which was rated poor.

Habitat assessments conducted in 2000 concurrent with the macroinvertebrate and fish communities noted that there were ubiquitous issues in the Rouge River watershed with flashy stream flows and resultant poor in-stream habitat, including increased siltation leading to homogenization of the stream substrate (Goodwin, 2002).

Monitoring in 2005 in the Rouge River TMDL reach found one of 18 stations rating poor for the macroinvertebrate community (Goodwin [in draft], 2007). One station was sampled for fish community, rating acceptable. Four stations were sampled in the Bishop Creek TMDL reach, the two uppermost rating poor for the macroinvertebrate communities with the other two rating acceptable. Five stations were sampled in the Tonquish Creek TMDL reach in 2005, two of which rated poor for macroinvertebrates. The two stations sampled for fish community on Tonquish Creek also rated poor in 2005 (Goodwin [in draft], 2007).

Habitat surveys conducted in 2005 concurrent with the macroinvertebrate and fish monitoring also reflected a widespread lack of in-stream habitat able to be colonized by biota. Siltation/sedimentation and indications of flashy stream flows were also predominant in the watershed.

Data from the Friends of the Rouge (FOTR) volunteer stream monitoring program's spring and fall data from 2001 through 2005 showed twice the number of poor ratings in listed TMDL reaches compared to the rest of the watershed (22 cumulative historic poor ratings in the TMDL reaches versus 12 outside the listed reaches) even though the same time period had a total of approximately 80 cumulative samples within the listed TMDL reaches and 125 cumulative samples outside the TMDL reaches (FOTR, 2005). Similarly, the same data set showed 11 good ratings in the listed TMDL reaches versus 51 outside those reaches. Notably, the FOTR monitoring found consistent poor macroinvertebrate communities over the five years of monitoring at two of three locations on Tonquish Creek (within the listed TMDL reach), and consistent fair/poor communities in the TMDL listed portions of the Lower Branch, Main Branch, and the Upper Branch Rouge River.

Fish community data collected in 1995 during the Department of Natural Resource (DNR), Fisheries Division's Rouge River Assessment (Assessment) was analyzed using the current Procedure 51 scoring criteria to provide additional fisheries information. Of the 13 stations in the TMDL reaches for which data was provided in the Assessment (Beam and Braunsheidel, 1998), 11 rated poor, and 2 rated acceptable. The DNR conducted an additional analysis of the assessment data using the Index of Biotic Integrity (Karr, 1981) producing similar results to the Procedure 51 scoring/rating criteria; all TMDL reach sites rated either fair (3) or in the poor range (10) using the Index of Biotic Integrity (Leonardi, 1996).

The Assessment provided discussion surrounding the fish communities in the watershed and placed a great deal of focus on the highly altered hydrology and its impacts on the fish community in the watershed. Additionally, the Assessment noted the lack of connectivity in the Rouge River watershed with respect to fish movement, migration, and recolonization potential that has been lost due to the many dams throughout the watershed (Beam and Braunsheidel, 1998).

Background SS data for the Rouge River watershed came from the Rouge River National Wet Weather Demonstration Project (Rouge Project) (Rouge Project, 2006). Watershed-wide data from 1994 to 2001 was taken under both wet and dry weather flow conditions. Average SS concentrations were calculated under both wet and dry conditions for each branch of the Rouge River watershed and for the entire watershed collectively (Table 1). Wet weather data was taken for events that followed a dry period (generally three days minimum) and following a precipitation event that caused the river to respond significantly (generally greater than 0.25 inches) (Hufnagel, 1996).

Table 1. Average SS concentrations in the Rouge River watershed in mg/L SS (Rouge Project, 2006)

Branch	Wet Weather Average SS	Dry Weather Average SS
Upper Rouge	152	30
Middle Rouge	95	19
Lower Rouge	191	37
Main Branch Rouge	114	27
Entire Watershed	138	28

SOURCE ASSESSMENT

The listed reaches for the Rouge River total approximately 106 miles and include the Main, Upper, Middle, Lower, Bell, and Franklin Branches and Evans Ditch (91 miles collectively); Bishop Creek (4 miles), and Tonquish Creek (10 miles), in Wayne and Oakland Counties in southeastern Michigan. The municipalities in the TMDL watershed are divided into Storm Water Management Areas (SWMAs) by the local units of government, as shown in Figure 2. Table 2 shows the land use distribution for the Rouge River watershed by SWMA (Southeast Michigan Council of Governments, 2003). Table 3 shows the land distribution for the Rouge River watershed by community. The entirety of the Rouge River watershed is addressed in this TMDL with the recognition that the listed TMDL reaches are impacted by land use and storm water within, and upstream, from them.

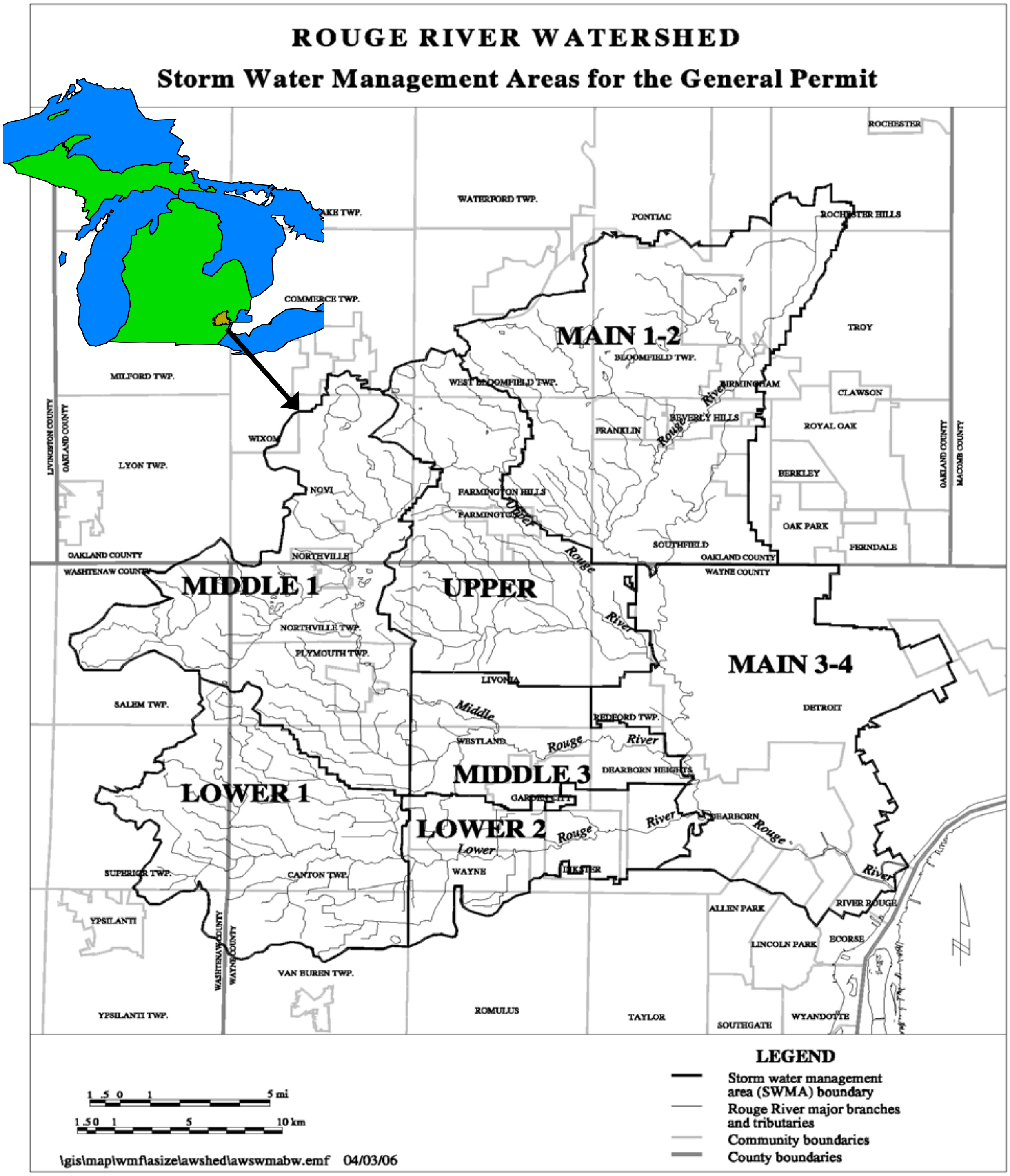

Figure 2. Rouge River Watershed SWMAs.

Table 2. Land Use Distribution for Rouge River Watershed by SWMA, 2000

	Storm Water Management Areas (SWMA) as Percentages of Total Drainage Area							
	MAIN 1-2	MAIN 3-4	UPPER	MIDDLE 1	MIDDLE 3	LOWER 1	LOWER 2	TOTAL
	103	91	64	81	32	62	33	466
Land Use Category	square miles	square miles	square miles	square miles	square miles	square miles	square miles	square miles
Forest/Rural open	5.8%	2.1%	8.5%	19.9%	4.0%	19.5%	4.5%	9.5%
Urban open	5.4%	6.8%	7.3%	5.5%	5.7%	5.5%	6.1%	6.0%
Agricultural	0.2%	0.0%	0.4%	9.4%	0.1%	25.2%	2.2%	5.2%
Medium density residetial	63.4%	52.1%	53.9%	31.8%	50.4%	22.6%	51.7%	47.2%
High density residential	5.2%	4.3%	5.2%	4.1%	4.8%	1.4%	2.7%	4.1%
Commercial	11.5%	15.6%	13.8%	7.1%	14.1%	2.5%	12.7%	10.9%
Industrial	1.5%	13.8%	4.2%	8.9%	12.1%	9.4%	8.6%	7.8%
Highways	2.0%	4.0%	2.6%	2.9%	0.7%	1.8%	1.2%	2.5%
Water/wetlands	4.9%	1.4%	4.2%	10.4%	8.0%	12.1%	10.3%	6.6%
TOTALS (%)	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table 3. Land Distribution for Rouge River Watershed by Community

Community	Area (acres)	Land Distribution (Percent)	Community	Area (acres)	Land Distribution (Percent)
Allen Park	892	0.30%	Northville	1,298	0.43%
Auburn Hills	191	0.06%	Northville Twp.	10,603	3.55%
Beverly Hills	2,382	0.80%	Novi	15,231	5.10%
Bingham Farms	783	0.26%	Oak Park	82	0.03%
Birmingham	1,978	0.66%	Orchard Lake	159	0.05%
Bloomfield Hills	3,219	1.08%	Plymouth	1,410	0.47%
Bloomfield Twp.	16,303	5.46%	Plymouth Twp.	10,251	3.44%
Canton Twp.	23,123	7.75%	Pontiac	450	0.15%
Commerce Twp.	606	0.20%	Redford Twp.	7,215	2.42%
Dearborn	15,659	5.25%	River Rouge	1,370	0.46%
Dearborn Heights	5,301	1.78%	Rochester Hills	1,977	0.66%
Detroit	38,779	12.99%	Romulus	2,458	0.82%
Ecorse	5	0.00%	Salem Twp.	10,339	3.46%
Farmington	1,706	0.57%	Southfield	14,982	5.02%
Farmington Hills	21,311	7.14%	Superior Twp.	10,371	3.48%
Franklin	1,680	0.56%	Troy	3,835	1.29%
Garden City	3,752	1.26%	Van Buren Twp.	8,421	2.82%
Highland Park	902	0.30%	Walled Lake	585	0.20%
Inkster	3,696	1.24%	Wayne	3,829	1.28%
Lathrup Village	963	0.32%	West Bloomfield Twp.	11,081	3.71%
Livonia	22,952	7.69%	Westland	12,457	4.17%
Lyon Twp.	468	0.16%	Wixom	548	0.18%
Melvindale	1,726	0.58%	Ypsilanti Twp.	1,097	0.37%

These TMDL reaches are focused in Wayne and Oakland Counties, which are largely urbanized. Possible sources of SS include storm water runoff, natural background conditions (this is primarily a lake plain system flowing through sedimentary, fine particled soils), and in-stream sources (erosion) exacerbated by significantly increased flashiness.

The Michigan Department of Environmental Quality (MDEQ), Water Bureau's National Pollutant Discharge Elimination System (NPDES) permit management system found the following permitted discharges in the Rouge River watershed (Appendix A): 13 individual industrial permits, 6 individual municipal permits, 12 individual combined sewer overflow (CSO) permits, 10 gas/petroleum cleanup wastewater certificates of coverage (COC) under general permit MIG080000, 2 hydrostatic pressure test water COCs under general permit MIG670000, 5 noncontact cooling water COCs under general permit MIG250000, 221 industrial storm water COCs under general permits MIS210000, MIS220000 and MIS319000, 2 municipal storm water COCs under general permit MIS710000, 68 Municipal Separate Storm Sewer System Phase II (MS4) COCs under the MS4 general permit (numbers MIG610000 and MIS04000), and 1 individual MS4 permit (Michigan Department of Transportation) (NMS, 2007).

Additionally, at the time of this TMDL preparation there were approximately 1217 active or pending notices of coverage (NOC) under Permit-by-Rule issued by the MDEQ in the Rouge River watershed. Construction activities of five acres or more, with a point source discharge to surface waters of the state are required to obtain a Soil Erosion and Sedimentation Control (SESC) Permit and submit an NOC for coverage under the Permit-by-Rule. However, submittal of the NOC is not required for regulated construction activities that disturb one to five acres. These sites have automatic coverage under Permit-by-Rule if they have obtained coverage under the SESC Program. The SS loads from these NOCs are assumed to be accounted for in the land use-based load calculations addressed below (see Table 4 and Appendix B for additional information).

Estimation of the annual SS loads in the Rouge River watershed from the various land use categories involved using the estimated acreage of each land use category (Southeast Michigan Council of Governments, 2003), a mean annual rainfall estimate of 33 inches, and the USEPA's Simple Method model approach (USEPA, 2001). Simple Method is an empirical approach for estimating pollutant loadings, using the following equation:

$$L_P = \Sigma_u(P*P_J*R_{VU}*C_U*A_U*2.7/12)$$

Where:

L_P = Pollutant load, lbs.
u = Land use type
P = Precipitation, inches/year
P_J = Ratio of storms producing runoff (default = 0.9)
R_{VU} = Runoff Coefficient for land use type u, $inches_{run}/inches_{rain}$, = 0.05 + (0.9 *$I_U$)
I_U = Percent Imperviousness
C_U = Event Mean Concentration for land use type u, mg/L
A_U = Area of land use type u, acres

Suspended Solids event mean concentrations for each land use category were developed for the Rouge River watershed (Cave et al., 1994). The pollutant load for each land use type was divided by 365 days to obtain a pollutant load per day. This same process was used to determine the target SS loading by appling the 80 mg/L target to those land use categories with Event Mean Concentrations over 80 mg/L (Appendix B).

The estimated total current annual SS load from all sources in the Rouge River watershed is 69,701,172 pounds (Table 4). The annual load represents a summation of NPDES-permitted point source and storm water SS loads (67,611,967 pounds) and the nonpoint source land use category (2,089,205 pounds) (Table 4). The use of annual load estimates for SS helps to identify the most probable sources and their relative contribution to the SS loads to the Rouge River watershed and allows for understanding changes between existing and targeted loading when the recommended annual average 80 mg/L SS target is applied.

Table 4. Land use categories and estimated current SS loads (pounds/year) and target SS load reductions in the Rouge River watershed, Washtenaw, Wayne, and Oakland Counties, Michigan.

Source Category	Acres	Current SS Estimate lb/yr (lb/day)	Target SS Load* lb/yr (lb/day)
WLA Components			
NPDES Non-storm water load **	NA	6,621,299	6,621,299
Urban/Industrial/Built-up Land (covered under multiple storm water permits)			
Residential (Medium Density)	140,769	25,924,906	25,924,906
Residential (High Density)	12,228	4,052,015	3,341,868 (17.5% reduction)
Transportation (MDOT)	7,456	3,718,448	2,109,758 (43.3% reduction)
Commercial	32,508	9,307,152	9,307,152
Urban Open	17,894	912,620	912,620
Industrial	23,263	17,075,527	9,168,068 (46.3% reduction)
WLA Total	**234,118**	**67,611,967 (185,238 lb/d)**	**57,385,671 (15% reduction) (157,221 lb/d)**
LA Components			
Agricultural Land	15,508	1,026,263	566,214 (44.8% reduction)
Forested/Rural Open Land	28,333	659,474	659,474
Water/Wetlands	19,684	403,467	403,467
LA Total	**63,525**	**2,089,205 (5,724 lb/d)**	**1,629,155 (22% reduction) (4,463 lb/d)**
Overall Total	**297,643**	**69,701,172 (190,962 lb/d)**	**59,014,827 (15.3% reduction) (161,684 lb/d)**

*The basis for proposed reductions is discussed in the Loading Capacity Development - WLAs section, Page 14. See Appendix B for more detailed information.
**See Appendix A for NPDES non-storm water permits from which the load was derived.

LINKAGE ANALYSIS

The stream flow conditions throughout much of the Rouge River watershed are highly variable. Altered hydrology has long been identified as the basis in the Rouge River watershed for channel scouring, siltation, and degraded in-stream habitat. Oemke and Stroh (1993) provided a synopsis of earlier MDEQ water quality studies in the watershed, all pointing toward a combination of highly variable flows and poor storm water quality (based largely on CSO discharges) that was leading to the poor biological communities throughout the watershed. More recent studies conducted in 2000 and 2005 resulted in habitat information suggesting that stream flashiness and extreme flows result in a loss of in-stream habitat from siltation, scouring, and bank erosion thereby homogenizing and greatly reducing colonizeable habitat for fish and macroinvertebrates (Goodwin, 2002; Goodwin [in draft], 2007).

Ecological targets investigated by Wiley et al. (1998) focus the rehabilitation of fish communities in the Rouge River watershed around issues largely related to flow and connectivity. Amelioration of the low base flows and elevated storm flows that are a result of urbanization are estimated to be necessary for fisheries rehabilitation in the watershed (Wiley et al., 1998).

An analysis of the flashiness of streams around Michigan using the recently developed Richards-Baker Flashiness Index (RB-index) (Baker et al., 2004) resulted in the estimation that 5 of 6 stations for which data were available in the Rouge River watershed showed increasing stream flashiness over the period of record of 40 to 70 years (Fongers et al., [*in draft*], 2007). The Rouge River stations were almost all in the highest quartile of the flashiness index for

Michigan Rivers, similar to many other lake plain drainages analyzed in the state (Fongers et al. [*in draft*], 2007), illustrating the expression of the common geology and often similar land use patterns associated within these areas. The RB-index provides a useful tool for tracking stream flashiness over time with no additional data collection, provided that river gauges are maintained.

The Assessment (Beam and Braunsheidel, 1998) notes the importance of the headwater areas of the watershed in the persistence and protection of fish communities. Relative to the rest of the watershed, these areas continue to exhibit more stable flow regimes and have undergone a lesser degree of degradation from human development and therefore retain a semblance of the original conditions in the Rouge River.

Many portions of the main branches of the Rouge River have been protected by park land and other green space. The maintenance of good riparian protection, thereby continuing to provide shading, connections to the floodplain for attenuation of high flows, and large woody debris supply is an important aspect to the continued and increasing protection of the Rouge River watershed. Projects involving impacts to the riparian corridor and stream channel should be mindful of the impacts on the biota and efforts should be taken to maintain the protection of the riparian corridor and enhance in-stream cover for the rehabilitation and maintenance of fish and macroinvertebrate communities.

The Assessment noted a lack of cover for fish and invertebrates during normal stream flows due to frequent and increased flood flows (Beam and Braunsheidel, 1998). This view is echoed by Leonardi (1996) following his assessment of the fish community in the Rouge River citing the greatly impacted flow regime and its erosive effects including “reduced bank stability, U-shaped channelization, increased sedimentation, and high turbidity” as influential in biological degradation in the Rouge River.

Habitat surveys conducted by the MDEQ as part of the assessments in the Rouge River watershed consistently point to diminished in-stream habitat as a ubiquitous feature of the drainage except in some remaining, less impacted, headwater areas (e.g., Johnson Creek) (Goodwin, 2002). The immediate riparian protection throughout much of the watershed is in reasonably good shape thereby continuing to provide functions like shading, woody debris (critical for fish and macroinvertebrate habitat in many systems), organic material input such as leaves (thus forming a base for the macroinvertebrate food web), and some level of streambank protection against the highly erosive flashy storm flows. This relatively intact riparian corridor was noted by Wiley et al., (1998) as one of the key aspects of the watershed that needed to be maintained for thermal protection of the Rouge River for fish communities.

The SS data from the Rouge Project (see Data Discussion section) demonstrate that the majority of loading occurs during wet weather events. Besides the physical scouring force of storm flows, the SS impacts the fish and macroinvertebrate communities in a myriad of ways, from physical abrasion to elimination of feeding and spawning habitats. For a complete summary of the many ways that SS may impact aquatic communities see Waters (1995). In summary, reducing SS loads in the Rouge River watershed, along with the commensurate decrease in flow volume and rate, should increase macroinvertebrate and fish community diversity and abundance, thus providing a tangible target towards meeting WQS.

LOADING CAPACITY (LC) DEVELOPMENT

Concurrent with the selection of numeric targets, development of the LC requires identification of the critical conditions. The “critical condition” is the set of environmental conditions (e.g., flow) used in developing the TMDL that result in attaining WQS and with an acceptably low frequency of occurrence that, if protected for, should also be protective of other more frequent occurrences. The critical conditions for the applicability of WQS in Michigan are given in

Rule 90 (R 323.1090), Applicability of WQS. R 323.1090 requires that the WQS apply at all flows equal to or exceeding the water body design flow, generally the lowest of the 12 monthly 95 percent exceedance flows (the stream flow equal to or exceeded 95 percent of the time), thus the critical condition for biological communities is under low flows. However, the habitat degradation and poor biological communities in the Rouge River watershed are linked to the excessive flows attributable to wet weather driven discharges. Because the numeric target of 80 mg/L SS is aimed at wet weather discharge conditions, and because elevated SS concentrations are most typically associated with wet weather flows in the Rouge River watershed, the critical condition for the SS target is wet weather/high flows; it is expected that this target concentration will be met under lower flow conditions as well.

LC

The LC is the sum of individual WLAs for point sources and 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. The overall LC is subsequently allocated into WLAs for point sources, LAs for nonpoint sources, and the MOS. The proposed total annual SS load capacity in the Rouge River watershed (WLA + LA + MOS) is 59,014,827 pounds/year.

WLAs

The estimated total annual SS load from the seasonal, non-storm water NPDES permitted point sources is 6,621,299 pounds (Tables 4 and 5). This load was estimated by multiplying the facility design flows by the monthly average SS concentration effluent limits or by using the monthly average loading limit as defined in the permits associated with the facilities, then summing daily loads over a year. For facilities without SS data or limits, a maximum monthly average discharge concentration of 30 mg/L was assumed to be worst-case-scenario, based on the limits imposed on other Rouge River watershed facilities (Table 5).

Based on the acres of land use categories and SS loading factors derived from the Rouge Project (Cave et al., 1994), a current total loads estimate of approximately 60,990,668 pounds/year is attributable to NPDES permitted storm water discharges to the Rouge River watershed (Appendix B). Approximately half of the categories listed are predicted to be meeting the 80 mg/L target, with the exception of the industrial, transportation, and high density residential land uses. To achieve the goal of 80 mg/L as an annual average during wet weather runoff events from all point sources, a reduction of 17.5 percent (710,147 pounds/year) from high density residential, 43.3 percent (1,608,690 pounds/year) from transportation, and a 46.3 percent reduction (7,907,459 pounds/year) from industrial sources will result in a projected annual WLA target load of 57,385,671 pounds of SS, a 15 percent reduction in loads from regulated point sources (Table 4 and Appendix B).

Table 5. Detailed NPDES non-storm water SS load estimations.

Name	Permit	Daily Load (Lbs./day)	Annual Load (Lbs./year)
YCUA Regional WWTP	**MI0042676**	**767.3**	**280057**
Carmeuse Lime-River Rouge	**MI0057126**	**117.6**	**42922**
Dearborn CSO Const Dewatering	**MI0057738**	**36.0**	**13151**
Dearborn CSO Const Dewater 2	**MI0057886**	**36.0**	**13151**
Triton Petroleum-Detroit	**MI0058068**	**1.1**	**411**
Buckeye Terminals-Detroit	**MIG670079**	**525.4**	**191778**
BP Products NA Inc-River Rouge	**MIG670081**	**250.2**	**91323**
Oakland Co Walled Lk/Novi WWTP	**MI0024287**	**712.6**	**260100**
Onyx Arbor Hills LF	**MI0045713**	**21.6**	**7901**
Salem Twp WWTP	**MI0054798**	**14.5**	**5286**
Commerce Twp WWTP	**MI0025071**	**1400.0**	**511000**
St Marys Cement Co	**MI0004243**	**62.3**	**22746.5**
Severstal North America Inc	**MI0043524**	**9223.6**	**3366614**
Double Eagle Steel Coating Co	**MI0044415**	**418.5**	**152753**
Dearborn Ind Generation Plt	**MI0056235**	**280.0**	**102200**
Ford-Wayne Assembly Plt	**MI0046183**	**0.3**	**91**
Steel Technologies Inc	**MIG250070**	**55.0**	**20091**
Buckeye Pipeline-Plymouth	**MIG080782**	**5.0**	**1826**
Falcon Center GWCU	**MIG081027**	**6.8**	**2466**
Diversified Fuels-Northville	**MIG081077**	**12.6**	**4603**
Detroit Diesel Corp	**MIG250058**	**35.8**	**13059**
Rock Tool & Machine-Plymouth	**MIG250484**	**9.0**	**3288**
Diversified Fuels - Livonia	**MIG081086**	**12.6**	**4603**
Robert Bosch Corp	**MIG250066**	**450.4**	**164381**
Norfolk Southern RR-Detroit	**MIG081017**	**31.3**	**11415**
Sunoco-River Rouge Term	**MIG081067**	**3.6**	**1315**
Michigan Fuels Inc	**MIG081075**	**23.5**	**8584**
Ford-Rouge Mfg Complex	**MIG250460**	**3377.7**	**1232861**
BP Products NA Inc-River Rouge	**MIG080778**	**250.2**	**91323**
	TOTAL	**18,141**	**6,621,299**

LAs

The LA component of the TMDL defines the fraction of the LC for SS from nonpoint sources including the following land use categories: agricultural, forested/rural open land, and water (Table 4). An estimated annual SS load of 2,089,205 pounds is attributed to these categories in the Rouge River watershed. All but the agricultural land uses are treated as background loading sources because the modeled runoff concentrations of SS are typically less than the 80 mg/L numeric target. The only targeted source load reduction is from the agricultural land use, which has an estimated average runoff SS concentration of 145 mg/L (Cave et al., 1994; Appendix B). A 45 percent annual reduction (from 1,026,263 to 566,214 pounds) from agricultural areas in the watershed is recommended resulting in an LA SS target of 1,629,155 pounds based on achieving a mean annual runoff concentration of 80 mg/L SS during wet weather events.

MOS

The MOS in a TMDL is used, in part, to account for variability in source inputs to the system and is either implicit or explicit. A MOS is implicit in a biota TMDL because the quality of the biological community, its integrity, and overall composition represent an integration of the effects of spatial and temporal variability in sediment loads to the aquatic environment. Ultimately it is the reflection by the biological community, signified by an acceptable or higher rating using Procedure 51, which is the goal of this TMDL thereby providing a MOS for the numeric SS goal. Follow-up biological and habitat quality assessments will be conducted to determine the progress in attaining the TMDL goals and will reflect this integration. Additionally, the goal of 80 mg/L SS for a mean annual runoff concentration integrates a MOS because it is based on literature values from longer-term exposure concentrations versus the event-driven target used herein.

In summary, the proposed total annual SS load target in the Rouge River watershed (WLA + LA + MOS) is 59,014,827 pounds/year, an overall 15.3 percent reduction from existing estimated loads. The sources of SS to the Rouge River watershed include 11.2 percent (6,621,299 pounds/year) allocated to individual and general non-storm water NPDES permitted sources (WLA), 86 percent (50,764,373 pounds/year) allocated to the NPDES permitted storm water sources (WLA), and 2.8 percent (1,629,155 pounds/year) is attributed to the LA.

To achieve the secondary numeric TMDL target of 80 mg/L mean annual SS concentration during wet weather events, and thereby address the primary target of biological communities increasing in quality, a reduction in the wet weather runoff of SS is necessary. It is likely that steps will need to be taken to control runoff rates and volumes during precipitation events. It may be necessary to require employing BMPs to attenuate the runoff delivery rates and volume to reduce flashiness, SS resuspension, and excessive siltation/sedimentation that impact habitat quality, and therefore biological integrity, throughout the Rouge River watershed.

SEASONALITY

Seasonality is addressed in this TMDL through specified sampling periods for fish and macroinvertebrate communities. To minimize temporal variability in the biological community, sampling will be conducted between June and September during stable, low flow conditions, following Procedure 51. These summer conditions are particularly critical because dilution of pollutants is minimal and stream temperatures are elevated, which may affect dissolved oxygen fluctuations and increase metabolic rates of the biota, providing additional stress on these in-stream organisms. Support of the designated uses using these biological indicators further addresses seasonality by their presence in the aquatic environment over their entire (or large portions of) life cycles, thereby being reflective of seasonal shifts in condition of the water body.

For assessing SS loading to the Rouge River watershed, seasonal event monitoring will be conducted, if necessary, once source control measures are in place to better define and characterize SS loading and the associated hydrologic pattern that influences the biota in the TMDL reaches.

MONITORING

Monitoring will be conducted by the MDEQ to assess progress toward meeting the biota TMDL target following implementation of applicable BMPs and control measures. Follow-up biological assessments will be conducted from June through September and under stable, low flow conditions, following Procedure 51. Additionally, the Rouge River watershed will continue to be monitored on a five-year rotating basis, regardless of TMDL activity, and the information from those surveys will be available to assess the condition of the biological communities as well.

In-stream monitoring of SS concentrations may be conducted by the MDEQ, if necessary and as resources allow, to augment ongoing monitoring efforts by the Rouge Project. This type of information, from appropriate sources, will be used in determining whether the secondary SS target is met.

REASONABLE ASSURANCE ACTIVITIES

The Rouge River has suffered from typical urban watershed stressors including CSOs, Sanitary Sewer Overflows, nonpoint sources, and industrial discharges, all of which influence the water quality and natural flow regime. The restoration of the Rouge River began by focusing on the primary public health pollutant threat, CSOs. At the start of the project in 1992, 168 CSOs were identified, with a tributary service area of approximately 59,300 acres (approximately 20 percent of the watershed). The CSO control program, while at the heart of the Rouge Project, is only one element of the overall Rouge River restoration effort. The impressive improvements in water quality and recreational use in the Rouge River can also be attributed to the multitude of other Rouge Project programs including illicit connection elimination, storm water management activities, and developing better public, industry, and community awareness of pollution control and prevention. These programs and others are all part of the watershed approach being successfully implemented in the Rouge River watershed.

Industrial Storm Water

Federal regulations require certain industries to apply for an NPDES permit if storm water associated with industrial activity at the facility discharges into a separate storm sewer system or directly into a surface water. A storm water permit is not required if storm water does not discharge from the facility or is discharged into a sewer system that leads to a Wastewater Treatment Plant.

The state of Michigan began issuing industrial storm water permits in 1994. There are three types of permits available in Michigan: a generic baseline general permit, a generic general permit with monitoring requirements, or a site-specific individual permit. There are approximately 4,000 facilities statewide with storm water discharge authorization, with approximately 265 within the Rouge River watershed. Michigan's storm water permit authorization requires facilities to obtain a certified operator who will have supervision and control over the control structures at the facility, eliminate any unauthorized non-storm water discharges, and develop and implement a storm water pollution prevention plan for their facility that includes structural and nonstructural control measures. Prior to obtaining permit coverage, applicants must certify that they do not have any unauthorized discharges. Additionally, general permits MIS210000 and MIS220000 contain requirements specific to TMDLs stating the need for the “identification of actions to limit the discharge of significant materials in order to comply with TMDL requirements.”

Municipal Storm Water

The USEPA, MDEQ, and most water resources professionals advocate holistic and adaptive watershed management approaches to the protection and restoration of aquatic ecosystems by encouraging pollution control strategies that are developed through collaborative partnerships within a hydrologic boundary. Michigan was one of the first states to embrace and help develop the concept of watershed-based general storm water permitting.

In 1997, as part of the Rouge Project, stakeholders in southeastern Michigan worked with the MDEQ to develop a voluntary watershed-based general permit for storm water discharges. The permit was originally voluntary because there was no legal requirement for the storm sewer operators in the Rouge River watershed to have a permit. Now a regulatory requirement, the MDEQ offers a watershed-based general permit as one of two options for compliance with the NPDES Phase I and II storm water regulations (MDEQ, 2007). The other option is a jurisdictional permit.

Within the Rouge River watershed, 67 local municipalities have obtained Phase II MS4 permit coverage. The municipalities include counties, cities, villages, townships, school districts, colleges and universities, airport authorities, and the Michigan Department of Transportation. The majority of these municipalities have had permit coverage since 1997 (voluntary permit between 1997 and mid-2003; required permit from 2003 to present). A number of additional school districts are currently in the process of obtaining MS4 permit coverage.

A requirement of the MS4 watershed permit is the development of Watershed Management Plans which, in part, define the long-term watershed goals including the protection of designated uses and the identification of priority problems and opportunities in the watershed, including determination of the actions needed to attain compliance with any established TMDL. The Watershed Management Plan should address concerns related to TMDLs in the watershed and detail actions specific to storm water controls. Additionally, the MS4 watershed permit states that "an emphasis of the Watershed Management Plan shall be to mitigate the undesirable impacts caused by wet weather discharges," such as discussed in this TMDL's Linkage Analysis section. It is anticipated that this document will assist in guiding portions of the various Watershed Management Plans in the Rouge River watershed.

In the Rouge River watershed, 49 individual municipal entities and 3 counties selected the watershed-based general storm water permit. Additionally, in August 2003, the communities and counties in the Rouge River watershed formed the Rouge River Watershed Local Management Assembly (Assembly of Rouge Communities) to continue the restoration of the Rouge River watershed into the future.

In 2004, the Assembly of Rouge Communities supported the passage of state legislation to authorize local governments to form watershed alliances; this was subsequently signed into law as Act No. 517, Public Acts of 2004, "Watershed Alliance Act." In November 2005, the Assembly of Rouge Communities became the public entity "Alliance of Rouge Communities" when 20 eligible members approved bylaws (modeled after the former Memorandum of Agreement for operation of the Assembly) developed under the Watershed Alliance Act. As of April 30, 2006, there were 41 Alliance of Rouge Communities members that had approved the bylaws. The Alliance of Rouge Communities collaborates on storm water management planning and permitting commitments to develop integrated plans that take advantage of economies of scale and produce more cost-effective solutions. Each member contributes financial support for storm water management compliance activities such as public involvement and education, water quality monitoring, and illicit discharge elimination programs. For more information about the Alliance of Rouge Communities, see the Web site http://www.rougeriver.com/alliance/.

The Rouge River watershed is approximately 466 square miles and includes all or parts of 47 communities and 3 counties. To manage this large area more effectively under the MS4 watershed permit, local units of government decided to divide the Rouge River watershed into seven subwatersheds (SWMAs) based on the four main branches of the Rouge River; the Main Branch, the Upper Branch, the Middle Branch, and the Lower Branch, and certain political jurisdictions.

Long-term watershed management plans have been developed for all seven SWMAs, and implementation of BMPs and other pollution prevention activities have been underway under these plans since 2001. All seven watershed management plans include at least one goal that addresses the protection of the warmwater fishery and other indigenous aquatic life and wildlife designated use, including:

- Minimization of soil erosion and sedimentation.
- Improvement and maintenance of habitat for fish and wildlife.
- Minimizing flow variability.

Permits-by-Rule

Construction activities covered under a Permit-by-Rule have SESC explicitly built into the process, thereby addressing SS loadings from wet weather runoff. Under this permit the site must have an SESC permit or plan, properly maintained and operated soil erosion control measures, and the owner or easement holder is required to provide for weekly inspections of the SESC practices identified in their SESC permit. In addition, the site should be inspected after major rain events that cause a discharge from the site. These inspections should be conducted by a storm water operator who is trained and certified by the MDEQ (MDEQ, 2007). Additionally, it is assumed that the SS loading factors developed for the Rouge River watershed (Cave et al., 1994) and used in the Simple Method calculations account for these types of construction activities and so can be considered reflective of these conditions.

Public Education and Involvement

Under the MS4 permits, municipalities are required to develop a public education plan for the purpose of encouraging the public to reduce the discharge of pollutants in storm water to the maximum extent practicable. Many Rouge municipalities have established comprehensive programs to achieve this goal and fulfill the permit requirement in a variety of ways; some of which are summarized below. The following discussion is not meant to be all-inclusive, but representative of the types of activities occurring throughout the watershed. For additional information on the activities identified below as well as other activities, see the Rouge River watershed Web site at www.rougeriver.com, or the individual annual reports submitted to the MDEQ by the permittees.

1998-2006 Public Education and Involvement

Municipalities have undertaken efforts to educate the public about water quality using various types of media. Water quality and/or riparian protection brochures were distributed to new residents in many communities, including Northville and Bloomfield Townships. Communities within the Main 1-2 SWMA periodically publish a newsletter called, *Waterside Living*, and distribute it to riparian landowners throughout the watershed. Several communities undertake outreach efforts to educate homeowner’s associations about water quality. For example, the Washtenaw County Drain Commissioner's, "Homeowner's Association Handbook, A Guide to Water Quality Protection for Homeowner Associations and Households," was distributed to Rouge watershed townships as a water quality education tool for homeowner associations. The city of Westland had several posters designed and displayed in city buildings and shopping malls to educate the public about the Rouge River. The city of Westland also mailed a brochure to all homeowners and commercial and industrial establishments and sent out 60,000 messages with water bills in 1998.

The Southeast Michigan Partners for Clean Water was formed to protect and improve the quality of the water resources through a coordinated and consistent storm water management effort. The Southeast Michigan Partners for Clean Water includes representatives from counties, municipalities, watershed councils, the private sector, and water quality professionals in southeast Michigan. The partners promote keeping pollutants out of storm drains, among other topics, using numerous materials that have been developed as part of their Regional 7 Simple Steps to Clean Water Campaign.

Many municipalities also use cable and radio public service announcements to educate the public about water quality. The Oakland County Drain Commission, for example, has been airing cable shows for three years that provide tips on how to improve water quality and protect the environment.

The Van Buren Township Environmental Department, as well as many other communities, use their municipal Web sites, newsletters, and/or community newspapers to further education on environmental issues. Additionally, the Rouge Project Web site was developed with the intent of being a primary tool for information dissemination about watershed activities and to increase storm water education.

Among the several videos produced for watershed education, the Rouge River Public Involvement Team developed a ten-minute video called, “Reclaiming the Rouge: A Partnership in Restoration and Preservation.” This video was produced by the Rouge Project to describe the Rouge River National Wet Weather Demonstration Project and to highlight the many successes throughout the watershed. Featured projects included educational projects in Salem Township, downspout disconnection in Livonia, stream bank restoration in Dearborn, the construction of CSO Retention and Treatment Basins in Oakland and Wayne Counties, activities of the FOTR, and many other projects and programs. A 15-minute public education video, “Storm Sewers Are Not Garbage Cans,” was also developed by Farmington Hills that covers how the actions of homeowners can impact the river. Guidelines for car washing, environmentally friendly lawn and garden care, preservation of streamside buffers, proper hazardous waste disposal, and other homeowner activities that can affect the river are reviewed in the video. Two copies were distributed to each upper subwatershed advisory group member with the intent that it would be shown on local cable television channels, distributed for public viewing through area libraries, and presented at meetings of local service clubs and neighborhood associations.

Most municipalities also display and distribute educational information within municipal buildings and at municipal events. The Wayne County Department of Environment, for example, distributed approximately 65,000 pieces of public information material relating to water pollution issues at community events or festivals, staff training sessions, workshops, leadership presentations, departmental presentations, or office display racks.

A number of festivals are held annually within the watershed. The Rouge River Water Festival is held annually for fifth grade students, where students visit exhibits and sessions related to water quality, native plants, composting, the water cycle, wetlands, and stream bank erosion. The Wayne County Festival, hosted annually at the University of Michigan-Dearborn, hosted 3,600 fifth grade students from 66 elementary schools in 12 Rouge River watershed communities and 3 downriver communities in 2005. The Oakland County Festival, hosted annually at Cranbrook Institute of Science, hosted approximately 1,300 students in 2005. An annual festival is also hosted in the Johnson Creek subwatershed by Northville Township and the Johnson Creek Protection Group. In 2005, native plantings were demonstrated during Johnson Creek Day.

Rouge Rescue, an annual river cleanup day, is hosted on the first Saturday in June by FOTR, a nonprofit organization that has been dedicated to promoting restoration and stewardship of the Rouge River through education and citizen involvement since 1986. FOTR programs also include volunteer watershed-wide monitoring (volunteers conduct frog and toad surveys twice per month at several hundred quarter sections in watershed); volunteer macroinvertebrate surveys three times per year at approximately 30 sites watershed-wide; information and outreach workshops; and restoration projects. FOTR also coordinates the Rouge Education Project, a program that promotes awareness and stewardship of the Rouge River watershed through school-based water quality monitoring, investigation, and problem solving. Schools collect and analyze river data and encourage taking action to improve the health of the Rouge River watershed based on their findings.

FOTR also coordinated a watershed-wide storm drain marking program (individual communities have subsequently taken over program management) that, through 2006, has enabled the marking of thousands of storm drains. In 2004, for example, more than 280 volunteers, organized by FOTR, marked a total of 2,250 storm drains in 8 communities during 22 projects. Storm drain marking, in part, helps to educate the public about the connection between these drains and nearby lakes and streams. To further increase awareness about the Rouge watershed and water quality, a large number of road signs have been installed at entry points into the watershed and at river crossings throughout the watershed.

Another example of a Rouge watershed education and monitoring effort is the one that was initiated with lake association groups in Bloomfield Township. The Forest Lake Outlet Watershed, a group of riparian landowners from multiple lake areas, in conjunction with Bloomfield Township, developed management strategies and set long- and short-term goals in an effort to improve water quality. The Forest Lake Outlet Watershed group also conducts water quality testing on several open water bodies.

Several environmental incentive programs have also been developed. The RiverSafe Homes program, for example, is under development by the Washtenaw County Drain Commissioner's Office to provide homeowners the opportunity to self assess their water quality protection practices and be awarded a "RiverSafe Home" plaque for display. A Rouge Friendly Business program was also developed and implemented within the watershed.

A number of surveys have been conducted to gauge public knowledge of storm water issues. Results from a public involvement survey of 1999 showed that public involvement techniques being used in the watershed were working. Almost half of the respondents indicated that they knew of the Rouge River project, a majority said that they were changing their practices on lawn fertilizing, and a majority felt that continuing actions by government would be needed to sustain the restoration. Future surveys will gauge the effectiveness of current education efforts. A 2004 survey was also conducted by the Southeast Michigan Council of Governments of 3,720 households within southeast Michigan concerning their knowledge of sources of pollution, watershed awareness, and other similar topics.

Other Projects

Reasonable assurance activities that are not included in the above categories are discussed in this subsection. The following discussion is not meant to be all inclusive, but representative of the types of activities occurring throughout the watershed. For additional information on the activities identified below as well as other activities, see the Rouge River watershed Web site at www.rougeriver.com or the individual annual reports submitted to the MDEQ by the permittees.

1998-2006 Other Projects

Wayne County established a grant program to support activities by communities and agencies that obtained MS4 permits in the Rouge. This program allocated several million federal dollars to the seven subwatersheds for illicit discharge elimination, public education, and subwatershed management plans.

Additionally, a number of projects have been implemented within the Rouge watershed to improve water quality and provide storm water detention. These projects include:

- Detention pond retrofit projects in Northville Township to provide outlet control, wetland plantings, prairie seeding, and create a wet pond among other tasks.

- Establishment of a regional storm water detention facility in the city of Livonia, constructed to manage storm water and provide significant pollutant removal from a 2,700 acre watershed, which is approximately 65 percent developed.

- Riparian zone improvement in Canton. In April 2001, roughly 150 students, parents, teachers, and friends volunteered their time to plant native trees, flowers, and seeds along the banks of Truesdell Creek; a site on the grounds of Field Elementary School in Canton that is used as an outdoor classroom over the school year.

- Construction of a swale with an underdrain on a gravel road as an alternative to constructing enclosed storm drains in the city of Beverly Hills, thereby providing system storage, storm water attenuation, ground water recharge, and solids and nutrient removal through vegetative linings.

- Construction of rain gardens at Comcast Communications in Plymouth Township. The rain gardens provide benefits such as groundwater recharge, wildlife habitat, chemical filtration of phosphates and nitrates, sediment removal, and reduction of runoff and erosion.

- Retrofitting four detention basins in Canton Township. The designs included a combination of regrading, dredging, wetland plantings, tree and shrub plantings, habitat improvements, and outlet structure modifications. Canton's Public Works Division completed the grading work while community staff and residents installed the plantings during volunteer planting days in the spring.

- Construction of the Fellows Creek Naturalization and Flow Reduction regional storm water wetland. In addition to reducing flashiness, this wetland also filters pollutants in the storm water runoff, thus improving the storm water quality. A walking path was constructed around the perimeter of the wetland with access points to areas of the stream where in-stream habitat is enhanced. Educational signage was installed describing in-stream habitat enhancements, descriptions of fish and macroinvertebrates species that might be observed, wetland features, and other habitat that may exist in the wetland.

- The Wayne County Parks Department and Wayne County Department of Environment Watershed Management Division implemented of a variety of streambank stabilization methods to improve the aesthetics, recreational desirability, and water quality of the Nankin Mill race.

- Van Buren Township constructed a recreational and interpretive area within a historically important wooded wetland complex. The township also worked with Visteon Corporation to design and construct a wetland fringe for an existing 36-acre (former gravel pit) lake. This project was completed in order to protect water quality, mitigate the impact of storm water pollutants on the lake, and provide fish and wildlife habitat for the lake.

- Oakland County Parks and Recreation grounds maintenance staff at the Glen Oaks Park have maintained and expanded vegetative buffers and planted shade trees along the stream to enhance riparian habitat and provide thermal protection for the stream.

Several municipalities within the Rouge watershed have adopted storm water ordinances. These municipalities include:

- *Wayne County*. The Wayne County Commission adopted the Wayne County Storm Water Management Ordinance and Administrative Rules in October 2000. These documents, along with the Wayne County Storm Water Standards Manual, are now being fully implemented to address storm water issues in the county. The ordinance requires that storm water management measures be incorporated into new development or redevelopment projects including peak runoff rate restrictions, buffer strips, and first flush treatment, among others.

- *Washtenaw County.* Washtenaw County established storm water design rules in May 2000. In addition, Washtenaw County has developed model ordinances for local units of government for regulating storm water, natural features, storm water system use (what can be discharged to a storm sewer), and reduction of phosphorus from new developments.

- The c*ity of Novi.* The city of Novi adopted a storm water ordinance that not only manages increased storm water runoff from new developments, but also addresses the water quality aspect of storm water runoff.

Inventory projects have been undertaken in several portions of the Rouge watershed including:

- *The Lower 1 SWMA*. Assessment of 125 wetlands in the six communities of the Lower 1 SWMA was completed. Communities were provided with maps, reports, and digital information so that the analysis of the project as well as recommendations for protecting wetland functions could be accessed as needed.

- *The Main 1-2 SWMA*. The Oakland County Drain Commission completed an inventory of detention ponds in the Main 1-2 SWMA, and made recommendations for improvements to the existing detention facilities to increase their pollutant removal efficiency.

- *The Main 1-2 SWMA*. The Oakland County Drain Commission performed a streambank inventory of the Rouge River and its tributaries in the area of the Main 1-2 SWMA, including open county drains. The inventory sites were located using a global positioning system, photographed, and surveyed to include the following parameters: condition of the bank, apparent cause of erosion, amount of erosion, slope ratio, river conditions, and soil texture.

- *Northville Township*. Northville Township inspected all privately owned detention basins in 2003 and required maintenance to be performed, as needed.

- *Westland, Livonia, and Bloomfield Township*. These communities have also completed detention basin inventory projects.

Future Projects

Grants were recently awarded by the MDEQ to the FOTR for continued support of the FOTR program including monitoring and educational activities and to support a monitoring program in the Bell Branch.

The United States Army Corps of Engineers is in the process of planning and evaluating the removal of the concrete lining above the normal water mark in the lined portion of the Main Branch Rouge River (Main 3-4) in an effort to reconnect riparian habitats and reestablish linear wetlands and other features.

Prepared by: Kevin Goodwin, Aquatic Biologist
Surface Water Assessment Section
Water Bureau
Michigan Department of Environmental Quality
August 15, 2007

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Appendix A. Permitted outfalls to the Rouge River watershed. Source: MDEQ, Water Bureau's NPDES Permit Management System. *Facilities used in NPDES non-storm water load calculations (see Table 4 and WLA Section)

MAIN BRANCH

Facility	Number	County	Latitude	Longitude	Receiving Water
Individual Permit					
MDOT MS4	MI0057364	Statewide	---	---	---
St Marys Cement Co*	MI0004243	Wayne	42.2833	-83.1367	River Rouge
Detroit WWTP	MI0022802	Wayne	42.2842	-83.1281	---
River Rouge CSO RTB	MI0028819	Wayne	42.2792	-83.1314	River Rouge
Birmingham CSO RTB	MI0025534	Oakland	42.5406	-83.2281	River Rouge
Oakland Co-Acacia Park CSO RTB	MI0037427	Oakland	42.5231	-83.2456	River Rouge
Severstal North America Inc*	MI0043524	Wayne	42.2978	-83.1578	River Rouge
Double Eagle Steel Coating Co*	MI0044415	Wayne	42.3119	-83.1583	River Rouge
Bloomfield Village CSO RTB	MI0048046	Oakland	42.5367	-83.2467	---
Dearborn Ind Generation Plt*	MI0056235	Wayne	42.3053	-83.1528	River Rouge
Carmeuse Lime-River Rouge*	MI0057126	Wayne	42.2792	-83.1292	River Rouge
Dearborn CSO Const Dewatering*	MI0057738	Wayne	42.3064	-83.2156	River Rouge
Dearborn CSO Const Dewater 2*	MI0057886	Wayne	42.3	-83.1997	River Rouge
Triton Petroleum-Detroit*	MI0058068	Wayne	42.2817	-83.1419	River Rouge
General Permit MIG080000	Wastewater from Cleanup of Water Contaminated by Gasoline & Related Petroleum Products				
BP Products NA Inc-River Rouge*	MIG080778	Wayne	42.2767	-83.1248	---
BP Products NA Inc-River Rouge*	MIG670081	Wayne	42.2767	-83.1248	---
Norfolk Southern RR-Detroit*	MIG081017	Wayne	42.2792	-83.1667	River Rouge
Sunoco-River Rouge Term*	MIG081067	Wayne	42.2954	-83.1539	River Rouge
Michigan Fuels Inc*	MIG081075	Oakland	42.4812	-83.2857	River Rouge
General Permit MIG250000	Non Contact Cooling Water				
Ford-Rouge Mfg Complex*	MIG250460	Wayne	42.3058	-83.1639	River Rouge
General Permit MIG619000	Municipal Separate Storm Sewer System				
Beverly Hills MS4-Oakland	MIG610005	Oakland	42.5253	-83.2642	---
Bingham Farms MS4-Oakland	MIG610006	Oakland	42.5069	-83.2856	---
Lathrup Village MS4-Oakland	MIG610013	Oakland	42.5031	-83.2225	---
Allen Park MS4-Wayne	MIG610020	Wayne	42.2447	-83.2222	---
W Bloomfield Twp MS4-Oakland	MIG610022	Oakland	42.5639	-83.3611	---
Pontiac MS4 - Oakland	MIG610023	Oakland	---	---	---
Bloomfield Twp MS4-Oakland	MIG610026	Oakland	42.5603	-83.2992	---
Southfield MS4-Oakland	MIG610027	Oakland	42.4883	-83.2861	---
Auburn Hills MS4 - Oakland	MIG610031	Oakland	---	---	---
Franklin MS4-Oakland	MIG610041	Oakland	42.5000	-83.3083	---
Oakland County MS4	MIG610042	Oakland	---	---	---
Birmingham MS4-Oakland	MIG610044	Oakland	42.5417	-83.2208	---
Troy MS4-Oakland	MIG610053	Oakland	---	---	---
Rochester PS	MIG610250	Oakland	---	---	---
Orchard Lake MS-Oakland	MIG610270	Oakland	---	---	---
Rochester Hills MS4-Oakland	MIG610283	Oakland	---	---	---
Bloomfield Hills MS4-Oakland	MIG610284	Oakland	---	---	---
Oak Park MS4-Oakland	MIG610285	Oakland	---	---	---
Avondale PS MS4-Oakland	MIG610294	Oakland	---	---	---
General Permit MIS040000	Storm Water Discharges from Municipal Separate Storm Sewer Systems (MS4s) with Controls				
Dearborn PS MS4-Wayne	MIS040012	Wayne	---	---	---
West Bloomfield PS MS4-Oakland	MIS040014	Oakland	---	---	---
Bloomfield Hills PS MS4-Oakland	MIS040048	Oakland	---	---	---
Melvin-N AP PS MS4-Wayne	MIS040052	Wayne	---	---	---
Wayne-Westland PS MS4-Wayne	MIS040060	Wayne	---	---	Rouge River
Detroit MS4-Wayne	MIS040066	Wayne	---	---	Rouge River
Henry Ford Comm Coll MS4-Wayne	MIS040067	Wayne	---	---	Rouge River
Birmingham PS	MIS040072	Oakland	---	---	---
Southfield PS	MIS040074	Oakland	---	---	---

Appendix A (cont). MAIN BRANCH

Facility	Number	County	Latitude	Longitude	Receiving Water
River Rouge	MIS040079	Wayne	---	---	---
General Permit MIS210000	Storm Water Discharges From Industrial Activities				
Arlans Manufacturing	MIS210290	Oakland	42.4442	-83.2781	Rouge River
Wisne Center-Southfield	MIS210293	Oakland	42.4444	-83.2781	Rouge River
Progressive Tool & Industries	MIS210299	Oakland	42.4456	-83.2781	Rouge River
Angelo Iafrate-Southfield	MIS210301	Oakland	42.4442	-83.2311	Rouge River
Waste Mgmt MI-Recycle America	MIS210303	Oakland	42.4442	-83.2386	Rouge River
Great Lakes Waste-Southfield	MIS210314	Oakland	42.4433	-83.2528	Rouge River
Waste Mgt of Mich-Detroit N	MIS210324	Oakland	42.4442	-83.2303	Rouge River
Dearborn Sausage Co	MIS210332	Wayne	42.3042	-83.1472	Rouge River
Levy-Clawson Concrete Plt 12	MIS210352	Oakland	42.4442	-83.2311	Rouge River
Owens Corning-Detroit	MIS210366	Wayne	42.2869	-83.1447	Rouge River
Yellow Freight System-Detroit	MIS210368	Wayne	42.2933	-83.1103	Rouge River
Mich Foundation Co-Wayne Plt 4	MIS210374	Wayne	42.2686	-83.4161	Rouge River
Peterson Spring-Southfield	MIS210391	Oakland	42.4458	-83.2781	Rouge River
USG Corp-River Rouge	MIS210411	Wayne	42.2792	-83.1319	Rouge River
Carmeuse Lime-Detroit	MIS210438	Wayne	42.2958	-83.1511	Rouge River
General Permit MIS210000	Storm Water Discharges From Industrial Activities				
Smart-Inkster	MIS210441	Wayne	42.2847	-83.3358	Rouge River
DHL Express-Southfield	MIS210586	Oakland	42.4478	-83.2531	River Rouge
Crystal Auto Parts-Dearborn	MIS210655	Wayne	42.3189	-83.1642	Rouge River
Ford-Rouge Mfg Complex	MIS210753	Wayne	42.3058	-83.1639	Rouge River
Superior Mtls-Plt 17-Detroit	MIS210782	Wayne	42.3582	-83.097	Rouge River
Detroit Diesel Corporation	MIS210789	Wayne	42.4393	-83.2075	Rouge River
Bernal Inc-Rochester Hills	MIS210812	Oakland	42.6358	-83.1953	Sprague Branch
A Raymond Inc-Rochester Hills	MIS210813	Oakland	42.6414	-83.1942	Sprague Branch
Saturn Electronics Corp	MIS210845	Wayne	42.2226	-83.3249	Rouge River
X-Cel Industries Inc	MIS210857	Oakland	42.4446	-83.2803	Trib to Rouge River
International Wholesale Inc	MIS210880	Oakland	42.4455	-83.2469	Owens Drain
General Permit MIS220000	Storm Water Discharges with Required Monitoring				
Great Lakes Agg-River Rouge	MIS220028	Wayne	42.2661	-83.1286	River Rouge

UPPER BRANCH

Facility	Number	County	Latitude	Longitude	Receiving Water
Individual Permit					
MDOT MS4	MI0057364	Statewide	---	---	---
Commerce Twp WWTP*	MI0025071	Oakland	42.5458	-83.4625	---
Wayne Co/RDFrd/Livonia CSO	MI0051535	Wayne	42.4061	-83.2947	Upper River Rouge
General Permit MIG080000	Wastewater from Cleanup of Water Contaminated by Gasoline & Related Petroleum Products				
Speedway SuperAmerica 2236	MIG081070	Oakland	42.4636	-83.364	---
Diversified Fuels – Livonia*	MIG081086	Wayne	42.3831	-83.3736	River Rouge
General Permit MIG250066	Non contact cooling water				
Robert Bosch Corp*	MIG250066	Oakland	42.4914	-83.4233	---
General Permit MIG619000	Municipal Separate Storm Sewer System				
Farmington MS4-Oakland	MIG610010	Oakland	42.4683	-83.3872	---
Farmington Hills MS4-Oakland	MIG610011	Oakland	42.4828	-83.3919	---
Livonia MS4-Wayne	MIG610015	Wayne	42.3917	-83.35	---
Redford Twp MS4-Wayne	MIG610016	Wayne	42.4028	-83.2953	---
Commerce Twp MS4-Oakland	MIG610033	Oakland	---	---	---
Wayne Co MS4	MIG610040	Wayne	42.4083	-83.2917	---
General Permit MIS040000	Storm Water Discharges from Municipal Separate Storm Sewer Systems (MS4s) with Controls				
Farmingto Hill PS MS4-Oakland	MIS040047	Oakland	---	---	---
Livonia PS MS4-Wayne	MIS040054	Wayne	---	---	---

Appendix A (cont). UPPER BRANCH

Facility	Number	County	Latitude	Longitude	Receiving Water
General Permit MIS210000	Storm water discharges from industrial activities				
Specialty Steel Treating-FHill	MIS210007	Oakland	42.4408	-83.3564	Upper Rouge River
Trend Tool Inc-Livonia	MIS210268	Wayne	42.3728	-83.3664	Shaw Drain
Prince Industries-Livonia	MIS210270	Wayne	42.3728	-83.3689	Shaw Drain
Sure Fit Metal Products	MIS210288	Wayne	42.38	-83.3458	Shaw Drain
Diamond Automation	MIS210294	Oakland	42.4614	-83.4344	Upper River Rouge
Washers Inc-Livonia	MIS210295	Wayne	42.3767	-83.3697	Belle Branch
BASF Corp-Livonia	MIS210296	Wayne	42.3775	-83.4017	Barlow Drain
Corrigan-Farmington Hills	MIS210305	Oakland	42.4639	-83.4286	Walled Lake
GM-Powertrain Div-Livonia	MIS210318	Wayne	42.3761	-83.3331	Shaw Drain
US Fabricating-Walled Lake	MIS210333	Oakland	42.5408	-83.4378	Seeley Drain
Quality Metalcraft Inc	MIS210342	Wayne	42.3767	-83.3681	Shaw Drain
Standard Die & Fabricating Inc	MIS210345	Wayne	42.3772	-83.3881	Barlow Drain
Kopacz Industrial Painting Inc	MIS210346	Wayne	42.3744	-83.3528	Shaw Drain
Sales & Engineering-Livonia	MIS210347	Wayne	42.3797	-83.3681	Shaw Drain
Fittings Prod Co-Livonia	MIS210349	Wayne	42.3772	-83.3139	Bell Branch
US Postal Service-Livonia	MIS210361	Wayne	42.3697	-83.3522	Shaw Drain
UPS-Livonia	MIS210362	Wayne	42.3831	-83.3381	Rouge River
Argent Limited-Livonia	MIS210370	Wayne	42.3714	-83.3644	Shaw Drain
Tru-Line-31100 Industrial	MIS210377	Wayne	42.3789	-83.3461	Shaw Drain
Tru-Line-30844 Industrial	MIS210378	Wayne	42.3806	-83.345	Shaw Drain
Tru-Line-30622 Industrial	MIS210379	Wayne	42.3806	-83.3431	Shaw Drain
Dept Army-AMSA 134G	MIS210382	Wayne	42.3817	-83.3828	Barlow Drain
Giffin-Farmington Hills	MIS210389	Oakland	42.4606	-83.4278	Upper River Rouge
ATW-Adv Tech & Testing-Livonia	MIS210394	Wayne	42.3789	-83.3789	Barlow Drain
Ductile Chrome Process-Livonia	MIS210414	Wayne	42.3794	-83.3461	Rouge River
Williams Panel Brick-Detroit	MIS210417	Wayne	42.4419	-83.3139	Upper River Rouge
Cass Erectors-Livonia	MIS210422	Wayne	42.3792	-83.3789	Barlow Drain
Ryan Transportation	MIS210440	Wayne	42.3728	-83.3722	Shaw Drain
Ideal Fabricators-Livonia	MIS210537	Wayne	42.3825	-83.3453	Shaw Drain
Fendt Builders-Farmington	MIS210587	Oakland	42.4525	-83.3858	Tarabusi Creek
City of Livonia DPS-Livonia LF	MIS210590	Wayne	42.3769	-83.3664	Shaw Drain
MSD Stamping LLC-Livonia	MIS210591	Wayne	42.3728	-83.37	Shaw Drain
O Keller Tool Engineering Co	MIS210593	Wayne	42.3772	-83.3139	Bell Branch
General Permit MIS210000	Storm water discharges from industrial activities				
Trio Tool Co-Livonia	MIS210596	Wayne	42.3817	-83.3822	Barlow Drain
Dedoes Industries-Walled Lake	MIS210597	Oakland	42.5378	-83.4781	Seeley Drain
Williams Diversified-Livonia	MIS210602	Wayne	42.3781	-83.3528	Shaw Drain
Quigley Industries-Farm Hills	MIS210626	Oakland	42.4706	-83.4297	Walled Lake
Metaldyne-Farmington Hills	MIS210640	Oakland	42.4728	-83.4186	Upper River Rouge
CSM Manufacturing Corp-Plt 1	MIS210642	Oakland	42.4711	-83.4247	Walled Lake
State Fabricators Inc	MIS210656	Oakland	42.4411	-83.3461	Upper Rouge River
Wayne Craft-Livonia	MIS210666	Wayne	42.3803	-83.3886	Barlow Drain
Lockwood Manufacturing-Livonia	MIS210667	Wayne	42.3778	-83.3456	River Rouge
Chemical Systems Corp-Livonia	MIS210671	Wayne	42.3772	-83.3886	Barlow Drain
Piedmont Concrete Inc	MIS210675	Oakland	42.4411	-83.3397	Upper River Rouge
Carlesimo Products Inc	MIS210682	Oakland	42.4411	-83.3383	Upper Rouge River
Quality Metalcraft-Livonia	MIS210683	Wayne	42.3767	-83.3697	Bell Branch
TAG Mfg-Farmington Hills	MIS210691	Oakland	42.4642	-83.4211	Tarabusi Creek
Producto Chemicals	MIS210714	Wayne	42.38	-83.3458	Bell Branch
A & J Precision Inc	MIS210762	Oakland	42.4592	-83.4225	Tarabusi Creek
Microheat Inc-Farmington Hills	MIS210769	Oakland	42.4956	-83.4197	Seeley Drain
Country Fresh LLC-Livonia	MIS210780	Wayne	42.3711	-83.3558	Shaw Drain
Tramar Industries-Redford	MIS210810	Wayne	42.3803	-83.2906	Bell Branch
Autotek Sealants Inc	MIS210843	Oakland	42.4588	-83.4321	River Rouge
Gehring LP	MIS210858	Oakland	42.4782	-83.3943	Upper Rouge River
Quality Metalcraft Inc-Livonia	MIS210868	Wayne	42.3775	-83.3702	Hawkins Drain

Appendix A (cont). UPPER BRANCH

Facility	Number	County	Latitude	Longitude	Receiving Water
General Permit MIS710000	Storm water from municipally operated industrial activity				
Commerce Twp WWTP	MIS710004	Oakland	42.5458	-83.4625	trib to Greenaway Dr
		MIDDLE BRANCH			
Individual Permit					
MDOT MS4	MI0057364	Statewide	---	---	---
Oakland Co Walled Lk/Novi WWTP*	MI0024287	Oakland	42.5086	-83.4978	---
Wayne Co-Lift Station 1A	MI0026123	Wayne	42.3292	-83.2486	Walled Lake Branch
Onyx Arbor Hills LF*	MI0045713	Wayne	42.4014	-83.5458	Johnson Drain
Wayne Co/Dearborn Heights CSO	MI0051489	Wayne	42.3444	-83.2731	Walled Lake Branch
Redford Twp CSO	MI0051829	Wayne	42.3675	-83.2756	Ashcroft-Sherwood Drain
Salem Twp WWTP*	MI0054798	Washtenaw	42.3994	-83.5781	Johnson Drain
CECO-Northville Compressor	MI0058016	Wayne	42.4322	-83.5514	Sump Drain
General Permit MIG080000	Wastewater from Cleanup of Water Contaminated by Gasoline & Related Petroleum Products				
Buckeye Pipeline-Plymouth*	MIG080782	Wayne	42.3897	-83.4383	River Rouge
Falcon Center GWCU*	MIG081027	Wayne	42.3533	-83.4519	---
Diversified Fuels-Northville*	MIG081077	Oakland	42.4374	-83.493	---
General Permit MIG250000	Non Contact Cooling Water				
Detroit Diesel Corp*	MIG250058	Wayne	42.3758	-83.2694	---
Rock Tool & Machine-Plymouth*	MIG250484	Wayne	42.3858	-83.5029	Walled Lake Branch
General Permit MIG619000	Municipal Separate Storm Sewer System				
Westland MS4-Wayne	MIG610001	Wayne	42.3167	-83.3736	---
Dearborn Heights MS4-Wayne	MIG610009	Wayne	42.3256	-83.3014	---
Garden City MS4-Wayne	MIG610012	Wayne	42.3206	-83.3425	---
Northville MS4-Oakland	MIG610024	Oakland	42.4375	-83.4875	---
Northville Twp MS4-Wayne	MIG610025	Oakland	42.4361	-83.4806	---
Walled Lake MS4-Oakland	MIG610028	Oakland	---	---	---
Novi MS4-Oakland	MIG610030	Oakland	42.4656	-83.4428	---
Plymouth MS4-Wayne	MIG610032	Wayne	42.3681	-83.4528	---
Lyon Twp MS4-Oakland	MIG610034	Oakland	---	---	---
Wixom MS4-Oakland	MIG610035	Oakland	---	---	---
Plymouth Twp MS4-Wayne	MIG610038	Wayne	42.3875	-83.4708	---
Plymouth-Canton PS MS4-Wayne	MIG610343	Wayne	---	---	---
General Permit MIS040000	Storm Water Discharges from Municipal Separate Storm Sewer Systems (MS4s)				
Wayne-Westland PS MS4-Wayne	MIS040060	Wayne	---	---	Tonquish Creek
			---	---	
Novi Twp MS4-Oakland	MIS040061	Oakland			Thornton Creek
Salem Twp MS4-Washtenaw	MIS040068	Washtenaw	---	---	---
Novi PS	MIS040076	Oakland	---	---	---
Northville PS	MIS040076	Oakland	---	---	---
General Permit MIG670000	Hydrostatic Pressure Test Water				
CECO - Newburgh Rd Pipeline	MIG670325	Wayne	42.4042	-83.4875	Walled Lake Branch
General Permit MIS210000	Storm Water Discharges From Industrial Activities				
Baron Drawn Steel Corp-Canton	MIS210006	Wayne	42.3431	-83.4542	Rouge River
Corrigan Moving Systems-Novi	MIS210009	Oakland	42.4847	-83.4936	Walled Lake
Koenig Fuel-Plymouth Yard	MIS210256	Wayne	42.3714	-83.2753	Ashcroft-Sherwood Drain
C & B Machiner-Livonia	MIS210269	Wayne	42.3697	-83.4094	Middle River Rouge
Nagle Paving Co-Livonia	MIS210282	Wayne	42.3747	-83.4053	Middle Rouge River
Metaltec Steel Abrasive-Canton	MIS210286	Wayne	42.3517	-83.4467	Deer Drain
Wisne Automation & Engineering	MIS210292	Oakland	42.4664	-83.4661	Walled Lake
Lacy Tool-Novi	MIS210298	Oakland	42.4733	-83.445	Bishop Creek
Ajax Materials-Plt 5	MIS210300	Wayne	42.3542	-83.3125	Sherman Drain
Temperform Corp-Novi	MIS210306	Oakland	42.4767	-83.4744	Walled Lake
Plymouth Plating Works	MIS210307	Wayne	42.35	-83.4583	Tonquish Creek
Spartan Distribution-Plymouth	MIS210310	Wayne	42.355	-83.4447	Tonquish Creek
Xmation	MIS210313	Oakland	42.4664	-83.4689	Walled Lake
Lyon Manufacturing-Livonia	MIS210316	Wayne	42.3778	-83.4119	Middle River Rouge
Vico Products-Plymouth	MIS210317	Wayne	42.3589	-83.4508	Tonquish Creek

Baron Drawn Steel Corporation	MIS210320	Wayne	42.3489	-83.4531	Tonquish Creek

Appendix A (cont). MIDDLE BRANCH

Facility	**Number**	**County**	**Latitude**	**Longitude**	**Receiving Water**
Polynorm Automotive-Novi	MIS210330	Oakland	42.4839	-83.4894	Walled Lake
Fendt Transit Mix-Novi	MIS210334	Oakland	42.4783	-83.4761	Walled Lake
Accum-Matic Systems Livonia	MIS210335	Wayne	42.3711	-83.3669	Middle Rouge River
Tower Automotive Inc	MIS210336	Wayne	42.3825	-83.4775	Middle River Rouge
Packaging Corp Amer-Plymouth	MIS210340	Wayne	42.3822	-83.4806	Tonquish Creek
E & E Manufacturing-Plymouth	MIS210343	Wayne	42.3725	-83.4483	Middle Rouge River
Hercules Drawn Steel Corp	MIS210348	Wayne	42.3742	-83.4264	Newburgh Lake
CSX Transportation-Plymouth	MIS210364	Wayne	42.3797	-83.4678	Middle Rouge River
General Permit MIS210000	Storm Water Discharges From Industrial Activities				
Cadillac Asphalt-Plt 3A-Wixom	MIS210392	Oakland	42.4964	-83.4503	Novi Lyon Drain
AAA Industries-Detroit	MIS210405	Wayne	42.3764	-83.2792	Middle Rouge River
Applied Process-Livonia	MIS210413	Wayne	42.3733	-83.4114	Middle Rouge River
National Concrete Products	MIS210415	Wayne	42.3625	-83.4583	Tonquish Creek
Sun Plastic Coating-Plymouth	MIS210421	Wayne	42.3564	-83.4597	Tonquish Creek
Plastomer Corp-Livonia	MIS210423	Wayne	42.3808	-83.4147	Patter Drain
Nat Block Co-Westland	MIS210431	Wayne	42.3236	-83.4239	Willow Creek
Mcgean-Rohco Inc	MIS210432	Wayne	42.3811	-83.4228	Gunn Branch
Ford-Livonia-Transmission Plt	MIS210444	Wayne	42.3678	-83.3992	Middle River Rouge
E & E Mfg Co-Plymouth	MIS210522	Wayne	42.3722	-83.4486	Middle Rouge River
Unco Automotive Products	MIS210531	Wayne	42.3694	-83.4092	Middle River Rouge
Mich Truck Parts-Westland	MIS210538	Wayne	42.3236	-83.4203	Willow Creek
Gil-Mar Mfg-Canton	MIS210553	Wayne	42.3442	-83.4528	Tonquish Creek
Automotive Comp Hold-Sheldon	MIS210588	Wayne	42.3533	-83.4716	Tonquish Creek
NSS Ind-Plymouth	MIS210592	Wayne	42.3544	-83.4542	Tonquish Creek
Westside Flame Hardening	MIS210611	Wayne	42.3297	-83.4175	Tonquish Creek
Plymouth Concrete Inc	MIS210617	Wayne	42.3797	-83.4692	Middle Rouge River
Dynamic Metal Treating-Canton	MIS210619	Wayne	42.3431	-83.4522	Tonquish Creek
Guardian Manufacturing-Livonia	MIS210633	Wayne	42.3719	-83.4017	Middle River Rouge
Tony Angelo-Heltzel 902TA	MIS210636	Oakland	42.4886	-83.5103	various
Tony Angelo-Heltzel 902 BC	MIS210637	Oakland	42.4886	-83.5103	various
Tony Angelo-Rex Model S	MIS210638	Oakland	42.4886	-83.5103	various
Tony Angelo-Heltzel 1000	MIS210639	Oakland	42.4886	-83.5103	various
NSS Ind-Ronda Plt	MIS210641	Wayne	42.3458	-83.4528	Tonquish Creek
Northfield Mfg Inc-Westland	MIS210647	Wayne	42.3269	-83.4211	Willow Creek
Tony Angelo-Hagan Model	MIS210662	Oakland	42.4886	-83.5103	various
AAR Cargo Systems-Livonia	MIS210672	Wayne	42.3772	-83.3139	Livonia storm sewer
Global CNC Industries	MIS210677	Wayne	42.3689	-83.4092	Rouge River
Key Plastics-Plymouth	MIS210681	Wayne	42.3731	-83.4372	Middle Rouge River
Inch Memorials-Northville	MIS210685	Wayne	42.4247	-83.4742	Johnson Drain
Webasto Roof-Livonia	MIS210692	Wayne	42.3786	-83.4092	Gunn Branch
General Filters Inc-Novi	MIS210696	Oakland	42.4819	-83.4803	Rouge River
General Permit MIS210000	Storm Water Discharges From Industrial Activities				
Fed Ex Ground	MIS210709	Wayne	42.3742	-83.4222	Newburgh Lake
Precision Com	MIS210725	Wayne	42.3947	-83.4992	Tonquish Creek
Great Lakes Agg-Northville	MIS210732	Washtenaw	42.4111	-83.5725	Rouge River
Novi Industries-Autotech	MIS210748	Oakland	42.4825	-83.4831	Walled Lake
Biologix-Novi	MIS210759	Oakland	42.4824	-83.4881	Walled Lake Branch
Spring Engin & Mfg-Canton	MIS210761	Wayne	42.3417	-83.4569	Tonquish Creek
Owens Corning Automotive-Novi	MIS210763	Oakland	42.5002	-83.5039	Walled Lake
Veolia ES Arbor Hills Landfill	MIS210766	Washtenaw	42.3975	-83.5508	unnamed trib to Johnson Dr
GDM Tool & Mfg-Canton	MIS210771	Wayne	42.3464	-83.4574	Tonquish Creek
AW Transmission Engineering	MIS210772	Wayne	42.3926	-83.5078	Middle Rouge River
Durr Industries-Rouge River	MIS210776				
J L Becker Co-Plymouth	MIS210778	Wayne	42.3539	-83.447	Tonquish Creek
Shiloh Ind-Canton-Haggerty	MIS210796	Wayne	42.3381	-83.4500	Tonquish Creek
AW Transmission Eng-Plymouth	MIS210797	Wayne	42.3926	-83.5078	unnamed tributary to Tonquish Cre
4 M Industries-Livonia	MIS210802	Wayne	42.3736	-83.3799	Ryder Drain
First Tech Safety Sys-Plymouth	MIS210806	Wayne	42.4366	-83.4511	Tonquish Creek

Appendix A (cont). MIDDLE BRANCH

Facility	Number	County	Latitude	Longitude	Receiving Water
Frito-Lay-Great Lakes Facility	MIS210822	Wayne	42.3875	-83.4875	Tonquish Creek
Schuler	MIS210830	Wayne	42.3475	-82.8856	Tonquish Creek
LOC Performance Prod-Plymouth	MIS210835	Wayne	42.3791	-83.4482	Middle River Rouge
J & J Machine Products	MIS210855	Wayne	42.3755	-83.3117	Rouge River
US Farathane-Plymouth	MIS210859	Wayne	42.3858	-83.5029	Tonquish Creek
Durcon Laboratory Tops Inc	MIS210860	Wayne	42.343	-83.4524	Koss Drain
Durcon Laboratory Tops Inc	MIS210860	Wayne	42.343	-83.4524	Rouge River
Durcon Laboratory Tops Inc	MIS210860	Wayne	42.343	-83.4524	Tonquish Creek
Master Automatic Inc-Plymouth	MIS210870	Wayne	42.3903	-83.4389	Rouge River
Hayes Trucking Facility	MIS210881	Oakland	42.4898	-83.4835	Walled Lake Branch
Hayes Portable Crusher	MIS210882	Oakland	42.4898	-83.4835	various receiving waters
Rock Tool & Machine-Plymouth	MIS210883	Wayne	42.3858	-83.5029	Tramp Hollow Drain
General Permit MIS220000	Storm Water Discharges with Required Monitoring				
AVL North America Inc	MIS220038	Wayne	42.3819	-83.5125	Tonquish Creek
General Permit MIS319000	Storm Water Discharges From Industrial Activities				
Waste Mgt of Mich-Romulus	MIS310278	Wayne	42.1614	-83.3053	Sherman Drain
General Permit MIS710000	Storm water from municipally operated industrial activity				
Oakland Co Walled Lk/Novi WWTP	MIS710020	Oakland	42.5086	-83.4978	Fenley Drain

LOWER BRANCH

Facility	Number	County	Latitude	Longitude	Receiving Water
Individual Permit					
MDOT MS4	MI0057364	Statewide	---	---	---
Dearborn CSO	MI0025542	Wayne	42.3125	-83.2125	River Rouge
YCUA Regional WWTP*	MI0042676	Washtenaw	42.2236	-83.5531	Lower Rouge River
Ford-Wayne Assembly Plt*	MI0046183	Wayne	42.2778	-83.4069	Lower Rouge River
Wayne Co/Inkster/Drbrn Hts CSO	MI0051462	Wayne	42.3017	-83.2906	Lower Rouge River
Wayne Co/Inkster CSO	MI0051471	Wayne	42.2967	-83.3092	Lower Rouge River
Inkster/Dearborn Heights CSO	MI0051837	Wayne	42.3008	-83.2958	Lower Rouge River
Visteon Headquarters-Van Buren	MI0057156	Wayne	42.2364	-83.4377	---
General Permit MIG250000	Non Contact Cooling Water				
Steel Technologies Inc*	MIG250070	Wayne	42.2658	-83.4867	---
General Permit MIG619000	Municipal Separate Storm Sewer System				
Canton Twp MS4-Wayne	MIG610002	Wayne	42.3083	-83.4917	---
Superior Twp MS4-Washtenaw	MIG610003	Washtenaw	42.3083	-83.5875	---
Dearborn MS4-Wayne	MIG610008	Wayne	42.3039	-83.2431	---
Inkster MS4-Wayne	MIG610014	Wayne	42.2889	-83.3047	---
Romulus MS4-Wayne	MIG610017	Wayne	---	---	---
Wayne MS4-Wayne	MIG610019	Wayne	42.2786	-83.3719	---
Van Buren Twp MS4-Wayne	MIG610021	Wayne	---	---	---
Melvindale MS4-Wayne	MIG610029	Wayne	42.2917	-83.1708	---
Ypsilanti Twp MS4-Washtenaw	MIG610037	Washtenaw	---	---	---
Washtenaw CDC MS4	MIG610039	Washtenaw	---	---	---
Wayne Co MS4	MIG610040	Wayne	---	---	---
Washtenaw CRC MS4	MIG610314	Washtenaw	---	---	---
Willow Run Airport MS4	MIG610368	Wayne	---	---	---
General Permit MIS040000	Storm Water Discharges from Municipal Separate Storm Sewer Systems (MS4s)				
Van Buren PS MS4-Wayne	MIS040011	Wayne	---	---	---
General Permit MIG670000	Hydrostatic Pressure Test Water				
Buckeye Terminals-Detroit*	MIG670079	Wayne	42.2811	-83.1419	Lower Rouge River

Appendix A (cont). LOWER BRANCH

Facility	Number	County	Latitude	Longitude	Receiving Water
General Permit MIS210000	Storm Water Discharges From Industrial Activities				
Levy-Dearborn-Falcon Trucking	MIS210252	Wayne	42.3158	-83.1508	Lower Rouge River
Levy-Dearborn-Stacy Trucking	MIS210253	Wayne	42.3106	-83.1406	Lower Rouge River
Levy-Detroit Plt 6	MIS210254	Wayne	42.2903	-83.1592	Lower Rouge River
Levy-Dearborn Plt 2	MIS210255	Wayne	42.3147	-83.1453	Baby Creek
Swiss American Screw	MIS210258	Wayne	42.2644	-83.4753	Yost Drain
Procoil-Canton	MIS210271	Wayne	42.2683	-83.4464	Lower Rouge River
Hajjar Plating-Wayne	MIS210285	Wayne	42.2667	-83.4125	Wilbur Drain
Weiser Recycling Inc	MIS210308	Wayne	42.2758	-83.3931	McClaughrey Drain
Levy-Clawson Concrete Plt 1	MIS210311	Wayne	42.2853	-83.1231	Lower Rouge River
Daikin Clutch Corp-Belleville	MIS210319	Wayne	42.24	-83.445	McClaughrey Drain
L & W Engineering Co-No 2	MIS210322	Wayne	42.2611	-83.4458	Bell Drain
Frito Lay-Allen Park	MIS210337	Wayne	42.2939	-83.1878	Lower Rouge River
Darling & Co-Melvindale	MIS210339	Wayne	42.4514	-83.1708	Lower Rouge River
Sauk Trail Hills	MIS210356	Wayne	42.2703	-83.4558	Lower Rouge River
Veolia ES Solid Waste Midwest	MIS210358	Wayne	42.3047	-83.1753	Lower Rouge River
Browning-Ferris-Wayne	MIS210365	Wayne	42.2669	-83.4089	Lower Rouge River
Causley Trucking-Melvindale	MIS210369	Wayne	42.2858	-83.1842	Lower Rouge River
Best Block Company-Canton	MIS210372	Wayne	42.27	-83.4872	Rouge River
Imperial Industries-Belleville	MIS210397	Wayne	42.2636	-83.4753	McKinstry Drain
AB Myr Industries-Belleville	MIS210399	Wayne	42.2625	-83.55	Belleville Lake
Norfolk Southern-Wayne	MIS210403	Wayne	42.2778	-83.4192	Bell Drain
Doan Companies-Inkster Plt	MIS210406	Wayne	42.2900	-83.3258	Lower Rouge River
GM-CPC-Romulus Engine	MIS210409	Wayne	42.2522	-83.4017	McClaughrey Drain
General Metal & Abrasive Co	MIS210412	Wayne	42.2514	-83.4142	McClaughrey Drain
Reilly Plating Co-Melvindale	MIS210418	Wayne	42.2806	-83.1708	Lower Rouge River
Linde Gas LLC-Canton	MIS210419	Wayne	42.2711	-83.4828	McKinstry Drain
Ford-Wayne Integral Stamping	MIS210420	Wayne	42.2783	-83.4103	Lower Rouge River
Plastipak Packaging	MIS210425	Wayne	42.3122	-83.4181	Hunter Drain
Waste Mgt-Woodland-Van Buren	MIS210435	Wayne	42.2656	-83.4264	Wilbur Drain
General Permit MIS210000	Storm Water Discharges From Industrial Activities				
H & H Metals-Inkster	MIS210437	Wayne	42.29	-83.3267	Lower Rouge River
Means Industries-Melvindale	MIS210540	Wayne	42.2753	-83.1931	Tyre Drain
US Postal Service-Allen Park	MIS210542	Wayne	42.2878	-83.2019	Allen Drain
Scrap Busters Auto & Truck	MIS210544	Wayne	42.2728	-83.4258	Bell Drain
Steel Technologies Inc	MIS210585	Wayne	42.2658	-83.4867	McKinstry Drain
L & W Engineering Co-No 1	MIS210600	Wayne	42.2561	-83.4456	Bell Drain
Galaxy Precision Products	MIS210601	Wayne	42.2667	-83.5042	Sines Drain
Broomes Auto Parts	MIS210643	Wayne	42.2733	-83.3994	McClaughrey Drain
Collins & Aikman-Westland Oper	MIS210648	Wayne	42.2972	-83.4072	Leng Drain
Bishop Auto Wrecking-Inkster	MIS210657	Wayne	42.2897	-83.3233	Lower Rouge River
Advanced Material Process	MIS210688	Wayne	42.2797	-83.3728	Lower Rouge River
NYX-Cherry Hill-Westland	MIS210764	Wayne	42.3067	-83.2884	Leng Drain
Powertrain Prod-Canton	MIS210791	Wayne	42.2625	-83.4375	Bell Drain
Plastech Eng Prod-Romulus	MIS210801	Wayne	42.2519	-83.4142	McClaughrey Drain
Norfolk Southern-Triple Crown	MIS210815	Wayne	42.2769	-83.1722	Rouge River
Norfolk Southern-Auto Ramp	MIS210816	Wayne	42.2797	-83.1631	Rouge River
Ford-Mich Truck Plt	MIS210829	Wayne	42.2753	-83.4139	Lower Rouge River
General Permit MIS220000	Storm Water Discharges with Required Monitoring				
Red Spot-Westland	MIS220019	Wayne	42.3000	-83.4125	Leng Drain
American Jetway Corp-Wayne	MIS220022	Wayne	42.2792	-83.375	Boyce Drain
SNF Polychemie Inc-Wayne	MIS220025	Wayne	42.2656	-83.4242	Wilbur Drain
Unistrut International Corp	MIS220040	Wayne	42.2761	-83.3900	McClaughrey Drain
General Permit MIS319000	Storm Water Discharges From Industrial Activities				
Woodbridge Corp-Romulus	MIS310219	Wayne	42.2833	-83.1958	Carter Drain
Ford-Allen Park Clay Mine LF	MIS310398	Wayne	42.2833	-83.2058	Allen Drain
Manfredi Motor Transit-Taylor	MIS310432	Wayne	42.2453	-83.2914	Lower Rouge River

Appendix B. Total annual SS loading calculation based on the Simple Method (USEPA, 2001) and concentration and imperviousness data from the Rouge River National Wet Weather Demonstration Program (Cave, 1994).

Land Use	Acres (*Au*)	SS concentration (*Cu*)	Percent Imperviousness (*Iu*)	Annual Precipitation (*P*)	*Pj*	Runoff Coefficient (*Rvu*)*	SS annual load**	Target SS	Target Load	Percent Reduction
WLA										
Residential Med	140769	70	38	32.9	0.9	0.392	25,924,906	--	25,924,906	0
Residential Hi	12228	**97**	51	32.9	0.9	0.509	**4,052,015**	**80**	**3,341,868**	**17.5**
Transportation (MDOT)	7456	**141**	53	32.9	0.9	0.527	**3,718,448**	**80**	**2,109,758**	**43.3**
Commercial	32508	77	56	32.9	0.9	0.554	9,307,152	--	9,307,152	0
Urban Open	17894	51	11	32.9	0.9	0.068	912,620	--	912,620	0
Industrial	23263	**149**	76	32.9	0.9	0.509	**17,075,527**	**80**	**9,168,068**	**46.3**
NPDES Non-storm water Permits							6,621,299	--	6,621,299	0
						WLA Total	*67,611,967*		*57,385,671*	
LA										
Forest/Rural Open	28333	51	2	32.9	0.9	0.068	659,474	--	659,474	0
Water/Wetlands	19684	6	51	32.9	0.9	0.509	403,467	--	403,467	0
Agricultural	15508	**145**	2	32.9	0.9	0.068	**1,026,263**	**80**	**566,214**	**44.8**
						LA Total	*2,089,205*		*1,629,155*	
Total Acres	297643					***Total Load***	***69,701,172***		***59,014,827***	***15.3***

BOLD: Land use categories with background SS runoff concentrations higher than the 80 mg/L target (needing reduction).
* Runoff coefficient (Rvu) is defined as: 0.05+(0.009*Iu).
** Annual Load is defined as: $P*Pj*Rvu*Cu*Au$*2.72/12

Michigan Department of Environmental Quality
Water Bureau
August 2007

Total Maximum Daily Load for Dissolved Oxygen for Johnson Creek Wayne and Washtenaw 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, 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 oxygen demanding pollutants so that the coldwater dissolved oxygen (D.O.) standard of 7 milligrams per liter (mg/l) as a minimum can be met in Johnson Creek.

Johnson Creek is the only designated trout stream in the Rouge River watershed and in Wayne County. The watershed is a mix of agricultural, low and medium density residential, industrial, and commercial land use. The channel has historically been highly modified through past drainage projects. Dredge spoils can be seen along the banks at numerous locations along the watercourse. In most cases the banks are now wooded indicating that the most recent dredging was decades ago. A map of the watershed is presented in Figure 1.

Based on miscellaneous flow measurements and long-term stream flow records on area gages, the low flow statistics have been estimated for several locations on the stream and are presented in Appendix A. These statistics indicate that the lower part of the watershed starting at Salem Road (drainage area of 11 square miles) has a much higher base flow than the upper watershed.

PROBLEM STATEMENT

The TMDL reach for Johnson Creek appears on the Section 303(d) list as:

Johnson Creek WBID#: 061304I
County: Wayne/ Washtenaw Size: 7 Miles
Location: From the confluence with the Walled Lake Branch upstream to 5 Mile Rd. West of Currie Rd.
NHD Reach Code: 04090004000067
Problem Summary: Dissolved Oxygen
TMDL YEAR(s): 2007

Johnson Creek was placed on the 2006 Section 303(d) list (Edly and Wuycheck, 2006) due to measured D.O. values at multiple locations on multiple days that are less than the standard of 7 mg/l as a minimum. During initial analysis of this reach it became apparent that the level of pollutant reduction needed to meet the 7 mg/l D.O. standard throughout the stream reach was unachievable due to extremely low stream flow characteristics under drought conditions. Therefore, this reach of river will be divided into two reaches. The first reach will be two miles long and extends from the confluence with the Walled Lake Branch of the Rouge River upstream to 6 Mile Road. This TMDL will prescribe loads to meet the D.O. standard in this reach. The second reach will be 9.4 miles long and extend from 6 Mile Road upstream to the 5 Mile Road crossing upstream of Currie Road. Note that while this TMDL addresses only the lower reach of Johnson Creek, loadings of oxygen demanding substances from the upper reach must also be considered in the TMDL development and are further discussed in the Data Discussion section.

The upper part of the watershed (upstream of Napier Road), although designated for the protection of coldwater fish, has a flow yield of only 0.01 cubic feet per second (cfs) per square mile at the lowest monthly 95 percent exceedance flow (Appendix A). Southeastern Michigan trout streams typically have low flow yields of 0.03 to 0.16 cfs at the lowest monthly 95 percent exceedance flow. The extremely low flow yields upstream of Napier Road contribute to the D.O. problem by reducing stream flow velocity and reaeration in the reach. The resulting wide and shallow characteristics at low flow, further contributes to the D.O. demand from the suspended solids on the stream bottom. The lack of flow is not an issue that can be addressed by a TMDL.

When the Section 303(d) list is updated in 2008, the Johnson Drain listing will be split as described above with the upstream reach rescheduled for a TMDL at a future date. This will allow sufficient time to evaluate flow conditions and model assumptions in more detail and to determine whether portions of the upstream reach of river are appropriately designated for coldwater fish protection.

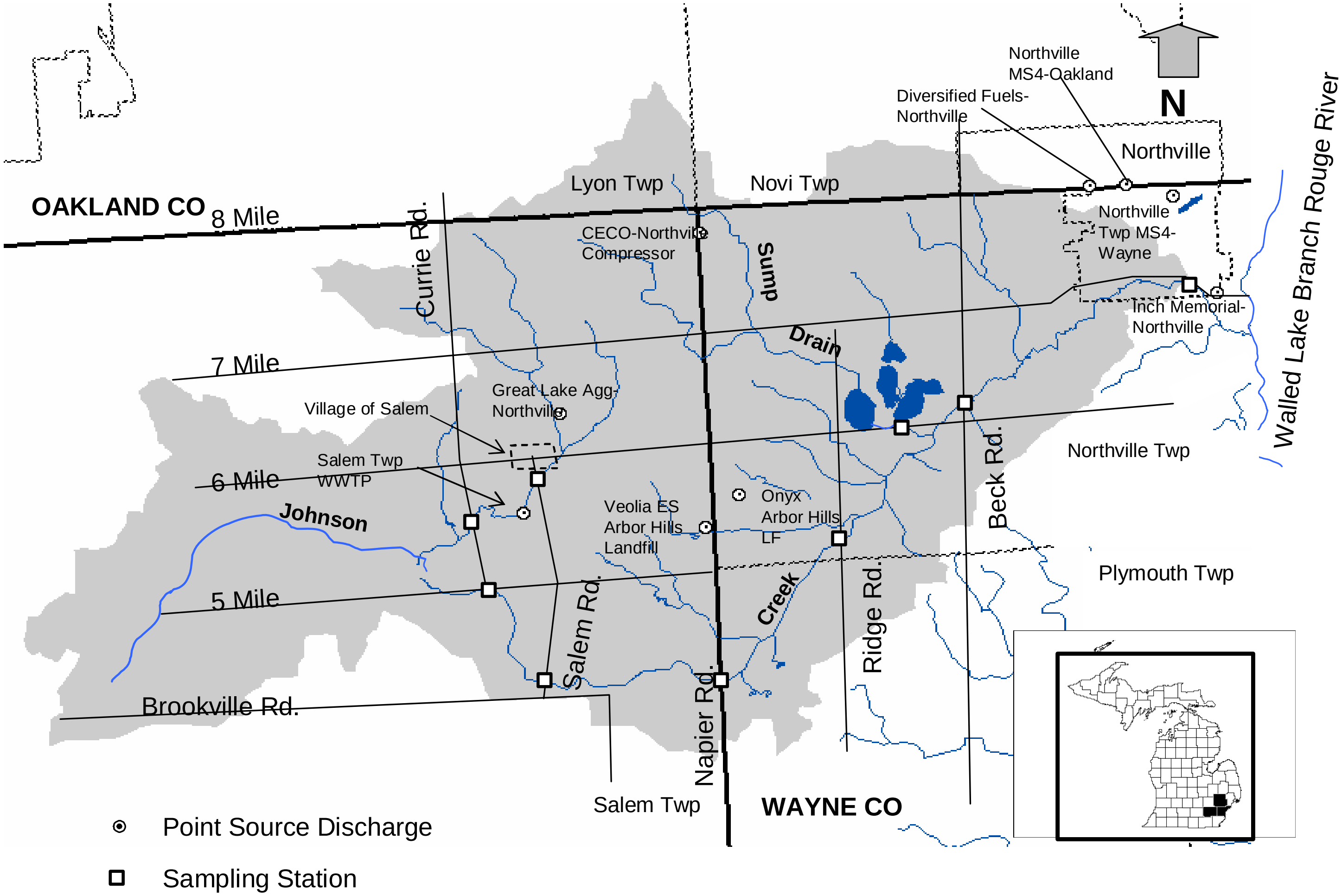

Figure1. Johnson Creek Watershed, Oakland, Washtenaw, and Wayne Counties.

NUMERIC TARGET

The D.O. rule (R 323.1064 (1) 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 (NREPA)) states, in part, that "a minimum of 7 mg/l of dissolved oxygen shall be maintained at all times in all inland waters designated by these rules to be protected for coldwater fish." Johnson Creek and all of its tributaries are protected for coldwater fish because it appears on the designated trout stream list established by the Department of Natural Resources, Director's Order No. DFI-101.97. However, as stated in the Problem Statement section of this document, this TMDL will determine pollutant loads needed to meet the coldwater stream D.O. standard only in the lower reach of river downstream from 6 Mile Road.

The D.O. WQS is defined as follows:

> R 323.1064 Dissolved oxygen in Great Lakes, connecting waters, and inland streams.
> Rule 64. (1) A minimum of 7 milligrams per liter of dissolved oxygen in all Great Lakes and connecting waterways shall be maintained, and, except for inland lakes as prescribed in R 323.1065, a minimum of 7 milligrams per liter of dissolved oxygen shall be maintained at all times in all inland waters designated by these rules to be protected for coldwater fish. In all other waters, except for inland lakes as prescribed by R 323.1065, a minimum of 5 milligrams per liter of dissolved oxygen shall be maintained. These standards do not apply for a limited warmwater fishery use subcategory or limited coldwater fishery use subcategory established pursuant to R 323.1100(11) or during those periods when the standards specified in subrule (2) of this rule apply.
> (2) Surface waters of the state which do not meet the standards set forth in subrule (1) of this rule shall be upgraded to meet those standards. The department may issue permits pursuant to R 323.2145 which establish schedules to achieve the standards set forth in subrule (1) of this rule for point source discharges to surface waters which do not meet the standards set forth in subrule (1) of this rule and which commenced discharge before December 2, 1986. For point source discharges which commenced before December 2, 1986, the dischargers may demonstrate to the department that the dissolved oxygen standards specified in subrule (1) of this rule are not attainable through further feasible and prudent reductions in their discharges or that the diurnal variation between the daily average and daily minimum dissolved oxygen concentrations in those waters exceeds 1 milligram per liter, further reductions in oxygen consuming substances from such discharges will not be required, except as necessary to meet the interim standards specified in this subrule, until comprehensive plans to upgrade these waters to the standards specified in subrule (1) of this rule have been approved by the department and orders, permits, or other actions necessary to implement the approved plans have been issued by the department. In the interim, all of the following standards apply:
> (a) For surface waters of the state designated for use for coldwater fish, except for inland lakes as prescribed in R 323.1065, the dissolved oxygen shall not be lowered below a minimum of 6 milligrams per liter at the design flow during the warm weather season in accordance with R 323.1090(2) and (3). At the design flows during other seasonal periods, as provided in R 323.1090(3), a minimum of 7 milligrams per liter shall be maintained. At flows greater than the design flows, dissolved oxygen shall be higher than the respective minimum values specified in this subdivision.
> (b) For surface waters of the state designated for use for warmwater fish and other aquatic life, except for inland lakes as prescribed in R 323.1065, the dissolved oxygen shall not be lowered below a minimum of 4 milligrams per liter, or below 5 milligrams per liter as a daily average, at the design flow during the warm weather season in accordance with R 323.1090(3) and (4). At the design flows during other seasonal periods as provided in

R 323.1090(3), a minimum of 5 milligrams per liter shall be maintained. At flows greater than the design flows, dissolved oxygen shall be higher than the respective minimum values specified in this subdivision.

(c) For surface waters of the state designated for use for warmwater fish and other aquatic life, but also designated as principal migratory routes for anadromous salmonids, except for inland lakes as prescribed in R 323.1065, the dissolved oxygen shall not be lowered below 5 milligrams per liter as a minimum during periods of migration.

(3) The department may cause a comprehensive plan to be prepared to upgrade waters to the standards specified in subrule (1) of this rule taking into consideration all factors affecting dissolved oxygen in these waters and the cost effectiveness of control measures to upgrade these waters and, after notice and hearing, approve the plan. After notice and hearing, the department may amend a comprehensive plan for cause. In undertaking the comprehensive planning effort the department shall provide for and encourage participation by interested and impacted persons in the affected area. Persons directly or indirectly discharging substances which contribute towards these waters not meeting the standards specified in subrule (1) of this rule may be required after notice and order to provide necessary information to assist in the development or amendment of the comprehensive plan. Upon notice and order, permit, or other action of the department, persons directly or indirectly discharging substances which contribute toward these waters not meeting the standards specified in subrule (1) of this rule shall take the necessary actions consistent with the approved comprehensive plan to control these discharges to upgrade these waters to the standards specified in subrule (1) of this rule.

This TMDL will be considered the comprehensive plan for this reach.

DATA DISCUSSION

Available D.O. data for Johnson Creek include a summer 2000 study by the Michigan Department of Environmental Quality (MDEQ) (Trapp, 2002) and data from the Rouge River National Wet Weather Demonstration Project (RRNWWDP), which is available on the Web at http://online2.cdm.com/detroit/rougeriver/query/query.cfm. Both data sources demonstrate D.O. values less than the standard of 7 mg/l at multiple locations and on multiple days in the watershed. The available D.O. data for Johnson Creek and tributaries to Johnson Creek are summarized in Table 1.

In July 2000, the MDEQ monitored D.O. and temperature continuously at Salem Road for 13 days. For all but 1 day, the minimum D.O. was less than 7 mg/l. The period monitored included wet and dry weather although weather did not appear to substantially affect D.O. except for a possible tendency for the D.O. to be higher after a heavy rain, which substantially increased flow in the stream. The lowest D.O. recorded was 5.1 mg/l. Twelve grab samples were also collected at 4 additional locations both upstream and downstream of Salem Road on 4 different days and analyzed for D.O. Six of the 12 samples were less than 7 mg/l with the minimum being 5.6 mg/l, which was recorded at the most upstream station in the watershed (in the unnamed creek flowing from the village of Salem). This station is upstream of all point sources and upstream from the village of Salem.

The RRNWWDP has collected D.O. data on Johnson Creek including continuously monitored stations at Salem Road and at 7 Mile Road near the mouth of Johnson Creek with over 43,000 hourly observations recorded at 7 Mile Road from 1994-2001 (although all but 42 values were collected from 1994 to 1996). An additional 50 grab samples were collected at 7 different locations from 1998 through 2001.

The continuous data at 7 Mile Road demonstrated compliance with the 7 mg/l standard for all but 1 observation in 1994 and 1996. In 1995, 93 percent of the hourly observations were greater than 7 mg/l with the minimum observed D.O. at 7 Mile Road being 6 mg/l. From 1997 to 2001, 2 of the 42 values were less than 7 mg/l. Even though the data spanned an 8-year period, no trends could be discerned because of the uneven distribution of data in time and because exceedances of the 7 mg/l standard occurred throughout this time period indicating no apparent change. In addition, although the D.O. values observed were strongly correlated to temperature because of saturation values being influenced by temperature, there was no apparent influence from wet weather on the observed values less than 7 mg/l.

Table 1. Summary of D.O. Data from Johnson Creek and its Tributaries.

Collecting Agency	**Location**	**Period of Record (mm/yr – mm/yr)**	**Number of Observations**	**Minimum (mg/l)**	**Average (mg/l)**	**% less than 7 mg/l**
DEQ	Tributary at Salem Rd.	07/00 – 08/00	3	5.6	6.6	66%
RRNWWDP	Tributary at Currie Rd.	06/01 – 10/01	4	5.5	6.4	50%
RRNWWDP	Currie Rd.	09/98 – 09/98	1	2.6	2.6	100%
DEQ	Salem Rd.	07/00 – 08/00	838	5.1	6.7	56%
RRNWWDP	Salem Rd.	06/98 – 09/98	2	8.5	8.8	0%
RRNWWDP	Napier Rd.	06/01 – 10/01	5	5.0	6.0	100%
DEQ	Ridge Rd.	07/00 – 07/00	2	6.8	6.9	100%
RRNWWDP	Ridge Rd.	06/98 – 11/01	34	4	7.3	41%
DEQ	6 Mile Rd.	07/00 – 08/00	3	6.2	6.8	33%
RRNWWDP	6 Mile Rd.	06/98 – 09/98	2	8.3	8.9	0%
DEQ	Beck Rd.	07/00 – 08/00	4	6.5	7.7	25%
RRNWWDP	Sump Drain at 6 Mile Rd.	08/01 – 10/01	2	5.4	6.9	50%
RRNWWDP	7 Mile Rd.	04/94 – 11/01	43,895	6.0	9	3%

Of 50 grab samples collected by the RRNWWDP from 1998 to 2001, 22 were less than 7 mg/l of D.O., 10 were less than 6 mg/l of D.O., and 3 were less than 5 mg/l of D.O. with the minimum observed being 2.6 mg/l at Currie Road in the upper part of the watershed.

Collectively these data show a pattern of intermittent but persistently recurring periods of D.O. less than the standard of 7 mg/l with a tendency for the lowest values being in the upper part of the watershed where stream flows and flow yields (flow per unit area) are lowest. Based on a comparison between wet and dry weather D.O. measurements at the 7 mile Road station and at the Salem Road station, there appear to be no wet weather D.O. sags occurring in the watershed following rainfall events. These two stations were the locations where data were collected hourly over multiple days. Values less than 7 mg/l were recorded at both stations, but these low D.O. values occurred during both wet and dry weather.

The diurnal variation in D.O. concentration gives an indication of the density of aquatic plants in Johnson Creek and can be an important consideration in D.O. models. The diurnal D.O. variation in Johnson Creek can be evaluated at two stations (Salem Road and 7 Mile Road) where continuous measurements (hourly) were made. The diurnal variation in this analysis is defined as the daily average minus daily minimum concentration. At Salem Road the diurnal variation during the monitoring period (July-August 2000) varied between 0.4 and 0.9 mg/l and averaged 0.6 mg/l. At 7 Mile Road the diurnal variation during the summer low flow period (June-August of 1994-1996) varied between 0.2 and 1.4 mg/l with an average of 0.6 mg/l.

Other water chemistry data were also collected during the MDEQ survey of 2000 and the RRNWWDP sampling. These data will be useful for determining nonpoint source loads of carbonaceous biochemical oxygen demand (CBOD) and ammonia.

LINKAGE BETWEEN D.O. AND POLLUTANTS

Factors, which deplete oxygen in Johnson Creek include the following:

1. CBOD, which is a measure of the amount of oxidizable organic matter in a sample of water.
2. Nitrogenous Oxygen Demand is a measure of nitrogenous material, which is oxidizable and is primarily in the form of ammonia.
3. Sediment oxygen demand (SOD), which is the oxidation of organic material on the stream bottom.
4. Plant respiration, which is the oxidative process by which energy-rich molecules such as glucose are converted into the energy needed to sustain the life of a plant.

CBOD and ammonia from point sources directly exert a D.O. demand on Johnson Creek. SOD and plant respiration are D.O. demands that are created indirectly by loads of suspended solids and nutrients respectively. SOD is created by loads of oxygen demanding suspended solids that are usually delivered to the stream during runoff after which they settle and concentrate on the stream bottom and exert their oxygen demand at a more or less steady rate, which is dependent primarily on temperature and sediment depth (USEPA, 1978). Plant respiration is an oxygen demand, which is created by a standing crop of aquatic plants. If nutrient discharges to the stream are excessive then the nutrients become pollutants of concern for a D.O. TMDL when they stimulate excessive plant growths, which contribute significantly to a D.O. problem by their respiration.

The relative importance of these multiple pollutants to the oxygen budget of a stream can be evaluated with a D.O. model that quantifies each oxygen demand present. For Johnson Creek, the oxygen budget of the stream was evaluated with a multi reach Streeter-Phelps model that incorporates SOD on an aerial basis in each reach and plant respiration by subtracting the observed difference between daily average and daily minimum D.O. from the simulated daily average D.O. values (Thomann and Mueller, 1987).

The available D.O. data indicate that the D.O. standard exceedances in Johnson Creek are not related to storm water sags. The only indication that runoff has an immediate affect on D.O. in the stream is that D.O. may be higher as the stream flow increases from runoff (Trapp, 2002). Therefore, for purposes of modeling the stream, two categories of pollutants will be considered: 1) point source discharges of CBOD and ammonia that are not storm water related, which would have an immediate effect on the D.O. of the stream; and 2) suspended solids, which are primarily discharged during runoff events but have their adverse oxygen consuming effect after they have settled and the stream flow has decreased. CBOD and ammonia are already controlled by National Pollutant Discharge Elimination System (NPDES) permits to the maximum extent possible and therefore are considered in the oxygen balance but not pollutants to be addressed by this TMDL.

Since the diurnal variation in stream D.O. was not excessive, plant nutrients including phosphorus will not be pollutants of concern for this TMDL. However, the diurnal variation in D.O. will still be considered in the model.

The D.O. concentration in permitted discharges is also relevant to the D.O. TMDL and will be addressed along with the other pollutants because of its importance to the overall oxygen balance in the stream.

TMDL DEVELOPMENT

D.O. levels in a stream typically reach their minimum level seasonally during warm weather, low flow conditions in the stream. The available D.O. data for Johnson Creek confirm that low D.O. occurs primarily during low flow non-runoff conditions. Therefore, the acceptable levels of oxygen demand in the stream were determined with the D.O. model at drought flow as defined in the Michigan WQS. The drought flow is the lowest of the 12-monthly 95 percent exceedance flows and was determined to be 0.03 cfs at the upstream end of Johnson Creek and 1.42 cfs at the downstream end of the creek (Appendix A).

The D.O. model was first calibrated to conditions observed on July 24, 2000 (Trapp, 2002). This date was chosen for calibration because of the availability of stream chemistry data at multiple locations and point source loading data; and because of the presence of steady low flow conditions in the stream. Calibration involved setting stream flow, temperature, point source water quality and upstream water quality to levels actually observed on that day and then adjusting the SOD rate to a level that would best predict observed D.O. throughout the stream. The SOD rate that best predicted D.O. in the stream was 1 gram per square meter (gm/square meter) per day. The median relative error in predicted D.O. was 0.05 mg/l.

Next, the model was verified by predicting D.O. at conditions of stream flow, temperature, point source loads, and background loads that occurred on July 27, 2000. This date was chosen for verification because of the availability of stream chemistry data at multiple locations and point source loading data; and because of the presence of steady low flow conditions in the stream. The SOD rate was kept at 1 gm/square meter per day. The median relative error in predicted D.O. was 0.4 mg/l, which is less than 6 percent. Median relative errors of 10 percent for D.O. modeling are typical and levels below that are considered acceptable (Thomann, 1982).

The calibrated and verified model was then used to predict D.O. under a design scenario, which included drought flow, 90 percent occurrence stream temperature as determined from the three years of continuous temperature data collected by the RRNWWDP, 1 gm/square meter per day of SOD, and the presently permitted point source discharge levels of CBOD, ammonia, and D.O. The result for this simulation indicated that the D.O. standard would not be met.

The relative importance of each oxygen demand (SOD, CBOD, and ammonia) was evaluated in the model for 15 different locations throughout the length of Johnson Creek. The results did not vary appreciably from location to location. The model indicated that SOD was by far the greatest oxygen demand in the stream followed by CBOD and then ammonia as shown in Table 2.

Table 2. Relative Importance of Factors that Deplete Oxygen in Johnson Creek.

Oxygen Demand	As a % of Total D.O. Deficit	
	Minimum	Maximum
SOD	80%	94%
CBOD	5%	12%
Ammonia	1%	8%

The model analysis continued by decreasing the SOD incrementally in the model until the D.O. standard was met in the lower two miles of Johnson Creek from 6 Mile Road down to the confluence with the Walled Lake Branch of the Rouge River. This required reducing SOD by 85 percent. Point source discharges of CBOD and ammonia with individual NPDES permits were not reduced beyond currently permitted levels because the currently permitted levels are already at the maximum treatment level achievable (10 mg/l of $CBOD_5$ and 2 mg/l ammonia as a maximum). This was the scenario from which the TMDL was developed.

The rate of SOD per unit area is dependent upon sediment depth when depth is less than a critical value of 10 to 20 centimeters (USEPA, 1978). The amount of D.O. consumed in a reach from SOD is also dependent upon the surface area that is covered by oxygen demanding sediment. Both of these parameters (sediment depth and areal coverage) can be expected to decrease as suspended solids loads are decreased to a stream. Modeling the fate of suspended solids discharged to Johnson Creek is well beyond the scope of this TMDL and is not necessary since the magnitude of the reduction needed is so large. To achieve an 85 percent reduction in SOD in Johnson Creek, a proportionate reduction in the suspended solids discharges is therefore needed.

SOURCE ASSESSMENT

The pollutant of concern for D.O. in Johnson Creek is suspended solids. For suspended solids, the effect on D.O. is a secondary effect. Suspended solids discharged primarily during high flow conditions settle on the stream bottom and have the greatest adverse effect under low flow conditions. Therefore, suspended solids should be regulated as a monthly average.

Sources of suspended solids to the stream include:

- Point sources with individual NPDES permits.
- Permitted storm water sources, which include facilities and land uses covered by general permits and construction sites covered by Permits-by-Rule.
- Runoff from agricultural, wetlands and forest land.

Collectively, the existing suspended solids load from these sources must be reduced by 85 percent to achieve the D.O. standard from 6 Mile Road downstream to the confluence with the Walled Lake Branch of the Rouge River. A list of individual and general NPDES permits is contained in Appendix B. A list of all 171 construction sites covered by a Permit-by-Rule that occur in the five townships encompassing Johnson Creek is shown in Appendix C. We estimate that approximately 21 of these sites are located in the Johnson Creek watershed. The suspended solids loads from point sources with individual permits were estimated from monitoring data and are presented in Table 3. The loads for $CBOD_5$, ammonia, and D.O. in Table 3 are based on permit limitations.

The suspended solids loads from all sources except those point sources described in the previous paragraph were estimated from 2000 land use data available from the Southeast Michigan Council of Governments and the USEPA's Simple Method model (USEPA, 2001). These loads are presented in Table 3. The Simple Method is an empirical approach for estimating pollutant loadings, using the following equation:

$$L_P = \Sigma_u(P*P_J*R_{VU}*C_U*A_U*2.7/12)$$

Where:

L_P = Pollutant load, lbs.
u = Land use type
P = Precipitation, inches/year
P_J = Ratio of storms producing runoff (default = 0.9)
R_{VU} = Runoff Coefficient for land use type u, $inches_{run}/inches_{rain}$, = 0.05 + (0.9 *$I_U$)
I_U = Percent Imperviousness
C_U = Event Mean Concentration for land use type u, mg/L
A_U = Area of land use type u, acres

Table 3. Johnson Creek Estimated Loads for all Pollutant Sources Covered in the TMDL.

Permit Type or Source		Daily Composite Maximum $CBOD_5$ lb/day	Daily Composite Maximum Ammonia (lbs/day)	Dissolved Oxygen Minimum (mg/l)	Daily Average Suspended Solids (lbs/day)
Individual	Salem Twp	5.8	1.2	8	2.4
Individual	Onyx Arbor Hills	8.3	1.7	7	7.9
General Permit	Diversified Fuels - Northville	Load of oxygen consuming materials not expected			
Industrial		N.A.	N.A.	N.A.	1592
Transportation					10
Commercial		N.A.	N.A.	N.A.	217
Urban Open		N.A.	N.A.	N.A.	108
Residential high density		N.A.	N.A.	N.A.	49
Residential medium density		N.A.	N.A.	N.A.	1577
Agriculture		N.A.	N.A.	N.A.	711
Forest		N.A.	N.A.	N.A.	294
Water and Wetland		N.A.	N.A.	N.A.	111
Total		14.1	2.9	N.A	4680

N.A. = Not applicable because these sources only contribute flow during runoff conditions and the TMDL is based on meeting the D.O. standard under a worst-case scenario of low flow, non-runoff conditions.

ALLOCATIONS

The loading capacity (LC) is 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 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 term LC represents the maximum loading that can be assimilated by the receiving water while still achieving WQS.

<u>WLAs</u>

There are three individual NPDES permitted point source discharges to Johnson Creek. These are the Salem Township Wastewater Treatment Plant (WWTP) (MI0054798), the Onyx Arbor Hills Landfill discharge (MI0045713), and the Michigan Department of Transportation (MDOT) MS4 (MI0057364). The WLAs for these permits are shown in Table 4 (note that the MDOT permit is addressed by the transportation land use category). The WLAs for Salem Township and Onyx Arbor Hills are based on their existing loads.

With the exception of the Diversified Fuels NPDES permitted discharge, the other entities in the WLA are storm water sources covered under NPDES permits under the following land use categories: residential, commercial, industrial, transportation, and urban open. The Diversified Fuels discharge originates from a petroleum cleanup and is not expected to be a source of suspended solids.

LAs

The LAs are shown in Table 4 for agricultural and forest land, and water/wetland. The LAs are 15 percent of the estimated existing loads of suspended solids from these sources.

Table 4 summarizes the existing loads and numeric targets for all sources and all pollutants of concern to the D.O. TMDL.

Table 4. Existing Loads of and Numeric Targets for Suspended Solids for the Johnson Creek D.O. TMDL.

Source Category	Existing Load (lbs/day)	WLA (lbs/day)	LA (lbs/day)	Numeric Target (lbs/day)
Salem Twp. Individual Permit	2.4	2.4		2.4
Onyx Arbor Hills Individual Permit	7.9	7.9		7.9
Diversified Fuels – Northville general permit	0	0		0
Industrial	1592	235.9		235.9
Transportation	10	1.4		1.4
Commercial	217	32.2		32.2
Urban Open	108	16.1		16.1
Residential high density	49	7.3		7.3
Residential medium density	1577	233.6		233.6
Agriculture	711		105.3	105.3
Forest	294		43.5	43.5
Water and Wetland	111		16.5	16.5
Total	**4679.3**	**536.8**	**165.3**	**702.1**

MOS

The MOS accounts for any uncertainty or lack of knowledge concerning the relationship between pollutant loading and water quality. This TMDL uses an implicit MOS due to very conservative assumptions incorporated in D.O. modeling. Background flows and tributary inflows are represented at the 95 percent exceedance summer low flow as determined by the MDEQ, Land and Water Management Division. The summer 95 percent exceedance flow is a stream flow that would be expected only during periods of severe drought. Stream flows would be expected to be this low for only five percent or less of the time during the driest summer month. Michigan WQS (R 323.1090), specify that WQS apply at all flows equal to or exceeding the lowest monthly 95 percent exceedance flow. Similarly, river temperatures are represented at the highest monthly 90 percent occurrence temperature for the summer season. This temperature would be expected to be exceeded only ten percent of the time during the summer months. Such high temperatures result in lower D.O. saturation concentrations and increased rates of in-stream oxygen utilization. The conservative assumptions regarding stream flow and water temperature are the same as those employed in the determination of water quality-based effluent limits in NPDES WLAs at critical design conditions. For design condition TMDL modeling, the Salem Township WWTP and the Onyx Arbor Hills Landfill discharge were represented as discharging their maximum design flows, which would not normally occur. This is an extremely unlikely scenario and further lends to the conservative assumptions of the modeling. A large degree of uncertainty in the D.O. modeling is also removed, as the models used, were calibrated to observed data and verified with an independent set of data.

SEASONALITY

The reduction in suspended solids loads recommended in this TMDL must apply year-round since suspended solids discharged at any time of the year could settle to the stream bottom and exert an oxygen demand during the summer low flow, high temperature period. Consequently, the reduced SOD will also occur year-round. Monitoring and modeling indicates that the summer season represents the most critical conditions for D.O. standard attainment in Johnson Creek. Since this TMDL was developed to meet the D.O. standard in the summer, the D.O. standard will also be met in other seasons without any further reductions of pollutants other than the suspended solids reductions recommended and the existing NPDES permit loads for $CBOD_5$ and ammonia.

MONITORING

Future monitoring will be conducted to assess whether activities implemented under the TMDL result in water quality improvements. This monitoring will be conducted as resources allow. Typically, the MDEQ monitors watersheds in accordance with the five-year NPDES permit review process. D.O. standard attainment will result in the water bodies being removed from the Section 303(d) list, while continued nonattainment will result in further evaluation under the TMDL process.

REASONABLE ASSURANCE ACTIVITIES

Under the NPDES permit program, the Salem Township WWTP and the Onyx Arbor Hill's discharges are required to meet limitations for CBOD, ammonia, and D.O. To ensure meeting these limitations at all times, the facilities typically achieve a much better effluent quality than required by their permits. Any violations of the permit limits are dealt with by a well established compliance and enforcement program administered by the MDEQ's Southeast Michigan and Jackson District Offices.

Erosion from construction sites is regulated under the Soil Erosion and Sedimentation Control (SESC) Program (Part 91, SESC, of the NREPA), by Wayne and Washtenaw Counties. This program aims to reduce sedimentation in rivers, lakes, and streams by controlling sediments in runoff from construction sites greater than one acre in area, or those located within 500 feet of a water of the state. Temporary (silt fences) and permanent control measures (such as vegetated buffer strips) are employed. The MDEQ, Water Bureau, oversees the counties' programs to ensure that they are effectively enforcing SESC regulations.

Johnson Creek is part of the Rouge River watershed, which is the site of a national demonstration project that seeks to restore and protect the Rouge River watershed through pollution control activities that are guided by a watershed management process (RRNWWDP, 2007). Johnson Creek has unusually high water quality for the Rouge River watershed; however, many of the initiatives of the Rouge River project such as identification of illicit connections, erosion control programs, and storm water runoff management will benefit Johnson Creek also.

In an effort to improve the water quality of Johnson Creek and the Rouge River, Northville Township, with help from several other organizations, facilitated the creation of the Johnson Creek Protection Group. In this organization, residents, businesses, and local officials can work together to identify actions in which the community can partake to preserve and restore water quality as well as educate the public regarding their role in this ongoing endeavor. The group mobilizes the public to protect Johnson Creek through hosting educational events and supporting volunteer inventory, restoration, and advocacy work.

The Washtenaw Conservation District serves farmers and landowners in the Johnson Creek watershed, which includes both Washtenaw and Wayne Counties, with conservation planning and erosion control through various programs by providing assistance and educational information related to conservation.

Federal regulations require certain industries to apply for an NPDES permit if storm water associated with industrial activity at the facility discharges into a separate storm sewer system or directly into a surface water. There are three industrial facilities with storm water discharge authorization within the Johnson Creek watershed. Prior to obtaining permit coverage, applicants must certify that they do not have any unauthorized discharges. MDEQ staff conduct inspections of a percentage of permitted, and all regulated, industrial facilities annually. Inspections are utilized to ensure that facilities comply with the regulations, and result in a further reduction in unauthorized discharges and illicit connections. Additionally, as additional facilities obtain industrial storm water permits, more illicit discharges will be eliminated. There are other industrial facilities that have not yet obtained storm water permit authorization.

Within Johnson Creek there are two local jurisdictions that have obtained Phase II municipal separate storm sewer (MS4) permit coverage (see Appendix B). Long-term watershed management plans were developed in 2001 under these permits and implementation of BMPs and other pollution prevention activities are under way. Among other things, these permits require:

1. Watershed planning that specifically addresses any TMDLs in the watershed, including identification of priority problems and opportunities (including any TMDL established for a parameter within the watershed that may be affected by storm water).

2. Development of a Storm Water Pollution Prevention Initiative that contains long-term goals for the watershed (which shall include both the protection of designated uses of the receiving waters as defined in Michigan's WQS, and attaining compliance with any TMDL established for a parameter within the watershed).

Prepared by: John Suppnick, Environmental Quality Analyst
Surface Water Assessment Section
Water Bureau
Michigan Department of Environmental Quality
August 22, 2007

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Appendix A

Low Flow Statistics for Johnson Creek.

Location	Drainage Area (Sq. Mi.)	% Exceedance	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
			Flows in cubic feet per second											
Trib to Johnson Creek at Salem Rd Center of section 14 T 1S, R 7E	3.2	95 %	0.07	0.10	0.14	0.12	0.16	0.54	0.86	0.31	0.10	0.03	0.04	0.06
		50 %	0.42	0.84	1.12	1.05	1.19	3.66	3.54	1.71	0.75	0.35	0.24	0.26
Johnson Creek Downstream of confluence with trib from Salem NW ¼, SE ¼ Sec 15 T 1S, R 7E	8.0	95 %	0.18	0.26	0.36	0.31	0.41	1.36	2.15	0.77	0.24	0.08	0.09	0.14
		50 %	1.05	2.09	2.81	2.64	2.97	9.14	8.86	4.28	1.88	0.87	0.61	0.64
Johnson Creek Downstream of confluence with trb from west SW ¼, SE ¼ Sec 15 T 1S, R 7E	10.1	95 %	0.22	0.33	0.45	0.39	0.52	1.71	2.72	0.97	0.30	0.10	0.11	0.18
		50 %	1.32	2.64	3.54	3.33	3.74	11.54	11.19	5.41	2.37	1.10	0.77	0.81
Johnson Creek Salem Rd SW ¼ 23 T 1S, R 7E	11	95 %	0.24	0.36	0.49	0.42	0.56	1.86	2.96	1.05	0.33	0.11	0.12	0.19
		50 %	1.44	2.88	3.86	3.62	4.08	12.57	12.18	5.89	2.58	1.19	0.84	0.88
Johnson Creek Ridge Rd SE ¼ 18 T1S, R 8E	15	95 %	0.69	0.90	1.12	1.01	1.24	3.03	4.37	1.96	0.85	0.41	0.43	0.59
		50 %	2.48	4.28	5.42	5.15	5.67	14.68	14.29	7.68	3.92	2.15	1.65	1.71
Johnson Creek Beck Rd. SE ¼ 8 T1S, R 8E	22.1	95 %	1.64	2.05	2.45	2.25	2.65	5.33	7.03	3.81	1.95	1.05	1.11	1.44
		50 %	4.58	6.92	8.26	7.95	8.54	17.31	16.97	10.71	6.47	4.10	3.33	3.43
Johnson Creek At confluence with Walled Lk. Branch SE ¼ 3 T1S, R 8E	26.1	95 %	2.19	2.70	3.21	2.96	3.45	6.64	8.54	4.86	2.58	1.42	1.49	1.92
		50 %	5.77	8.42	9.88	9.55	10.18	18.81	18.50	12.44	7.93	5.21	4.29	4.40

Note: These statistics were derived by the MDEQ Land and Water Management Division hydrologists from flow yields observed during 1958 through 2004 at the United States Geological Survey stream flow gage on the Upper Rouge River at Farmington using correlations derived from 11 flow measurements on Johnson Creek at Napier Road and 34 flow measurements on Johnson Creek at Hines Drive.

Appendix B

List of Facilities in Johnson Creek Watershed that have Individual or General Permits.

NAME	Design Flow (MGD)	PERMIT NO.	COUNTY	TOWNSHIP	RECEIVING WATER
Diversified Fuels-Northville	no data	MIG081077	Oakland	Novi	Unnamed tributary of Rouge River
Great Lakes Agg-Northville	NA	MIS210732	Washtenaw	Salem	Johnson Creek
Inch Memorials-Northville	NA	MIS210685	Wayne	Plymouth	Johnson Creek
Oakland Co. Watershed wide Storm water (MS4)	NA	MIG610042	Oakland	--	Johnson Creek
Wayne Co. Watershed wide Storm water (MS4)	NA	MIG610040	Wayne	--	Johnson Creek
Washtenaw Co. Rd. Comm. Watershed wide Storm water (MS4)	NA	MIG610314	Washtenaw	--	Johnson Creek
Washtenaw Co. Drain Comm. Watershed wide Storm water (MS4)	NA	MIG610039	Washtenaw	--	Johnson Creek
MDOT Statewide Storm water (MS4)	NA	MI0057364	Multple	--	Johnson Creek
Northville Schools Jurisdictional Storm water (MS4)	NA	MIS040078	Wayne	Northville	Johnson Creek
Plymouth Twp. Watershed wide Storm water (MS4)	NA	MIG610038	Wayne	Plymouth	Johnson Creek
Salem Twp. Jurisdictional Storm water (MS4)	NA	MIS040068	Washtenaw	Salem	Johnson Creek
Novi Watershed wide Storm water (MS4)	NA	MIG610030	Oakland	Novi	Johnson Creek
Lyon Twp. Watershed wide Storm water (MS4)	NA	MIG610034	Oakland	Lyon	Johnson Creek
Northville MS4-Oakland	NA	MIG610024	Oakland	Novi	Rouge River, Johnson Drain and others
Northville Twp MS4-Wayne	NA	MIG610025	Oakland	Novi	Rouge River, Johnson Drain and others
Onyx Arbor Hills LF	0.10	MI0045713	Wayne	Plymouth	Unnamed tributary to Johnson Creek
Salem Twp WWTP	0.07	MI0054798	Washtenaw	Salem	Unnamed tributary to Johnson Creek
Veolia ES Arbor Hills Landfill	NA	MIS210766	Washtenaw	Salem	Unnamed tributary to Johnson Creek

Appendix C

List of Permit-by-Rule Construction Sites in the Townships Encompassing Johnson Creek.

Facility Location Address	Facility Location City	Facility Location Zip	County	Township Name
Lyon Center Drive	Unknown	0	Oakland	Lyon
Nine Mile Road	Northville	48167	Oakland	Lyon
Pontiac Trail, north of 11 Mile Road	Unknown	0	Oakland	Lyon
10 Mile Road	South Lyon	48178	Oakland	Lyon
31001 Lahser Road	Beverly Hills	48025	Oakland	Lyon
5201 Knobby Hill Drive	Highland	48357	Oakland	Lyon
10 Mile Road	South Lyon	48178	Oakland	Lyon
49397 Shafer Avenue	Wixom	48393	Oakland	Lyon
26740 Pontiac Trail	South Lyon	48178	Oakland	Lyon
51830 Grand River	Wixom	48393	Oakland	Lyon
345 South Warren Street	South Lyon	48178	Oakland	Lyon
51490 Pontiac Trail	Wixom	48393	Oakland	Lyon
345 South Warren	South Lyon	48178	Oakland	Lyon
31731 Northwestern Highway	Farmington Hills	48334	Oakland	Lyon
403b East Grand River Avenue	Brighton	48116	Oakland	Lyon
Napier & 9 Mile Road	Novi	48374	Oakland	Lyon
345 South Warren Street	South Lyon	48178	Oakland	Lyon
Martindale Road & 11 Mile Road	South Lyon	48178	Oakland	Lyon
Lake Street (10 Mile Road)	West Bloomfield	48325	Oakland	Lyon
Beck Road	Wixom	48393	Oakland	Lyon
Eleven Mile Road West of Milford Road	New Hudson	48165	Oakland	Lyon
11 Mile and Martindale Road	South Lyon	48178	Oakland	Lyon
Ten Mile Road at Johns Road	Unknown	0	Oakland	Lyon
Ten Mile and Johns Road	South Lyon	48178	Oakland	Lyon
Ten Mile Road and Currie Road	South Lyon	48178	Oakland	Lyon
Martindale Street	New Hudson	48165	Oakland	Lyon
Pontiac Trail and Nine Mile Road	South Lyon	48178	Oakland	Lyon
Dixboro Road	South Lyon	48178	Oakland	Lyon
Between Spaulding Road and Milford Road	New Hudson	48165	Oakland	Lyon
Eleven Mile Road	New Hudson	48165	Oakland	Lyon
William K Smith Drive	New Hudson	48165	Oakland	Lyon
28140 Lakeview Drive	Wixom	48393	Oakland	Lyon
Milford Road	South Lyon	48178	Oakland	Lyon
South side of Ten Mile Road, East of Currie Road	Unknown	0	Oakland	Lyon
Nine Mile Road (vacant property)	South Lyon	48178	Oakland	Lyon
Ten Mile Road and Matindale Road	New Hudson	48165	Oakland	Lyon

Facility Location Address	Facility Location City	Facility Location Zip	County	Township Name
Coach House Lane	Southfield	48034	Oakland	Lyon
30729 Lyon Center Drive East	New Hudson	48165	Oakland	Lyon
22727 Griswold Road	Unknown	0	Oakland	Lyon
Northwest corner of 10 Mile Road and Milford Road	New Hudson	48165	Oakland	Lyon
Haggerty Road	Novi	48375	Oakland	Lyon
10 Mile Road and Martindale Road	Unknown	0	Oakland	Lyon
55500 Grand River Avenue	New Hudson	48165	Oakland	Lyon
32400 Telegraph Road, Suite 100	Bingham Farms	48025	Wayne	Northville
3005 University Drive, Suite 100	Auburn Hills	48326	Wayne	Northville
30100 Telegraph Road, Suite 366	Bingham Farms	48025	Wayne	Northville
740 Salem Road	Northville	48167	Wayne	Northville
6024 West Maple Road, Suite 106	West Bloomfield	48322	Wayne	Northville
34018 Beacon Street	Livonia	48150	Wayne	Northville
46680 West Seven Mile Road	Northville	48167	Wayne	Northville
1330 Goldsmith	Plymouth	48170	Wayne	Northville
30500 Northwestern Highway, Suite 400	Farmington Hills	48334	Wayne	Northville
30500 Northwestern Highway, Suite 400	Farmington Hills	48334	Wayne	Northville
Southeast corner of Ridge Road & Six Mile Road	Northville	48167	Wayne	Northville
Southeast corner of Ridge Road and Six Mile Road	Northville	48167	Wayne	Northville
46670 Six Mile Road	Northville	48167	Wayne	Northville
Northwest corner of 12 Mile and Dixon Road	Novi	48375	Oakland	Novi
Northwest corner of 12 Mile Road & Dixon Road	Novi	48375	Oakland	Novi
32070 Lahser Road	Beverly Hills	48025	Oakland	Novi
1330 Goldsmith	Plymouth	48170	Oakland	Novi
31731 Northwestern Highway, Suite 250	Farmington Hills	48334	Oakland	Novi
26699 West 12 Mile Road, Suite 200	Southfield	48034	Oakland	Novi
31000 Northwestern Highway, Suite 220	Farmington Hills	48334	Oakland	Novi
Unknown	Farmington Hills	48333	Oakland	Novi
41200 Bridge Street	Novi	48375	Oakland	Novi
45175 West 10 Mile Road	Novi	48375	Oakland	Novi
30500 Northwestern Highway, Suite 400	Farmington Hills	48334	Oakland	Novi
32400 Telegraph Road	Bingham Farms	48025	Oakland	Novi
32400 Telegraph Road	Bingham Farms	48025	Oakland	Novi
1330 Goldsmith	Plymouth	48170	Oakland	Novi

Facility Location Address	Facility Location City	Facility Location Zip	County	Township Name
111 South Telegraph Road	Pontiac	48341	Oakland	Novi
45175 West 10 Mile Road	Novi	48375	Oakland	Novi
39000 Country Club Drive	Farmington Hills	48331	Oakland	Novi
30500 Northwestern Highway, Suite 400	Farmington Hills	48334	Oakland	Novi
7125 Orchard Lake Road, Suite 200	West Bloomfield	48322	Oakland	Novi
31300 Orchard Lake Road, Suite 100	Farmington Hills	48334	Oakland	Novi
41115 Jo Drive	Novi	48375	Oakland	Novi
45380 West 10 Mile Road, Suite 135	Novi	48375	Oakland	Novi
45175 West Ten Mile Road	Novi	48375	Oakland	Novi
39575 Thirteen Mile Road	Novi	48377	Oakland	Novi
30100 Telegraph Road, Suite 220	Bingham Farms	48025	Oakland	Novi
45380 West 10 Mile Road, Suite 135	Novi	48375	Oakland	Novi
30500 Northwestern Highway, Suite 400	Farmington Hills	48334	Oakland	Novi
30500 Northwestern Highway, Suite 400	Farmington Hills	48334	Oakland	Novi
30100 Telegraph Road, Suite 220	Bingham Farms	48025	Oakland	Novi
2617 Beacon Hill Drive	Auburn Hills	48326	Oakland	Novi
39000 Country Club Drive	Farmington Hills	48331	Oakland	Novi
42355 Grand River	Novi	48375	Oakland	Novi
Unknown	West Bloomfield	48325	Oakland	Novi
14200 Breakfast Drive	Redford	48239	Oakland	Novi
30078 Schoenherr, Suite 300	Warren	48088	Oakland	Novi
31300 Orchard Lake Road	Farmington Hills	48334	Oakland	Novi
43700 Expo Drive	Novi	48375	Oakland	Novi
39000 Country Club Drive	Farmington Hills	48331	Oakland	Novi
30500 Northwestern Highway	Farmington Hills	48334	Oakland	Novi
45175 West Ten Mile Road	Novi	48375	Oakland	Novi
45175 West Ten Mile Road	Novi	48375	Oakland	Novi
49232 Hunt Club Court	Plymouth	48170	Oakland	Novi
Unknown	Lansing	48909	<UNKNOWN>	Novi
31550 Northwestern Highway, Suite 200	Farmington Hills	48334	Oakland	Novi
41115 Jo Drive	Novi	48375	Oakland	Novi
Meadowbrook Road	Novi	48375	Oakland	Novi
Northwest corner of 12 Mile Road and Dixon Road	Novi	48375	Oakland	Novi
Meadowbrook Road	Novi	48374	Oakland	Novi
Haggerty Road	Novi	48375	Oakland	Novi
Eight Mile Road and Garfield	Novi	48374	Oakland	Novi
Napier and 12 Mile Roads	Novi	48374	Oakland	Novi
10 Mile Road	Novi	48375	Oakland	Novi

Facility Location Address	Facility Location City	Facility Location Zip	County	Township Name
Grand River Avenue and Wixom Road	Novi	48376	Oakland	Novi
27875 Cabot Drive	Novi	48377	Oakland	Novi
North of Eight Mile Road, Between Garfield Road & Beck Road	Novi	48374	Oakland	Novi
12 1/2 Mile Road	Novi	48375	Oakland	Novi
12 Mile Road	Novi	48375	Oakland	Novi
South of Chattman Road, West of Meadowbrook Road	Novi	48375	Oakland	Novi
Saybrook Court	Novi	48375	Oakland	Novi
Nine Mile Road	Novi	48375	Oakland	Novi
50200 Ten Mile Road	Novi	48374	Oakland	Novi
39450 12 Mile Road	Novi	48377	Oakland	Novi
25500 Meadowbrook Road	Novi	48375	Oakland	Novi
Southwest corner of Grand River and Beck Road	Wixom	48393	Oakland	Novi
Northwest corner of Twelve Mile and Dixon Roads	Novi	48375	Oakland	Novi
Northwest corner of Twelve Mile and Dixon Roads	Novi	48375	Oakland	Novi
Ten Mile Road	Novi	48374	Oakland	Novi
Various	Novi	48375	Oakland	Novi
Southwest corner of Grand River and Beck Road	Novi	48374	Oakland	Novi
Northeast corner of 12 Mile and West Park Drive	Novi	48374	Oakland	Novi
45625 Grand River Avenue	Novi	48375	Oakland	Novi
Northwest corner of 12 Mile Road and Dixon Road	Novi	48375	Oakland	Novi
27500 Novi Road	Novi	48377	Oakland	Novi
Taft Road	Novi	48375	Oakland	Novi
44150 12 Mile Road	Novi	48375	Oakland	Novi
Unknown	Novi	48374	Oakland	Novi
Ten Mile Road and Wixom Road	Novi	48375	Oakland	Novi
51000 Grand River Avenue	Wixom	48393	Oakland	Novi
41787 Grand River Avenue	Novi	48375	Oakland	Novi
41720 and 41750 8 Mile Road	Novi	48375	Oakland	Novi
48201 Grand River Avenue	Novi	48374	Oakland	Novi
Southwest corner of Grand River and Beck Road	Unknown	0	Oakland	Novi
32535 Schoolcraft	Livonia	48150	Oakland	Novi
Nine Mile Road	Novi	48374	Oakland	Novi
North side of Grand River, East of Novi Road	Novi	48374	Oakland	Novi
243 West Grand River	East Lansing	48823	Wayne	Plymouth
243 West Grand River	East Lansing	48823	Wayne	Plymouth
McClumpha Road and Ann	Plymouth	48170	Wayne	Plymouth

Facility Location Address	Facility Location City	Facility Location Zip	County	Township Name
Arbor Road				
Haggerty Road	Plymouth	48170	Wayne	Plymouth
M-14 from Napier Road to Haggerty Road	Plymouth	48170	Wayne	Plymouth
North Territorial Road	Plymouth	48170	Wayne	Plymouth
220 North Smith Street, Suite 300	Palatine	60067	Wayne	Plymouth
45501 Helm Street	Plymouth	48170	Wayne	Plymouth
14270 Livonia Crescent	Livonia	48154	Wayne	Plymouth
15075 Beck Road	Plymouth	48170	Wayne	Plymouth
15000 Haggerty Road	Plymouth	48170	Wayne	Plymouth
Napier Road to Haggerty Road	Plymouth	48170	Wayne	Plymouth
15726 Penderbrook Lane	Northville	48168	Wayne	Plymouth
Five Mile and Sheldon Roads	Northville	48167	Wayne	Plymouth
5 Mile Road and Sheldon Road	Unknown	0	Wayne	Plymouth
East of Sheldon, north of 5 Mile Road	Northville	48167	Wayne	Plymouth
Ridge Road	Northville	48167	Wayne	Plymouth
Ridge Road and 7 Mile Road	Northville	48167	Wayne	Plymouth
Ridge Road, 5 Mile Road, Sheldon Road	Northville	48167	Wayne	Plymouth
40440 Palmer Road	Canton	48188	Wayne	Plymouth
34333 Michigan Avenue	Wayne	48184	Wayne	Plymouth
From Meyers Road to Greenfield Road	Unknown	0	Wayne	Plymouth
Pontiac Trail	South Lyon	48178	Washtenaw	Salem
7 Mile & Chubb Roads	Unknown	0	Washtenaw	Salem
55815 8 Mile Road	Northville	48167	Washtenaw	Salem
5755 Vorhies Road	Ann Arbor	48105	Washtenaw	Salem

Michigan Department of Environmental Quality

Water Bureau

August 2007

Total Maximum Daily Load for *E. coli* for

the Rouge River

Wayne and Oakland Counties, Michigan

CONTENTS

FIGURES

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1.0 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, 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 in the Rouge River, located in Wayne and Oakland Counties, Michigan.

2.0 PROBLEM STATEMENT

The TMDL reach for the Rouge River appears on the Section 303(d) list as:

RIVER ROUGE (MAIN BR.); UPPER BR.; MIDDLE BR.; LOWER BR., BELL BR.; FRANKLIN BR.; EVANS DITCH WBID#: 061305G
County: Oakland/Wayne Size: 91 M
Location: Detroit River confluence u/s (Main River Rouge (u/s to Big Beaver Road); Upper River Rouge (u/s to Rt. 696); Middle Br. River Rouge (u/s to 8 Mile Rd.); Lower Br. (u/s to Beck Road); Bell Br. (u/s to 7 Mile Rd.); Evans Ditch (u/s to Lahser Rd.); and the Franklin Br. (u/s to Big Beaver Rd.)
HUC: 4090004 RF3RchID: 4090004 15
Problem: Fish and macroinvertebrate communities rated poor; pathogens; WQS exceedances for dissolved oxygen (D.O.)
TMDL YEAR(s): 2007 (2011 for D.O.)

The Rouge River was placed on the Section 303(d) list due to impairment of recreational uses as indicated by the presence of elevated levels of *E. coli* (Edly and Wuycheck, 2006). Monitoring data collected by the Michigan Department of Environmental Quality (MDEQ) in 2005 documented exceedances of the WQS for *E. coli* at all sampling locations during the total body contact recreational season of May 1 through October 31. Elevated *E. coli* levels have been observed through the years in sampling conducted on this water body.

3.0 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 is to 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, as a 30-day geometric mean. Compliance shall be based on the geometric mean of all individual samples taken during 5 or more sampling events representatively spread over a 30-day period. Each sampling event shall consist of 3 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 milliliters. Compliance shall be based on the geometric mean of 3 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 milliliters, based on the geometric mean of all of 5 or more samples taken over a 30-day period, nor more than 400 fecal coliform bacteria per 100 milliliters, based on the geometric mean of all of 3 or more samples taken during any period of discharge not to exceed 7 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. This is assumed because *E. coli* are a subset of fecal coliform (American Public Health Association, 1995). Fecal coliform concentrations are substantially higher than *E. coli* concentrations alone when the wastewater of concern is sewage (Whitman, 2001). Therefore, it can reasonably be assumed that there are fewer 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.

Rule 62(2) provides that all surface waters of the state are protected for partial body contact recreation and shall not contain more than a maximum of 1,000 *E. coli* per 100 ml with compliance based on the geometric mean of 3 or more samples, taken during the same sampling event, at representative locations within a defined sampling area. The partial body contact standard will be used in this report for evaluating *E. coli* levels; however, it is not a basis for the TMDL.

The target for this TMDL is 300 *E. coli* per 100 ml expressed as a daily maximum load and concentration from May 1 to October 31 (i.e., daily target). An additional target is 130 *E. coli* per 100 ml as a 30-day geometric mean, expressed as a concentration (e.g., monthly target).

3.1 Linkage Analysis

Determining the link between the *E. coli* concentrations in the Rouge River 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 total body contact recreation WQS for *E. coli* consists of 2 criteria values: a daily maximum of 300 *E. coli* colony forming units (cfu) per 100 ml (daily target) and a 30-day geometric mean of 130 *E. coli* cfu per 100 ml (monthly target). Because the wasteload allocations (WLA) - the loading associated with point source discharges - provided herein are based on the daily target, a linkage analysis is needed to demonstrate these allocations also assure attainment of the monthly target.

The USEPA's development of ambient water quality criteria for bacteria, as contained in the "Ambient Water Quality Criteria for Bacteria – 1986" (USEPA, 1986), defines the statistical relationship between the daily maximum and 30-day geometric mean criteria values. The assumption used to develop the 30-day geometric mean of 126 cfu per 100 ml (rounded to

130 cfu per 100 ml as the Michigan criterion) is a log-normal distribution using a log standard deviation of 0.4. Using this assumption and a comparable recurrence interval (e.g., 30 days), a daily maximum projected from the 30-day geometric mean would be 713 cfu per 100 ml. Conversely, the Michigan daily maximum criterion of 300 cfu per 100 ml is comparable to a 30-day geometric mean of approximately 55 cfu per 100 ml. This relationship provides the basis for demonstrating that attaining the daily target in the TMDL will also achieve the monthly target. A further conservative assumption is the log standard deviation of 0.4. The log standard deviation observed in most riverine systems is generally at least 0.3, and often quite larger (Cleland, 2007). The greater the variability, the more protective the daily maximum is relative to the monthly target.

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 MDEQ believes the sanitary wastewater discharges are in compliance with the daily and monthly targets and the allocations associated with the daily target, 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 (i.e., 8 illnesses per 1,000 swimmers) provided by the fecal coliform indicator level of 200 cfu 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 by these sources.

4.0 DATA DISCUSSION

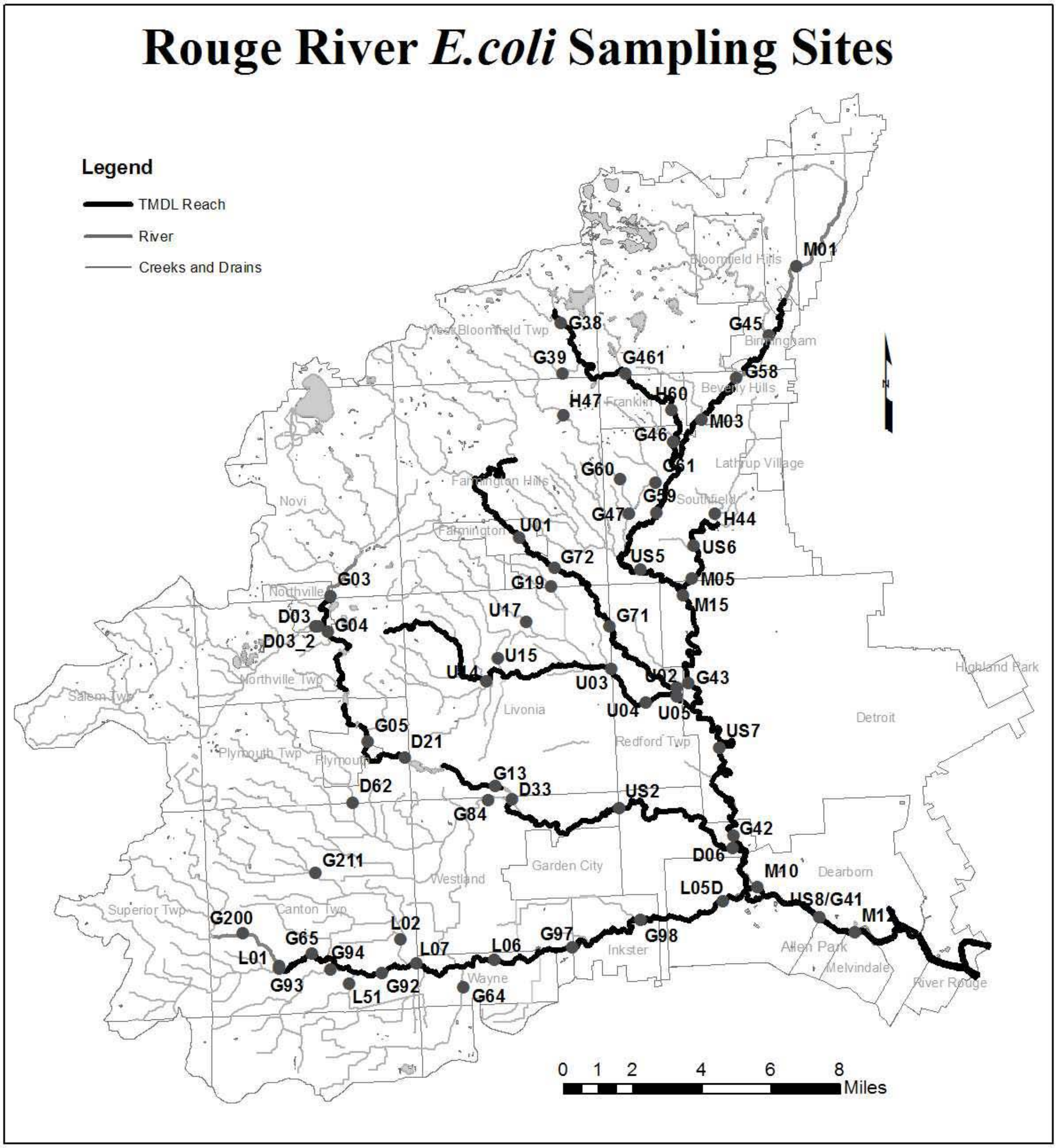
The data discussion is separated into 3 parts:

- Data collected by the MDEQ in 2005 and 2006
- Data collected by the Alliance of Rouge Communities (ARC) and the Wayne County Rouge Program Office (RPO)
- A brief overall summary

4.1 MDEQ 2005 and 2006 Sampling Data

***E. coli* Data.** In 2005 the Section 303(d) listed reaches in the Rouge River watershed were sampled by the MDEQ at 62 locations in Wayne and Oakland Counties (Figure 1). *E. coli* sampling was performed weekly from May through October 2005 consistent with the sampling requirements of Rule 62. To evaluate compliance with the targets, 30-day rolling geometric means and daily geometric means, e.g., daily maximums, were calculated for each location sampled, per Rule 62(1). Figures A-1 through A-20 (Appendix A) and Figures B-1 through B-20 (Appendix B) graphically display the daily maximums and 30-day rolling geometric means, respectively, of *E. coli* levels in the water samples during the total body contact recreational season at all sampling stations. Appendices C, D, E, and F each contain tabular summaries of the sampling locations, sample dates, *E. coli* results (daily maximums and 30-day rolling geometric means) for the Main, Upper, Middle, and Lower Branches of the Rouge River, respectively. Sampling location field IDs in the appendix data refer to the map locations shown in Figure 1.

Figure 1



Rouge River E.coli Sampling Sites
Legend
TMDL Reach
River
Creeks and Drains
M01
G45
Birmingham
G58
Beverly Hills
G38
West Bloomfield Twp
G39
G461
H47
Franklin
H60
M03
G46
G60
G61
Lathrup Village
Farmington Hills
G59
Southfield
G47
H44
Novi
Farmington
U01
US6
US5
G72
M05
G03
Northville
G19
M15
D03
G04
D03_2
U17
G71
U15
Northville Twp
U14
U03
U02
G43
Highland Park
Salem Twp
U04
U05
Livonia
Detroit
US7
G05
Redford Twp
Plymouth Twp
Plymouth
D21
G13
D62
D33
US2
G84
G42
D06
G211
Garden City
Westland
M10
Dearborn
L05D
US8/G41
Superior Twp
Canton Twp
G200
L02
M12
G65
G94
L07
L06
G97
G98
Inkster
Allen Park
L01
Melvindale
Wayne
G93
L51
G92
G64
River Rouge
0 1 2 4 6 8
Miles

Bacterial Source Tracking. To further investigate sources of the *E. coli* detected in samples collected from sites throughout the Rouge River watershed, samples were also collected for human *Bacteroidetes* analysis in 2005 and for human *Bacteroidetes* and human *Enterococcus* analyses in 2006. These DNA-based methods screen for the presence of specific genes in samples suspected of containing human fecal matter. The bacterial source tracking (BST) analyses were conducted by Source Molecular Corporation (Miami, Florida) using the Human *Bacteroidetes* ID™ method and the Human *Enterococcus* ID™ method. A positive result would suggest, but would not conclusively prove, a human source for at least some of the *E. coli* in the samples analyzed. A negative result would suggest, but would not conclusively prove, the absence of human-derived fecal pollution.

Load Duration Curves. Information linking *E. coli* data to potential sources was determined through the calculation of *E. coli* load duration curves (LDCs). LDCs help assess under what streamflow conditions, ranging from low dry weather flows to peak wet weather flows, the daily target is most frequently exceeded (and by how much), giving investigators insight into the possible sources of contaminants. LDCs were developed for each of the Rouge River locations sampled in 2005 using United States Geological Survey (USGS) historical flow data. *E. coli* LDCs developed from MDEQ *E. coli* data collected in 2005 are presented in Appendices G through J. Note that in the LDCs the points above the curve on the left side of the figure are indicative of water quality exceedances of the daily target during wet weather conditions (higher flows) and the points above the curve to the middle and right side of the figure indicate water quality exceedances during midflow to dry weather conditions (lower flows). The calculated LDCs were evaluated for the number and magnitude of exceedances of the daily target under all flow conditions (wet to dry). The target level shown on each figure is the daily maximum criterion of 300 cfu per 100 ml calculated using USGS historical flow data. Summaries of the LDC data are presented in this section.

The remainder of Section 4.1 summarizes the following 3 topics for the Main Rouge, Upper Rouge, Middle Rouge, and Lower Rouge in turn, based on the 2005 and 2006 MDEQ data:

- Daily maximums and 30-day rolling geometric means of *E. coli* concentrations, which are compared with the daily and monthly targets, respectively.
- BST testing to determine linkage to sources.
- LDCs to determine linkage to sources.

4.1.1 Main Rouge

4.1.1.1 Overview. There are high *E. coli* levels in all weather conditions throughout the Main Branch, Franklin Branch, Pebble Creek, and Evans Ditch. Positive results for human sources were obtained in the Main Branch and Evans Ditch in wet weather, Franklin Branch in wet and dry weather, and in Pebble Creek in dry weather.

4.1.1.2 Daily Maximum and 30-Day Rolling Geometric Mean. For the 2005 MDEQ-collected data in the Main Rouge subwatershed, Figures 2 and 3 show the percentages of the daily maximum *E. coli* concentrations that fall into each of the following numeric ranges:

- Less than or equal to 300 cfu per 100 ml (i.e., meeting the daily target)
- Greater than 300 but less than or equal to 1,000 cfu per 100 ml (i.e., meeting the state partial body contact standard)
- Greater than 1,000 cfu per 100 ml

Figure 2 shows the values for the Main Branch (Upper) and Figure 3 shows the values for the Main Branch (Lower), coded to specific sampling locations. On the pie chart at each location, darker shading corresponds with higher *E. coli* levels.

Detailed graphs of the daily maximums for the Main Rouge are shown in Figures A-1 through A-6 in Appendix A. Graphs of the 30-day rolling geometric means for the Main Rouge are shown in Figures B-1 through B-6 in Appendix B. A detailed tabulation of results for each Main Rouge location, showing sampling dates, individual sample results, and calculated means, is included in Appendix C.

There was no compliance with the monthly target in the Main Rouge except at 1 location, Franklin Branch at Middlebelt Road (G38), with a compliance of 41%. Compliance with the daily target ranged from 60% at Franklin Branch at Middlebelt Road (G38) to 0% at Plymouth Road (US7). The percentage of values exceeding 1,000 cfu per 100 ml, the partial body contact standard, ranged from 71% at Plymouth Road (US7) to 0% in the Franklin Branch at Middlebelt Road (G38).

Figure 2

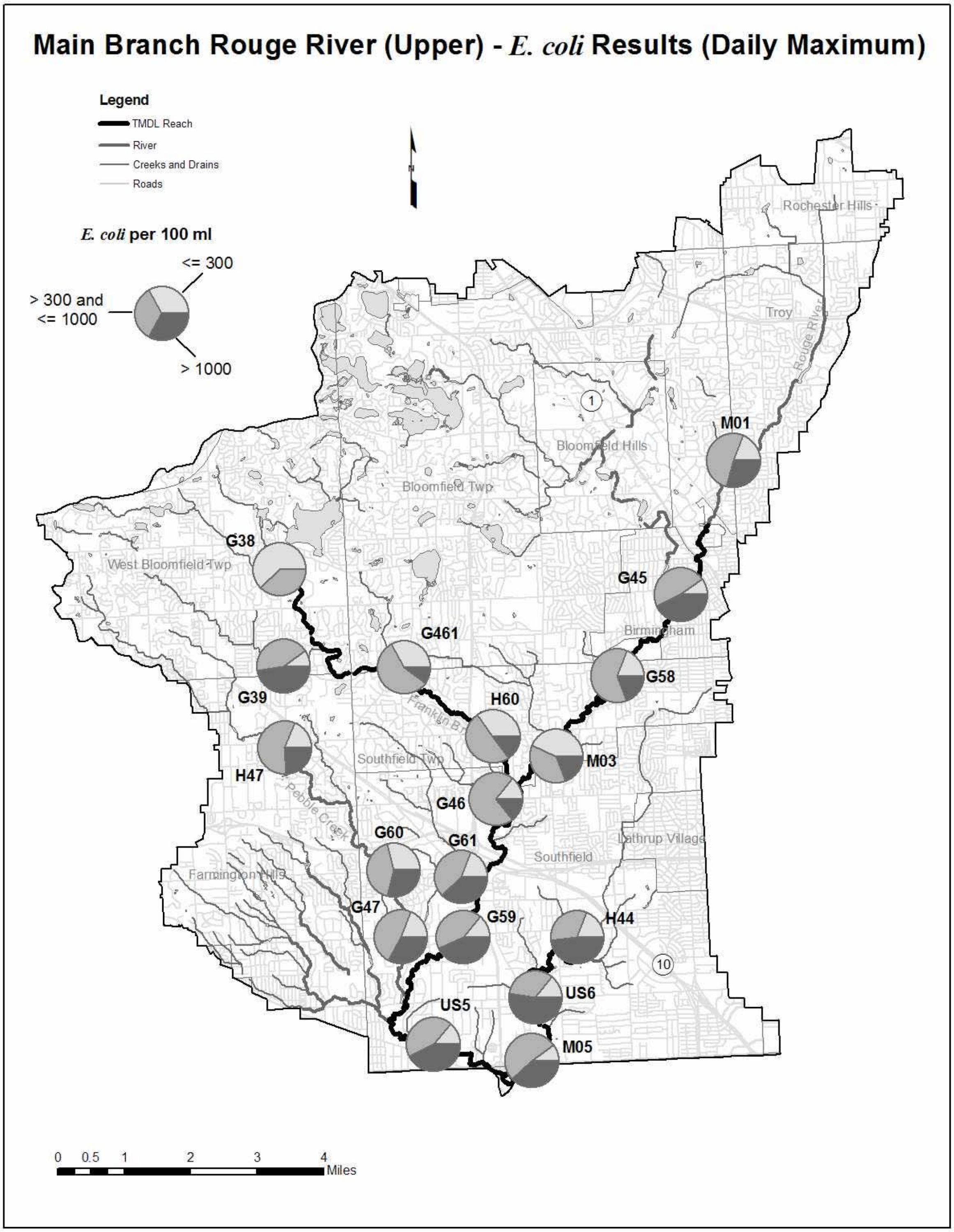
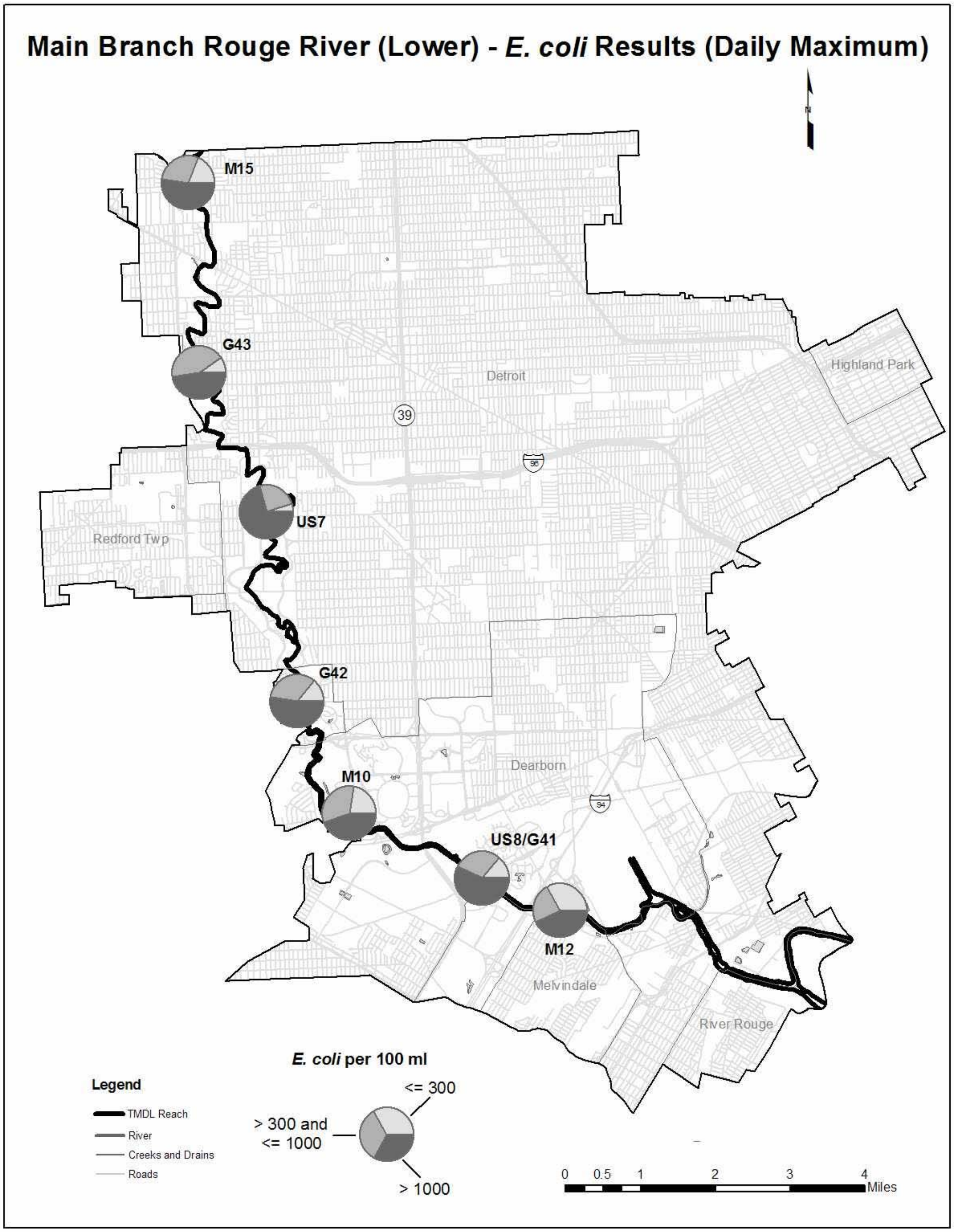

Main Branch Rouge River (Upper) - E. coli Results (Daily Maximum)
Legend
TMDL Reach
River
Creeks and Drains
Roads
E. coli per 100 ml
<= 300
> 300 and <= 1000
> 1000
Rochester Hills
Troy
Rouge River
Bloomfield Hills
Bloomfield Twp
West Bloomfield Twp
Birmingham
Franklin B
Southfield Twp
Pebble Creek
Southfield
Lathrup Village
Farmington Hills
M01
G38
G45
G461
G39
G58
H60
M03
H47
G46
G60
G61
G47
G59
H44
US6
US5
M05
0 0.5 1 2 3 4
Miles

Figure 3


Main Branch Rouge River (Lower) - *E. coli* Results (Daily Maximum)
M15
G43
US7
G42
M10
US8/G41
M12
Detroit
Highland Park
Redford Twp
Dearborn
Melvindale
River Rouge
39
96
94
E. coli per 100 ml
<= 300
> 300 and <= 1000
> 1000
Legend
TMDL Reach
River
Creeks and Drains
Roads
0 0.5 1 2 3 4 Miles

4.1.1.3 Bacterial Source Tracking. Tables 1a and 1b list the Main Rouge locations from which samples were analyzed for human *Bacteroidetes* and/or human *Enterococcus* in 2005 and 2006, the results of these BST analyses, and the concurrent *E. coli* values. Positive results suggesting human-associated bacteria were obtained at Maple Road (G45) in wet weather, the Franklin Branch at Middlebelt between 14 Mile Road and Maple Road (G39) in dry and wet weather, Pebble Creek at Franklin Road (G61) in dry weather, and Evans Ditch at Berg Road (M05) in wet weather. Wet and dry weather upstream human sources might include illicit connections, failing onsite disposal systems, and sanitary sewer overflows (SSOs). Negative results obtained using the Human *Bacteroidetes* ID™ or Human *Enterococcus* ID™ laboratory methodologies do not necessarily mean that human sources of *E. coli* are not present.

Table 1a
2005 Main Rouge River BST Analyses (Bacteroidetes analyses only)

Main Rouge River		2005 SAMPLING RESULTS							
Field ID	Location Description	Date	*E. coli* (cfu/100ml)	Human Bacteroidetes	Dry/Wet Weather	Date	*E. coli* (cfu/100ml)	Human Bacteroidetes	Dry/Wet Weather
G39	Franklin Branch at Middlebelt between 14 Mile and Maple Road	8/9/2005	1,890	Negative	Dry	8/23/2005	628	**Positive**	Dry
G61	Pebble Creek at Franklin Road south of 11Mile Road	8/9/2005	1,715	**Positive**	Dry	8/23/2005	870	Negative	Dry
US6	Evans Ditch at 9 Mile Rd.	8/9/2005	1,931	Negative	Wet	8/23/2005	765	Negative	Dry
M05	Evans Ditch at Berg and 8 Mile Road	9/27/2005	944	Negative	Wet				

Note: Shading indicates no sample collection.

Table 1b
2006 Main Rouge River BST Analyses (Bacteroidetes and Enterococcus analyses)

Main Rouge River		2006 SAMPLING RESULTS							
		Dry Weather				Wet Weather			
Field ID	Location Description	Date	*E. coli* (cfu/100ml)	Human Bacteroidetes	Human Enterococcus	Date	*E. coli* (cfu/100ml)	Human Bacteroidetes	Human Enterococcus
G45/US4	Maple, west of Southfield Road	7/24/2006	340	Negative	Negative	9/12/2006	10,000	Negative	**Positive**
G39	Franklin Branch at Middlebelt between 14 Mile and Maple Road	7/24/2006	820	Negative	Negative	9/12/2006	70,000	**Positive**	Negative
M05	Evans Ditch at Berg and 8 Mile Road	7/24/2006	310	Negative	Negative	9/12/2006	12,000	Negative	**Positive**

4.1.1.4 Load Duration Curves. Table 2 summarizes the results of the LDC analyses from the 2005 Main Rouge data; the curves are in Appendix G. The table shows results for sample locations on the Main Rouge (white rows) and also on its tributaries (shaded). The locations in the table are ordered from upstream to downstream.

Main Rouge (13 locations sampled). The data indicate that exceedances of the daily target were observed in all weather conditions. *E. coli* levels increased in dry weather relative to wet weather at 10 Mile Road (G59), which is downstream of the confluence with the Franklin Branch. Upstream sources in dry weather might include illicit connections, failing on-site disposal systems (OSDS), SSOs, and animal or other waterfowl. From Ann Arbor Trail (G42) to Greenfield Road (M12) *E. coli* levels increased in wet weather conditions. Possible sources could be those described above; however, there are also active combined sewer overflows (CSOs) downstream of 8 Mile Road that are likely contributing to wet weather exceedances.

Franklin Branch (5 locations sampled). Overall there was little change in *E. coli* levels from upstream to downstream. Levels were near the daily target at 4 of the 5 locations. The Franklin

Branch at Middlebelt between 14 Mile Road and 15 Mile Road (G39) had higher *E. coli* levels in all weather conditions than the other locations. Since there are no CSOs in the Franklin Branch, dry and wet weather sources might include illicit connections, failing OSDSs, SSOs, and animal or other waterfowl.

Pebble Creek (4 locations sampled). Overall there was little change in *E. coli* levels from upstream to downstream. There were *E. coli* exceedances of the daily target in all weather conditions; however, the levels were only slightly above the target. Dry and wet weather sources include those suggested for the Franklin Branch.

Evans Ditch (3 locations sampled). Overall there was little change in *E. coli* levels from upstream to downstream. *E. coli* levels exceeded the target in all weather conditions. Dry and wet weather sources include those suggested for the Franklin Branch.

Table 2
2005 Main Rouge Load Duration Curve Evaluation
(Locations are ordered from upstream to downstream)

Main Rouge River		WET WEATHER (High-flow and Moist Conditions)		Mid-Range Flow		DRY WEATHER (Dry and Low-flow conditions)		Weather Condition associated with target exceedances
Field ID	**Location**	**Greater than**	**Percent Less than or Equal to Target**	**Percent Greater than Target**	**than or Equal to Target**	**Greater than**	**Percent Less than or Equal to Target**	**(Dry, Mid-range, Wet, or All)**
M01	Main Rouge at Adams Rd.	50	50	67	33	80	20	All
G45	Main Rouge at Maple Rd.	50	50	80	20	100	0	All
G58	Main Rouge at Riverside Dr.	75	25	50	50	90	10	All
M03	Main Rouge at Lahser Rd.	75	25	33	67	55	45	All
G38	Franklin Branch at Middlebelt between Walnut Lake and 15 Mile Rd.	50	50	33	67	18	82	Wet, Mid
G39	Franklin Branch at Middlebelt between 14 Mile Rd. and 15 Mile Rd.	100	0	60	40	82	18	All
G461	Franklin Branch at Franklin Rd.	75	25	33	67	36	64	All
H60	Franklin Branch at 13 Mile Rd.	100	0	20	80	64	36	Wet, Dry
G46	Franklin Branch at 12 Mile Rd.	50	50	50	50	80	20	All
G59	Main Rouge at 10 Mile Rd. west of Telegraph Rd.	50	50	50	50	85	15	All
H47	Pebble Creek west of Middlebelt and south of 13 Mile Rd.	100	0	17	83	73	27	Wet, Dry
G60	Pebble Creek at 11 Mile Rd.	75	25	50	50	64	36	All
G61	Pebble Creek at Franklin Rd.	75	25	80	20	64	36	All
G47	Pebble Creek at 10 Mile Rd.	100	0	50	50	91	9	All
US5	Main Rouge at Beech Rd.	100	0	50	50	83	17	All
H44	Evans Ditch at Tamarack off 10 Mile Rd.	75	25	50	50	92	8	All
US6	Evans Ditch at 9 Mile Rd.	100	0	50	50	77	23	All
M05	Evans Ditch at Berg Rd.	75	25	50	50	62	38	All
M15	Main Rouge north of 7 Mile Rd. at Bonnie Brook Golf Course	100	0	50	50	77	23	All
G43	Main Rouge at Fenkell Rd.	100	0	50	50	92	8	All
US7	Main Rouge at Plymouth Rd.	100	0	80	20	100	0	All
G42	Main Rouge at Ann Arbor Trail	100	0	80	20	64	36	All
M10	Main Rouge at Ford Mansion	100	0	33	67	73	27	All
US8/G41	Main Rouge at Rotunda Dr.	88	13	75	25	100	0	All
M12	Main Rouge at Greenfield Rd.	75	25	63	38	20	80	Wet, Mid

Shaded rows are tributary to the unshaded row directly below them.

4.1.2 Upper Rouge

4.1.2.1 Overview. There are high *E. coli* levels in all weather conditions throughout the Upper Rouge Branch, Bell Branch, and Tarabusi Creek. Positive results for human sources were obtained in the Upper Rouge Branch, Bell Branch, and Tarabusi Creek in wet weather, but not in dry weather.

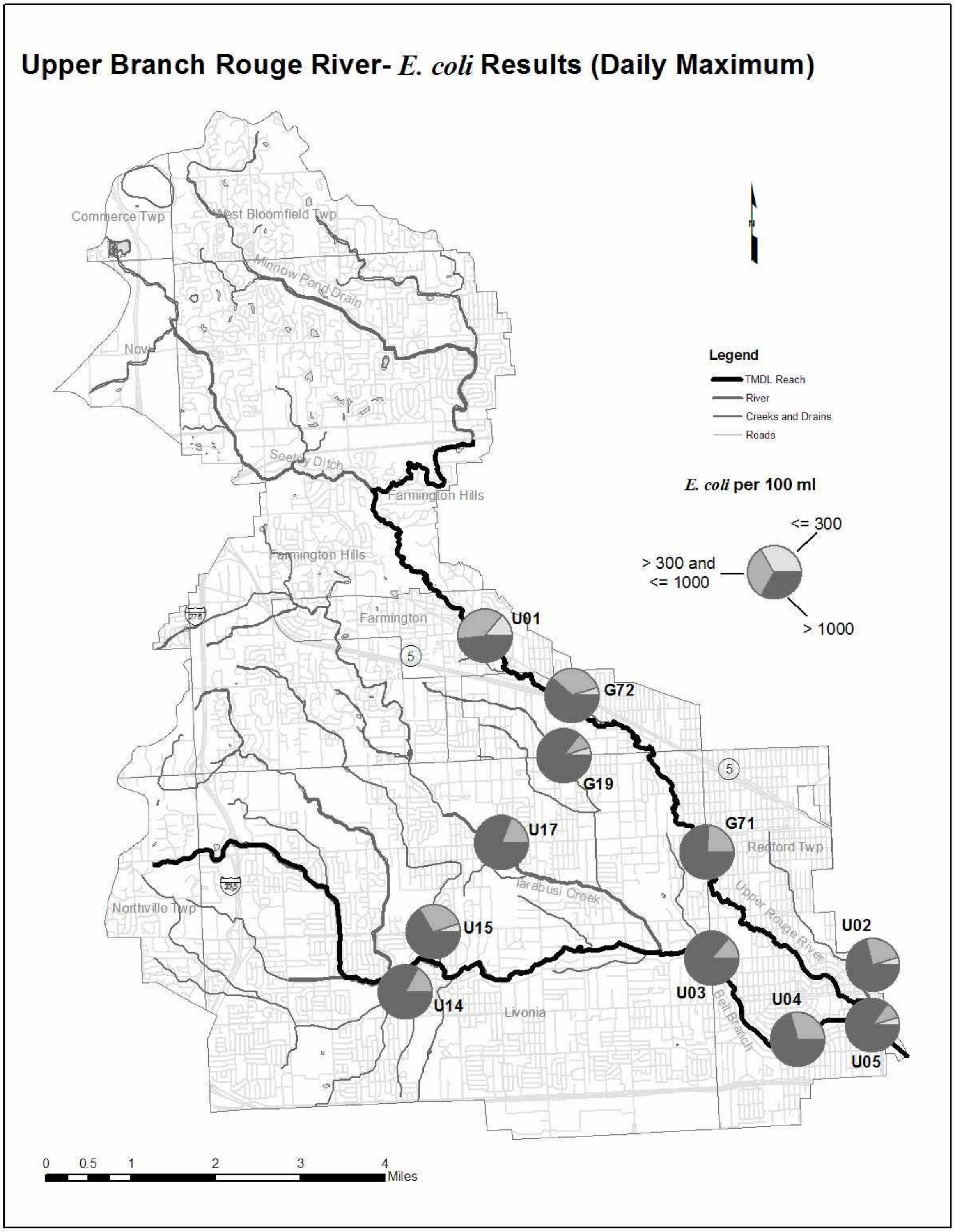
4.1.2.2 Daily Maximum and 30-Day Rolling Geometric Mean. Figure 4 shows, in summarized form, the percentages of the Upper Rouge Branch, Bell Branch, and Tarabusi Creek daily maximum *E. coli* concentrations that fall into each of the following numeric ranges:

- Less than or equal to 300 cfu per 100 ml
- Greater than 300, but less than or equal to 1,000 cfu per 100 ml
- Greater than 1,000 cfu per 100 ml

Detailed graphs of the daily maximums for the Upper Rouge are shown in Figures A-7 through A-10 in Appendix A. Graphs of the 30-day rolling geometric means for the Upper Rouge are shown in Figures B-7 through B-10 in Appendix B. A detailed tabulation of results for each Upper Rouge sampling location is included in Appendix D.

There was no compliance with the monthly target in the Upper Rouge or its tributaries. Only 1 location, the Upper Rouge at Powers Road (U01), complied with the daily target. This location complied with the daily target 10% of the time. The percentage of values exceeding 1,000 cfu per 100 ml, the partial body contact standard, ranged from 86% at 3 locations to 48% at Upper Rouge at Powers Road (U01).

Figure 4


Upper Branch Rouge River- E. coli Results (Daily Maximum)
Commerce Twp
West Bloomfield Twp
Minnow Pond Drain
Novi
Seeley Ditch
Farmington Hills
Farmington Hills
Farmington
Northville Twp
Tarabusi Creek
Livonia
Redford Twp
Upper Rouge River
Bell Branch
U01
G72
G19
G71
U17
U15
U14
U03
U02
U04
U05
Legend
TMDL Reach
River
Creeks and Drains
Roads
E. coli per 100 ml
<= 300
> 300 and
<= 1000
> 1000
0 0.5 1 2 3 4
Miles

4.1.2.3 Bacterial Source Tracking. Tables 3a and 3b list the locations from which samples were analyzed for human *Bacteroidetes* and/or human *Enterococcus* in 2005 and 2006 in the Upper Rouge Storm Water Management Area (SWMA), with the results and the concurrent *E. coli* values. Positive results suggesting human-associated bacteria were obtained during wet weather conditions at Inkster Road (G71), Riverside Drive (U14), 7 Mile Road west of Merriman Road (U17), and at 8 Mile Road and Purlingbrook (G19). Wet weather upstream human sources might include illicit connections, failing OSDSs, and SSOs. There are no CSOs upstream of these locations. Dry weather samples were all negative for human *Bacteroidetes* and *Enterococcus*. Negative results obtained using the Human *Bacteroidetes* ID™ or Human *Enterococcus* ID™ laboratory methodologies do not necessarily mean that human sources are not present.

Table 3a
2005 Upper Rouge River BST Analyses (Bacteroidetes analyses only)

Upper Rouge River		2005 SAMPLING RESULTS							
Field ID	Location Description	Date	*E. coli* (cfu/100ml)	Human Bacteroidetes	Dry/Wet Weather	Date	*E. coli* (cfu/100ml)	Human Bacteroidetes	Dry/Wet Weather
G71	Inkster Road	9/26/2005	2,499	Negative	Wet				
U14	Riverside at Alpine (Bell Branch)	8/12/2005	7,151	Negative	Wet	8/26/2005	1,104	Negative	Dry
G19	Purlingbrook/8 Mile (Tarabusi Creek)	8/12/2005	3,208	Negative	Wet	8/26/2005	400	Negative	Dry

Note: Shading indicates no sample collection.

Table 3b
2006 Upper Rouge River BST Analyses (Bacteroidetes and Enterococcus analyses)

Upper Rouge River		2006 SAMPLING RESULTS							
		Dry Weather				Wet Weather			
Field ID	Location Description	Date	*E. coli* (cfu/100ml)	Human Bacteroidetes	Human Enterococcus	Date	*E. coli* (cfu/100ml)	Human Bacteroidetes	Human Enterococcus
G71	Inkster Road	7/24/2006	1,100	Negative	Negative	9/12/2006	9,600	**Positive**	**Positive**
U14	Riverside at Alpine (Bell Branch)	7/24/2006	1,600	Negative	Negative	9/13/2006	7,700	Negative	**Positive**
U17	7 Mile Road west of Merriman Road (Tarabusi Creek)	7/24/2006	770	Negative	Negative	9/12/2006	13,000	Negative	**Positive**
G19	Purlingbrook/8 Mile (Tarabusi Creek)	7/24/2006	3,100	Negative	Negative	9/12/2006	11,000	**Positive**	**Positive**

4.1.2.4 Load Duration Curves. Table 4 summarizes the results of the LDC analyses from the 2005 Upper Rouge data; the curves are in Appendix H. Most of the CSOs have been controlled in the Upper Rouge. CSOs in the Rouge watershed have been controlled by the installation of retention treatment basins (RTBs) or sewer separation projects in which previously combined sewer systems have been separated into sanitary and storm sewer systems. During wet weather events, RTBs store excess flow until the sewer system can manage the flow to the WWTP. In an extreme wet weather event, the storage capacity of a basin may be exceeded and the excess flow released to the river. The discharge to the river from the basin receives minimal treatment including settling, skimming, and disinfection.

CSOs actively discharge in the downstream end of the Bell Branch below Inkster Road (U03). Table 4 shows results for sample locations on the Upper Rouge mainstem (white rows) and also on its tributaries (shaded). Different levels of shading indicate that Tarabusi Creek, a tributary to Bell Branch (which is itself a tributary), flows into Bell Branch before the Bell's confluence with the Upper Rouge. The locations in the table are listed in order from upstream to downstream. The following general comments about the trend of conditions along the stream reaches are an interpretation of the data in Table 4, and the detailed data in Appendix H.

Upper Rouge (5 locations sampled). *E. coli* levels exceeded the daily target throughout the Upper Rouge in all weather conditions and levels were consistent from upstream to downstream except at U05, where *E. coli* levels were slightly higher in dry weather.

Bell Branch (4 locations sampled). *E. coli* levels exceeded the daily target throughout the Bell Branch and levels were consistent from upstream to downstream, in all weather conditions.

Tarabusi Creek (2 locations sampled in different branches). *E. coli* levels exceeded the daily target in both branches in all weather conditions.

When elevated *E. coli* levels are measured in the Upper Rouge, Bell Branch, and Tarabusi Creek, in dry and wet weather, upstream sources might include illicit connections, failing OSDSs, SSOs, and animal or other waterfowl. Additional sources in wet weather are the CSOs discharging below Inkster Road (U03).

Table 4
2005 Upper Rouge Load Duration Curve Evaluation
(Locations are ordered from upstream to downstream)

Upper Rouge River		WET WEATHER (High-flow and Moist Conditions)		Mid-Range Flow		DRY WEATHER (Dry and Low-flow conditions)		Weather Condition associated with target exceedances
Field ID	Location	Percent Greater than Target	Percent Less than or Equal to Target	Percent Greater than Target	Percent Less than or Equal to Target	Percent Greater than Target	Percent Less than or Equal to Target	(Dry, Mid-range, Wet, or All)
U01	Upper Rouge at Powers Rd.	83	17	100	0	83	17	All
G72	Upper Rouge at Tuck Rd.	100	0	100	0	83	17	All
G71	Upper Rouge at Inkster Rd.	100	0	100	0	92	8	All
U02	Upper Rouge at Graham Rd.	100	0	100	0	91	9	All
U14	Bell Branch at Riverside St.	100	0	100	0	100	0	All
U15	Bell Branch at 6 Mile Rd., west of Farmington	100	0	100	0	83	17	All
U17	Tarabusi Creek at 7 Mile Rd. between Farmington Rd. and Merriman Rd.	100	0	100	0	100	0	All
G19	Tributary to Tarabusi Creek at 8 Mile Rd. and Purlingbrook, east of Orchard Lake Rd.	100	0	100	0	92	8	All
U03	Bell Branch at Inkster Rd. between 5 Mile Rd. and 6 Mile Rd.	100	0	100	0	91	9	All
U04	Bell Branch at Beech Daly Rd. south of 5 Mile Rd.	100	0	100	0	100	0	All
U05	Upper Rouge at Telegraph Rd. north of I-96	100	0	100	0	92	8	All

Shaded rows are tributary to the unshaded row directly below them.

4.1.3 Middle Rouge

4.1.3.1 Overview. The *E. coli* levels in the Middle Rouge and Johnson Creek are worse in wet conditions. Tonquish Creek has high *E. coli* levels in all weather conditions, but the problem appears worse in wet weather. Positive results for human sources were obtained in the Middle Rouge in wet weather and in Tonquish Creek in dry and wet weather.

4.1.3.2 Daily Maximum and 30-Day Rolling Geometric Mean. Figure 5 shows, in summarized form, the percentages of the daily maximum *E. coli* concentrations that fall into the following numeric ranges for the Middle Rouge:

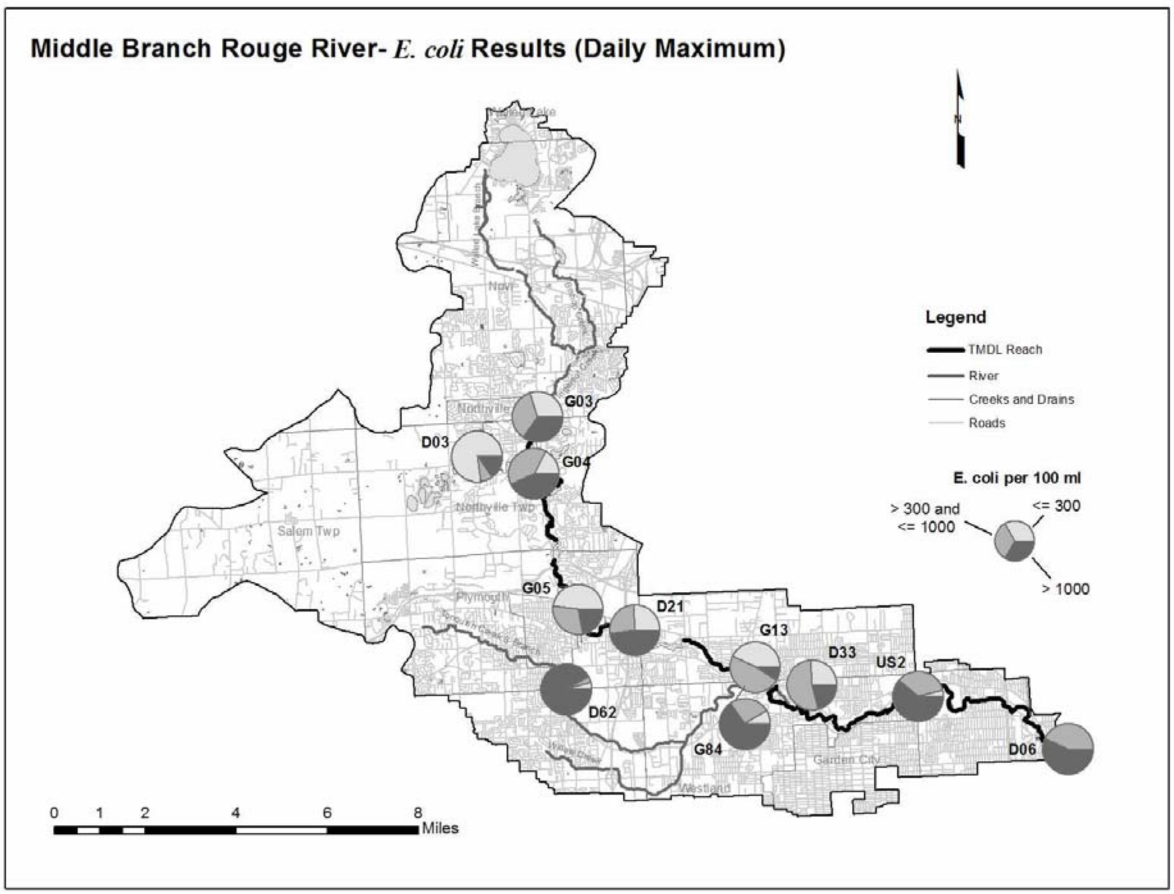
- Less than or equal to 300 cfu per 100 ml
- Greater than 300, but less than or equal to 1,000 cfu per 100 ml

- Greater than 1,000 cfu per 100 ml

Detailed graphs of daily maximums for the Middle Rouge are shown in Figures A-11 through A-14 (Appendix A). Graphs of the 30-day rolling geometric means are shown in Figures B-11 through B-14 (Appendix B). A detailed tabulation of results for each Middle Rouge sampling location is included in Appendix E.

There was compliance with the monthly target only at 3 locations: Johnson Creek at Sheldon Road (D03), Gunsolly Drive (G05), and Hines east of Wayne Road (G13). The 3 locations were in compliance with the monthly target 11%, 5%, and 5% of the time, respectively. Compliance with the daily target ranged from 61% at Johnson Creek at Sheldon Road (D03) to 0% at 3 other locations. The percentage of values exceeding 1,000 cfu per 100 ml, the partial body contact standard, ranged from 91% at Tonquish Creek at Joy Road (D62) to 9% at Hines east of Wayne Road (G13).

Figure 5



4.1.3.3 Bacterial Source Tracking. Tables 5a and 5b list the Middle Rouge locations from which samples were analyzed for human *Bacteroidetes* and/or human *Enterococcus* in 2005 and 2006, along with the BST results and the concurrent *E. coli* values. Positive results suggesting human-associated bacteria were obtained at Old Novi Road, Baseline Road (G03) and Newburgh Lake Inlet (D21) in wet weather, and Tonquish Creek at Joy Road (D62) in dry and wet weather. Wet and dry weather upstream human sources might include illicit connections, failing OSDSs, and SSOs. Negative results obtained using the human *Bacteroidetes* ID™ or human *Enterococcus* ID™ laboratory methodologies do not necessarily mean that human sources are not present.

Table 5a
2005 Middle Rouge River BST Analyses (Bacteroidetes analyses only)

Middle Rouge River		2005 SAMPLING RESULTS			
Field ID	Location Description	Date	*E. coli* (cfu/100ml)	Human Bacteroidetes	Dry/Wet Weather
G03	Old Novi Rd./Baseline	9/28/2005	179	Negative	Wet
D21	Newburgh Lake Inlet, in river near mouth	8/24/2005	201	Negative	Dry
D62	Tonquish Creek at Joy Road west of Lilley	8/24/2005	3,826	Negative	Dry
G84	Tonquish Creek at Wayne Rd.	9/28/2005	1,174	Negative	Wet

Table 5b
2006 Middle Rouge River BST Analyses (Bacteroidetes and Enterococcus analyses)

Middle Rouge River		2006 SAMPLING RESULTS							
		Dry Weather				Wet Weather			
Field ID	Location Description	Date	*E. coli* (cfu/100ml)	Human Bacteroidetes	Human Enterococcus	Date	*E. coli* (cfu/100ml)	Human Bacteroidetes	Human Enterococcus
G03	Old Novi Rd./Baseline					9/12/2006	16,000	**Positive**	Negative
D21	Newburgh Lake Inlet, in river near mouth					9/13/2006	2,500	Negative	**Positive**
D62	Tonquish Creek at Joy Road west of Lilley	7/25/2006	4,900	**Positive**	Negative	9/13/2006	10,000	Negative	**Positive**

Note: Shading indicates no sample collection.

4.1.3.4 Load Duration Curves. Table 6 summarizes the results of the LDC analyses from 2005 Middle Rouge data; the curves are in Appendix I. The locations are listed in order from upstream to downstream. Within the dry weather category, there were no samples collected in low flow conditions in the Middle Rouge. There are several impoundments in the Middle Rouge: a small impoundment upstream of Old Novi Road (G03), none between Old Novi Road (G03) and King's Mill Farm Park Bridge (G04), 3 between King's Mill Farm Park Bridge (G04) and Gunsolly Drive (G05), and none between Gunsolly Drive (G05) and Newburgh Lake Inlet (D21). Hines Drive east of Wayne Road (G13) is downstream of Newburgh Lake (an impoundment) and upstream of Nankin Lake (an impoundment), and Hines at Nankin Lake (D33) is at the downstream end of Nankin Lake. There are no other impoundments in the downstream end of the Middle Branch to the confluence with the Main Branch. Impoundments might cause a reduction in the levels of bacteria through various processes including die-off from exposure to the ultraviolet radiation from the sun, adsorption onto particles and settling out, and a filtering effect from the plants growing in the impoundment. There were some active CSOs in 2005 in the downstream end of the Middle Rouge, 3 of which were controlled in December 2005. There are a few CSOs remaining in the Middle Rouge, but all of the outfalls are now controlled upstream of the location where the Middle Rouge crosses Warren Avenue. The following general comments about the trend of conditions along the stream reaches are an interpretation of Table 6 and the detailed data in Appendix I.

Middle Rouge (8 locations sampled). There was an increase in *E. coli* levels in dry and wet weather conditions from Old Novi Road (G03) to King's Mill Farm Park Bridge (G04) and an increase in all weather conditions from Hines at Nankin Lake (D33) to Inkster Road (US2).

Johnson Creek (1 location sampled). E. coli levels increased greatly under wet weather conditions.

Tonquish Creek (2 locations sampled). E. coli exceedances were measured in all weather conditions. There was little change from upstream to downstream.

When elevated *E. coli* levels are measured in the Middle Rouge, Johnson Creek, and Tonquish Creek, in dry or wet weather, upstream sources might include illicit connections, failing OSDSs, SSOs, and animal or other waterfowl. Additional sources in wet weather are the CSOs discharging in the downstream end of the Middle Rouge.

Table 6
2005 Middle Rouge Load Duration Curve Evaluation
(Locations are ordered from upstream to downstream)

Middle Rouge River		WET WEATHER (High-flow and Moist Conditions)		Mid-Range Flow		DRY WEATHER (Dry and Low-flow conditions)		Weather Condition associated with target exceedances
Field ID	Location	Percent Greater than Target	Percent Less than or Equal to Target	Percent Greater than Target	Percent Less than or Equal to Target	Percent Greater than Target	Percent Less than or Equal to Target	(Dry, Mid-range, Wet, or All)
G03	Middle Rouge at Old Novi Rd./Baseline Rd.	80	20	63	38	22	78	Wet, Mid
D03	Johnson Creek at Sheldon Rd.	80	20	13	88	11	89	Wet
G04	Middle Rouge at King's Mill Farm, Park Bridge - Northville Area Dr.	100	0	63	38	63	38	All
G05	Middle Rouge at Gunsolly Dr. NE of Edward Hines and Plymouth Rd.	100	0	25	75	13	88	Wet
D21	Middle Rouge at Newburgh Lake Inlet, in river near mouth	100	0	63	38	56	44	All
G13	Middle Rouge at Hines E. Wayne (Upstream Nankin)	50	50	63	38	11	89	Wet, Mid
D33	Middle Rouge at Hines/Nankin Lake opposite canoe livery	67	33	80	20	75	25	All
D62	Tonquish Creek at Joy Rd, W. of Lilley	100	0	88	13	100	0	All
G84	Tonquish Creek at Wayne Rd.	100	0	88	13	88	13	All
US2	Middle Rouge at Inkster Rd.	100	0	88	13	67	33	All
D06	Middle Rouge at Hines/Ford Rd.	100	0	100	0	100	0	All

Shaded rows are tributary to the unshaded row directly below them.

4.1.4 Lower Rouge

4.1.4.1 Overview. *E. coli* conditions improve just downstream of the Ypsilanti Community Utility Authority (YCUA) wastewater treatment plant (WWTP) discharge in the upstream end, and worsen downstream of the inflow from Sines Drain, McKinstry Drain, and Fellows Creek. There is an increase in *E. coli* levels downstream where CSOs are still active. Positive results for human sources were obtained in wet weather in the Lower Rouge Branch, Fowler Creek, Sines Drain, and Fellows Creek. Dry weather results were all negative for human sources.

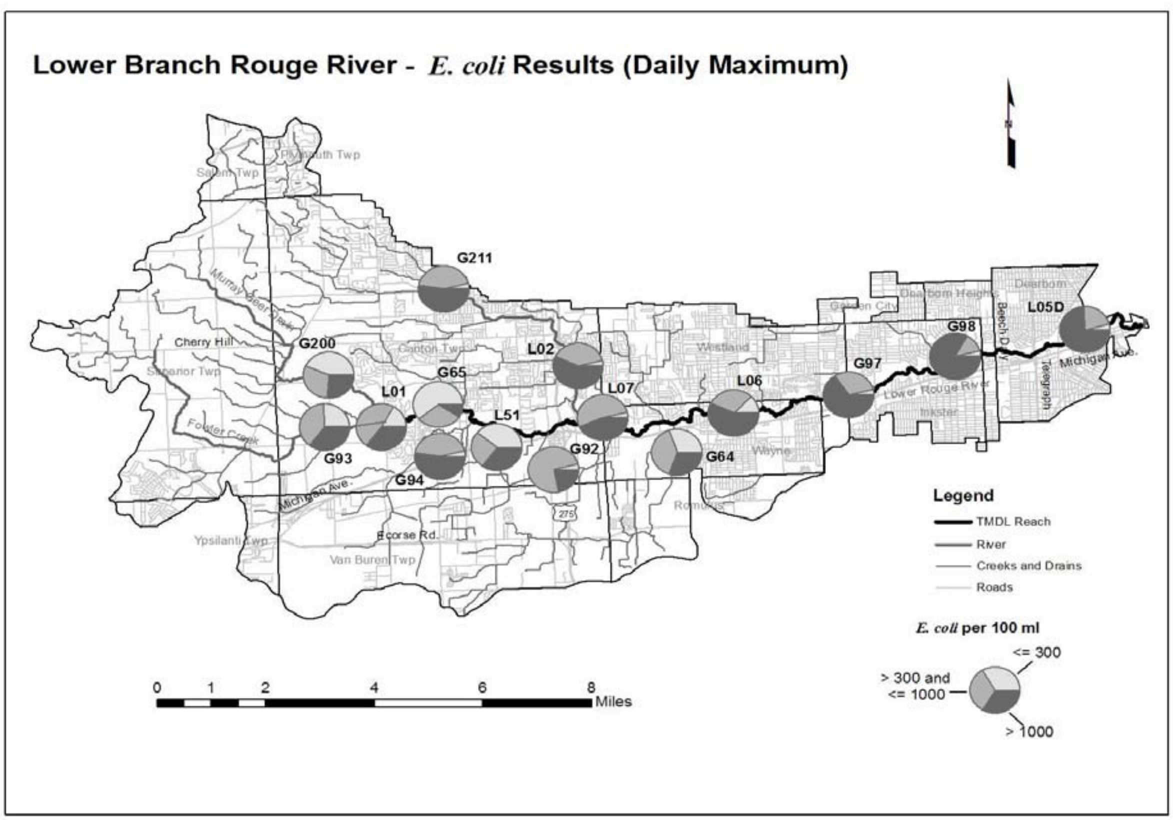
4.1.4.2 Daily Maximum and 30-Day Rolling Geometric Mean. Figure 6 shows, in summarized form, the percentages of the daily maximum *E. coli* concentrations that fall into each of the following numeric ranges for the Lower Rouge:

- Less than or equal to 300 cfu per 100 ml
- Greater than 300, but less than or equal to 1,000 cfu per 100 ml
- Greater than 1,000 cfu per 100 ml

Detailed graphs of the daily maximums for the Lower Rouge are in Figures A-15 through A-20 (Appendix A). Graphs of the 30-day rolling geometric means are in Figures B-15 through B-20 (Appendix B). A detailed tabulation of results, by sampling location, is in Appendix F.

There was compliance with the monthly target only at 2 locations in the Lower Rouge, Denton Road (G200) and Canton Center Road (G65). Both locations complied with the standard 11% of the time. Compliance with the daily target ranged from 59% at the Lower Rouge at Canton Center Road (G65) to 0% at 8 other locations. The percentage of values exceeding 1,000 cfu per 100 ml ranged from 83% at the Lower Rouge at John Daly (G98) to 9% at the Lower Rouge at Canton Center Road (G65).

Figure 6



4.1.4.3 Bacterial Source Tracking. Tables 7a and 7b list the Lower Rouge locations from which samples were analyzed for human *Bacteroidetes* and/or human *Enterococcus* in 2005 and 2006, with the results and the concurrent *E. coli* values. Positive results suggesting human-associated bacteria were obtained at Beck Road (L01), Fowler Creek at Beck Road (G93), Sines Drain at Sheldon Road (G94), and Fellows Creek at Palmer Road (L02). All of these positive results were observed during wet weather. Wet weather upstream sources might include illicit connections, failing OSDSs, and SSOs. All dry weather samples were negative. Negative results obtained using the Human *Bacteroidetes* ID™ or Human *Enterococcus* ID™ laboratory methodologies do not necessarily mean that human sources are not present.

Table 7a
2005 Lower Rouge River BST Analyses (Bacteroidetes analyses only)

Lower Rouge River		2005 SAMPLING RESULTS			
Field ID	Location Description	Date	*E. coli* (cfu/100ml)	Human Bacteroidetes	Dry/Wet Weather
L01	Beck Road	8/25/2005	604	Negative	Dry
G94	Sines Drain at Sheldon Rd.	9/29/2005	1,533	**Positive**	Wet
L02	Fellows Creek at Palmer Road	8/25/2005	1,455	Negative	Dry

Table 7b
2006 Lower Rouge River BST Analyses (Bacteroidetes and Entercoccus analyses)

Lower Rouge River		2006 SAMPLING RESULTS							
		Dry Weather				Wet Weather			
Field ID	Location Description	Date	*E. coli* (cfu/100ml)	Human Bacteroidetes	Human Enterococcus	Date	*E. coli* (cfu/100ml)	Human Bacteroidetes	Human Enterococcus
L01	Beck Road	7/25/2006	710	Negative	Negative	9/13/2006	3,500	Negative	**Positive**
G93	Fowler Creek at Beck Road					9/13/2006	3,000	Negative	**Positive**
L02	Fellows Creek at Palmer Road					9/13/2006	1,000	**Positive**	**Positive**

Note: shading indicates no sample collection.

4.1.4.4 Load Duration Curves. Table 8 summarizes the results of the LDC analyses from the 2005 Lower Rouge data; the curves are in Appendix J. Samples were collected in all flow conditions in the Lower Rouge. In the upstream end of the Lower Rouge, the YCUA WWTP discharges downstream of Beck Road (L01). CSOs are controlled upstream of Henry Ruff Road (G97). There are some CSOs upstream of John Daly Road (G98), and several upstream of Military Road (L05D). Table 8 shows results for locations on the Lower Rouge (white rows) and its tributaries (shaded). The locations are listed in order from upstream to downstream. The following general comments about the trend of conditions are an interpretation of Table 8 and the detailed data in Appendix J.

Lower Rouge (9 locations sampled). There was a slight increase in *E. coli* levels in dry and wet weather conditions between Denton Road (G200) and Beck Road (L01), and a decline in levels in all weather conditions between Beck Road (L01) and Canton Center Road (G65). Canton Center Road (G65) is downstream of the YCUA discharge and this apparent improvement may be from dilution with the discharge. The plant uses ultraviolet light for disinfection so die-off from total residual chlorine in the stream is not a consideration. There was an increase in *E. coli* levels in all weather conditions at Haggerty Road (G92), which is downstream of the confluence with both Sines Drain and McKinstry Drain. Although both drains exceeded the daily target, the severity of the exceedances appears worse in Sines Drain. The *E. coli* exceedances persist at all downstream locations in the Lower Rouge; however, the magnitude of the exceedances increases in the CSO area.

Fowler Creek (1 location sampled). E. coli levels exceeded the daily target in all weather conditions.

Sines Drain (1 location sampled). E. coli levels exceeded the daily target in all weather conditions. In 2005, samples were collected on 23 days from May through October and the geometric mean of the dry weather samples collected was 1,111 cfu per 100 ml. In 2006, dry weather samples were collected on 6 days from May through October, but only 1 sample was collected on each day of sampling. The geometric mean of the samples collected in 2006 was 759 cfu per 100 ml, which indicates an improvement of 32%. A motel was identified in Sines Drain in 2005 that had a failing septic system. The Wayne County Health Department verified the septic system failure using dye testing and required the motel operators to pump and haul the wastewater. Eventually all the buildings were red-tagged (unsafe for human occupation) and the building and windows were boarded. The tanks were pumped out and the discharge pipe removed. Follow-up monitoring performed in 2006 indicated an improvement in *E. coli* levels.

McKinstry Drain (1 location sampled). Exceedances of the *E. coli* daily target were found in all weather conditions.

Fellows Creek (2 locations sampled). Exceedances of the *E. coli* daily target were found at both locations in all weather conditions.

McClaughrey Drain (1 location sampled). E. coli levels above the daily target appear in all weather conditions.

When elevated *E. coli* levels are measured in the Lower Rouge, Fowler Creek, Sines Drain, McKinstry Drain, Fellows Creek, and McClaughrey Drain, in dry or wet weather, upstream sources might include illicit connections, failing OSDSs, SSOs, and animal or other waterfowl. Additional sources in wet weather are the CSOs discharging in the downstream end of the Lower Rouge.

Table 8
2005 Lower Rouge Load Duration Curve Evaluation
(Locations are ordered from upstream to downstream)

Lower Rouge River		WET WEATHER (High-flow and Moist Conditions)		Mid-Range Flow		DRY WEATHER (Dry and Low-flow conditions)		Weather Condition associated with target exceedances
Field ID	Location	Percent Greater than Target	Percent Less than or Equal to Target	Percent Greater than Target	Percent Less than or Equal to Target	Percent Greater than Target	Percent Less than or Equal to Target	(Dry, Mid-range, Wet, or All)
G200	Lower Rouge at Denton Rd	71	29	67	33	46	54	All
L01	Lower Rouge at Beck Rd.	86	14	33	67	77	23	All
G93	Fowler Creek at Beck Rd.	86	14	67	33	83	17	All
G65	Lower Rouge at Canton Center Rd.	57	43	0	100	23	77	Wet
G94	Sines Drain at Sheldon Rd.	86	14	100	0	92	8	All
L51	McKinstry Drain at Michigan Ave, E. of Morton Taylor Rd	57	43	67	33	46	54	All
G92	Lower Rouge at Haggerty Rd.	86	14	100	0	92	8	All
G211	Fellows Creek at Ford Rd, Between Canton Center & Sheldon	100	0	67	33	100	0	All
L02	Fellows Creek at Palmer Rd.	86	14	100	0	100	0	All
US9/L07	Lower Rouge at Hannan Rd.	86	14	100	0	100	0	All
G64	McClaughrey Drain at Annapolis and Treadwell	71	29	100	0	46	54	All
L06	Lower Rouge at Wayne Rd.	86	14	100	0	85	15	All
G97	Lower Rouge at Henry Ruff Rd.	86	14	100	0	100	0	All
G98	Lower Rouge at John Daly Rd.	86	14	100	0	100	0	All
L05D	Lower Rouge at Military Rd.	86	14	100	0	100	0	All

Shaded rows are tributary to the unshaded row directly below them.

4.2 <u>Alliance of Rouge Communities/Rouge Program Office Data</u>

Congress appropriated money through the USEPA to Wayne County, Michigan, for the creation of the Rouge River National Wet Weather Demonstration Project (Rouge Project) in 1992. The restoration of the Rouge River began by focusing on the primary public health pollutant threat, CSOs. CSO controls are being implemented in the Rouge Project through 3 phases as established by NPDES permit:

Phase I: Elimination of raw sewage and the protection of public health for approximately 40% of the combined sewer area.

Phase II: Elimination of raw sewage and the protection of public health for the remaining combined sewer area.

Phase III: Meet WQS in the Rouge River.

Six communities separated their sewers and 8 communities constructed 10 RTBs under Phase I. A CSO work group was formed in 1999 to compile information on the success of the individual RTBs and to propose the level of treatment that would be considered adequate. The

CSO work group was comprised of members from the MDEQ, the RPO, and from each jurisdiction that constructed a RTB.

The RTBs capture most wet weather flows for later conveyance to the Detroit Publicly-Owned Treatment Work for treatment. CSO pollutant loads to the river have been cut by 90 to 100% during most wet weather events. Flows from very large wet weather events that are not captured by the RTBs receive screening, skimming, settling, and disinfection prior to discharge. These CSO control projects have effectively eliminated or controlled the discharge of untreated sewage from approximately half of the watershed CSOs. The completed basins are controlling overflows at a rate of approximately 4 billion gallons per year resulting in improved water quality, aesthetic improvements, and increased recreational usage in the Rouge River.

The RPO and the ARC conduct a sampling and monitoring program of the Rouge River, which includes physical, chemical, and biological monitoring (including *E. coli*). The program began over 10 years ago to measure progress as various projects and activities were implemented throughout the watershed. Sampling and monitoring has been performed every year since the program began and is divided into two monitoring efforts, extensive watershed-wide monitoring from 1994 to 2002 and less extensive monitoring under the Five-Year Monitoring Plan that started in 2003 and continues through 2007. Both monitoring efforts include water quality sampling in the 7 SWMAs. The 7 SWMAs are made up of numerous communities (or parts thereof) as follows:

- The Main 1-2 SWMA includes the communities of Auburn Hills, Beverly Hills, Bingham Farms, Birmingham, Bloomfield Hills, Bloomfield Township, Farmington, Farmington Hills, Franklin, Lathrup Village, Oak Park, Orchard Lake, Pontiac, Rochester Hills, Southfield, Southfield Township, Troy, and West Bloomfield (Rouge River Main 1-2 Subwatershed Advisory Group [SWAG], 2001).

- The Main 3-4 SWMA includes the communities of Allen Park, Dearborn, Dearborn Heights, Detroit, Highland Park, Melvindale, Redford Township, and River Rouge (Rouge River Main 3-4 SWAG, 2001).

- The Upper SWMA includes the communities of Commerce Township, Farmington, Farmington Hills, Livonia, Northville Township, Novi, Redford Township, and West Bloomfield Township (Rouge River Upper SWAG, 2001).

- The Middle 1 SWMA is located in western Wayne County, eastern Washtenaw County, and southern Oakland County. The area is made up of parts of Canton Township, Commerce Township, Farmington Hills, Livonia, Lyon Township, Northville, Northville Township, Novi, Plymouth, Plymouth Township, Salem Township, Walled Lake, and Wixom (Rouge River Middle 1 SWAG, 2001).

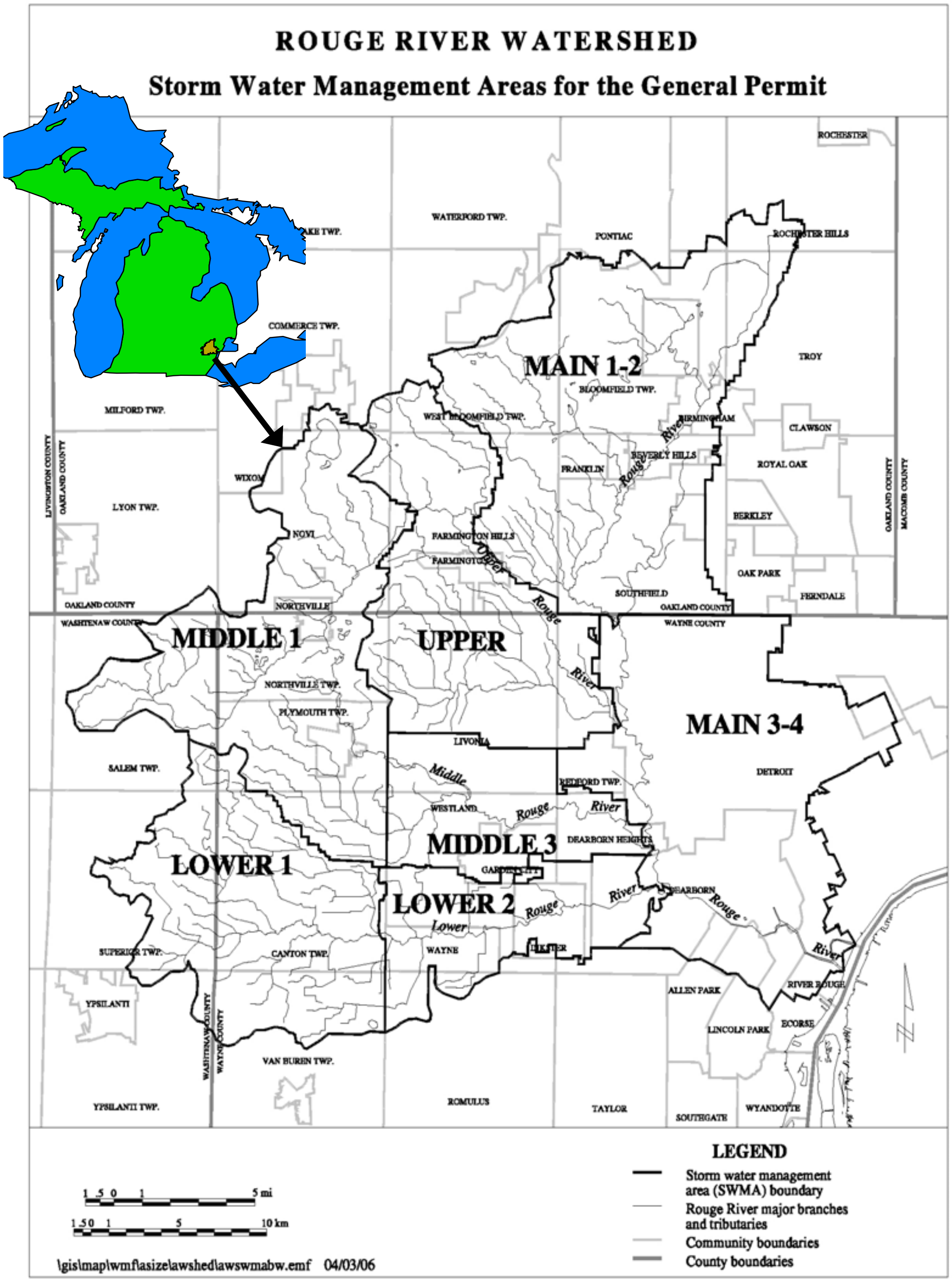
- The Middle 3 SWMA includes the communities of Dearborn Heights, Garden City, Livonia, and Westland (Rouge River Middle 3 SWAG, 2001).

- The Lower 1 SWMA includes the communities of Canton, Plymouth Township, Salem Township, Superior Township, Van Buren Township, and Ypsilanti Township (Rouge River Lower 1 SWAG, 2001).

- The Lower 2 SWMA includes the communities of Dearborn, Dearborn Heights, Garden City, Inkster, Romulus, Wayne, and Westland (Rouge River Lower 2 SWAG, 2001).

Figure 7 shows the Rouge River watershed 7 SWMAs designated as Main 1-2, Main 3-4, Upper, Middle 1, Middle 3, Lower 1, and Lower 2.

Figure 7


ROUGE RIVER WATERSHED
Storm Water Management Areas for the General Permit
MAIN 1-2
MIDDLE 1
UPPER
MAIN 3-4
MIDDLE 3
LOWER 1
LOWER 2
ROCHESTER
WATERFORD TWP.
PONTIAC
ROCHESTER HILLS
COMMERCE TWP.
TROY
BLOOMFIELD TWP.
WEST BLOOMFIELD TWP.
BIRMINGHAM
CLAWSON
MILFORD TWP.
WIXOM
FRANKLIN
BEVERLY HILLS
ROYAL OAK
LYON TWP.
NOVI
FARMINGTON HILLS
FARMINGTON
BERKLEY
OAK PARK
SOUTHFIELD
FERNDALE
OAKLAND COUNTY
WASHTENAW COUNTY
NORTHVILLE
WAYNE COUNTY
LIVINGSTON COUNTY
MACOMB COUNTY
NORTHVILLE TWP.
PLYMOUTH TWP.
LIVONIA
SALEM TWP.
DETROIT
REDFORD TWP.
WESTLAND
DEARBORN HEIGHTS
GARDEN CITY
DEARBORN
WAYNE
INKSTER
SUPERIOR TWP.
CANTON TWP.
ALLEN PARK
RIVER ROUGE
YPSILANTI
LINCOLN PARK
ECORSE
VAN BUREN TWP.
YPSILANTI TWP.
ROMULUS
TAYLOR
SOUTHGATE
WYANDOTTE
Upper Rouge River
Middle Rouge River
Lower Rouge River
Rouge River
LEGEND
Storm water management area (SWMA) boundary
Rouge River major branches and tributaries
Community boundaries
County boundaries
1 .5 0 1 5 mi
1.5 0 1 5 10 km
\gis\map\wmf\asize\awshed\awswmabw.emf 04/03/06

The Five-Year Monitoring Plan calls for a rotational schedule of intermittent sampling and monitoring of at least 3 dry weather locations and at least 1 wet weather location in each SWMA over this 5-year period. The wet weather location(s) selected is/are not necessarily the same as the dry weather locations and locations may vary from the 1994 to 2002 sampling locations.

Only 1 sample at each location was collected for *E. coli* testing per sampling event, which is not in compliance with state standard sample collection procedures for *E. coli* requiring 3 samples per location. Consequently, although *E. coli* results cannot be directly compared to the targets, they can still provide valuable information indicating improvements or degradation in *E. coli* levels.

4.2.1 ARC/RPO E. coli Data Discussion, 1994-2005

Trend analyses were performed in 2002 on the data collected from 1994 through 2002. In addition, updated trend analyses were developed where sample sites from the 1994-2002 and five-year monitoring efforts are comparable. The trend analyses performed in 2002 on *E. coli* levels throughout the watershed generally showed improvement directly downstream of most watershed improvement projects, particularly downstream of now-controlled CSOs during wet weather. Additionally, some locations were identified where *E. coli* concentrations may be increasing. These sites are generally located near the headwaters or in areas still influenced by CSOs. Although improving, most locations are still not meeting the targets or the partial body contact recreation standard. A brief summary of the *E. coli* trend analyses for each of the SWMAs, and additional general discussion regarding the data collection from the two monitoring efforts, follows below. Recent data analyses performed by the ARC and the RPO are presented in the *Rouge River Ecosystem Monitoring and Assessment Report,* produced yearly and accessible at http://www.rougeriver.com.

4.2.1.1 Main Rouge (Main 1-2 SWMA and Main 3-4 SWMA)

Main 1-2 SWMA

A sewer separation project in Bloomfield Hills and the construction of the Birmingham (December 1997), Bloomfield Village (December 1997), and Acacia Park (January 1997) RTBs have controlled all known CSOs in the Main 1-2 SWMA. The trend analyses of *E. coli* data collected from 1994 through 2002 at 10 locations in the Main 1-2 SWMA showed improvement in the Main 1-2 SWMA in both dry and wet weather, with substantial improvement occurring directly downstream of now-controlled CSOs, particularly during wet weather. However, analyses of the *E. coli* data at the same locations showed that, in general, the targets and the partial body contact recreation standard were exceeded (RPO, 2004a).

Five-Year Monitoring Plan sampling in 2004 showed that the targets were not met in dry weather conditions that year. In addition, all of the 2004 wet weather event geometric means exceeded the partial body contact standard of 1,000 cfu per 100 ml for *E. coli* (RPO, 2005).Trend analyses performed on dry weather data from the combined 1994-2002 and Five-Year Monitoring Plan efforts, where comparable stations existed, showed improvement at 2 locations and no statistically significant change at the third location. A trend analysis was not performed on the combined 1994-2002 and five-year wet weather monitoring data because comparable locations were not sampled.

Main 3-4 SWMA

As the most downstream SWMA in the Rouge watershed, the Main 3-4 SWMA may be influenced by improvement activities completed in all Rouge SWMAs, in addition to those within the Main 3-4 SWMA. A sewer separation project in Bloomfield Hills and the construction of the Birmingham (December 1997), Bloomfield Village (December 1997), and Acacia Park (January 1997) RTBs have controlled all known CSOs in the Main 1-2 SWMA. Construction of the 7 Mile (December 1998), Puritan Fenkell (February 1999), and Hubbell Southfield (February 1999) RTBs have partially controlled the known CSOs in the Main 3-4 SWMA. Sewer separation projects in Garden City, Livonia, Plymouth Township, Wayne, and Westland and the construction of the Redford (January 1997), Dearborn Heights (June 1997), and Inkster (January 1997) RTBs have partially controlled the known CSOs in the Upper, Middle, and Lower SWMAs.

Trend analyses of the *E. coli* geometric means from 1994 through 2002 at 7 locations in the Main 3-4 SWMA showed improving conditions or no statistically significant change at most sites evaluated under both dry and wet weather conditions. In general, *E. coli* bacteria levels have been above the targets and partial body contact recreation standard. Much of the Main 3-4 SWMA is still influenced by uncontrolled CSOs (RPO, 2004a).

4.2.1.2 Upper Rouge

Construction of the Redford (January 1997) RTB has partially controlled CSOs in the Upper SWMA. However, there are still some uncontrolled CSOs along the Bell Branch. Trend analyses of the *E. coli* geometric means at 8 locations from 1994 through 2002 showed either no trend or an improving trend in both dry and wet weather conditions. In general, *E. coli* levels were above the targets and partial body contact recreation standard (RPO, 2004a).

Five-Year Monitoring Plan sampling in 2004 showed that in dry weather the total body contact recreation targets were not met. Trend analyses performed on dry weather data from the combined 1994-2002 and Five-Year Monitoring Plan efforts, where comparable stations existed, showed no change at 2 locations. A degrading condition was calculated at the third location. This location is in close proximity to a septic system that was discovered in December 2004 and in need of repair. It is not known how long the system was failing or if discharge from it reached the river. Repairs were made in May 2005. A trend analysis using the combined 1994-2002 and Five-Year Monitoring Plan wet weather data showed an improving trend for *E. coli* at the one location sampled. However, the *E. coli* wet weather location geometric means in 2004 still exceeded the partial body contact standard (RPO, 2005).

4.2.1.3 Middle Rouge (Middle 1 SWMA and Middle 3 SWMA)

Middle 1 SWMA

Sewer separation projects in Plymouth Township have eliminated all uncontrolled CSOs in the Middle 1 SWMA. Trend analyses of the *E. coli* geometric means from 1994 through 2002 at 8 locations showed either no trend or an improving trend for both wet and dry weather conditions at most locations; however, even though *E. coli* levels in the Middle 1 were better than for most of the SWMAs in the Rouge watershed, there were still a substantial percentage of measurements above the targets and partial body contact recreation standard (RPO, 2004a).

Five-Year Monitoring Plan sampling in 2005 showed that in dry weather the state standard for total body contact recreation was not met. Trend analyses of the combined 1994-2002 and Five-Year Monitoring Plan data were performed on the dry weather data from 1994 through 2005 and no change in conditions was calculated at 2 locations. An improving condition was calculated at the third. A trend analysis performed on the wet weather data showed an improving trend for *E. coli;* however, all of the *E. coli* wet weather location geometric means in 2005 still exceeded the partial body contact standard of 1,000 cfu per 100 ml. Overall, concentrations of *E. coli* bacteria have remained high in the Middle 1 SWMA, although some improvements were observed in wet weather (RPO, 2007).

Middle 3 SWMA

Sewer separation projects in Plymouth Township, Westland, Garden City, and Livonia and the construction of the Dearborn Heights (June 1997) RTB have partially controlled the CSOs in the Middle 3 SWMA. However, there are still some uncontrolled CSOs towards the downstream end of this SWMA. Trend analyses of the dry and wet weather *E. coli* geometric means at 10 locations from 1994 through 2002 showed either no trend or an improving trend except at 4 locations. Wayne County Department of the Environment illicit discharge investigation activities indicated that some of these locations were influenced by illicit discharges to storm sewers upstream of the locations and that these discharges have since been addressed. Analyses of the *E. coli* data collected from 1994 through 2002 at these 10 locations in the Middle 3 SWMA showed that, in general, *E. coli* levels have been above the targets and partial body contact recreation standard (RPO, 2004a).

Five-Year Monitoring Plan sampling in 2005 showed that the total body contact recreation target was not met in dry weather. Trend analyses were performed on the combined 1994-2002 and Five-Year Monitoring Plan dry and wet weather data collected between 1994 and 2005. In dry weather, no change in conditions was calculated at 2 locations and an improving condition was calculated at the third. A trend analysis performed on the wet weather data showed no significant change in *E. coli* levels. All *E. coli* wet weather location event geometric means in 2005 exceeded the partial body contact standard of 1,000 cfu per 100 ml. These locations are downstream of uncontrolled CSOs, some of which were controlled after the 2005 sampling season. Overall, concentrations of *E. coli* bacteria remained high in the Middle 3 SWMA (RPO, 2007).

4.2.1.4 Lower Rouge (Lower 1 SWMA and Lower 2 SWMA)

Lower 1 SWMA

All sampled locations in the Lower 1 SWMA are upstream of known CSOs. Trend analyses of the dry and wet weather *E. coli* geometric means at 5 locations sampled from 1994 through 2002 showed either no trend or an improving trend, except at 1 upstream location. In general, *E. coli* bacteria levels have been above the state WQS for both total and partial body contact recreation (RPO, 2004a).

Lower 2 SWMA

Sewer separation projects in Wayne and the construction of the Inkster RTB (January 1997) have partially controlled the CSOs in the Lower 2 SWMA. However, there are still many uncontrolled CSOs towards the downstream end of this SWMA. Trend analyses of the dry and wet weather *E. coli* geometric means at 4 locations from 1994 through 2002 showed either improving trends or no trends. Three locations showed substantial improvement, particularly during wet weather. Overall, concentrations of *E. coli* bacteria have improved in the Lower 2 SWMA, particularly directly downstream of the sewer separation projects in Wayne and the Inkster RTB; however, levels were generally above the state WQS for both total and partial body contact recreation (RPO, 2004a).

4.2.2 Load Duration Curves from ARC/RPO 1994–2004 Data

The ARC and the RPO collected *E. coli* data suitable for LDC development from 1994 to 2004. LDCs were prepared using the ARC/RPO *E. coli* data and historical USGS flow data to evaluate progress during significant phases of CSO control and other best management practices (BMPs) in the Rouge River watershed (see Appendix K). The ARC/RPO data were divided into 3 time periods: 1994 through 1996, 1997 through 1999, and 2000 through 2004. A baseline sampling and monitoring program was conducted from 1994 through 1996, prior to the completion of CSO RTBs and sewer separation projects. This period provides baseline data for the LDCs. During the second period, 1997 through 1999, most of the Phase I CSO RTBs became operational and sewer separation projects were completed. Therefore, significant progress was made in CSO control. Additionally, illicit discharge correction programs were being implemented, public education and information programs had begun, and other BMPs were being implemented. From 2000 through 2004 all of the Phase I CSO control projects were completed, with the exception of the Dearborn CSOs, which are currently under construction. Phase II CSO control is currently in various stages of planning, design, and construction. The LDCs prepared using the ARC/RPO data (Appendix K) were compared with the LDCs prepared using the 2005 MDEQ data (Appendix G) to produce Tables 9 through 12. These tables summarize changes over time that correspond to the time periods in the LDCs at select locations in each branch. Figure 1 in Section 4.1 shows the locations for field IDs in Tables 9 through 12.

Table 9

Main Rouge River Chronological Summary from ARC/RPO and MDEQ Data Load Duration Curves

Main Rouge River					
Field ID	From	To	WET WEATHER (High-flow and Moist Conditions)	Mid-Range Flow	DRY WEATHER (Dry and Low-flow conditions)
Maple Road (G45)	1994-1996	1997-1999	Improvement in all weather conditions, results approaching daily target.		
	1997-1999	2000-2004	Continuing improvement in all weather conditions, most results near the daily target.		
	2000-2004	2005	Little change in all weather conditions, results remain near the daily target		
Lahser (M03)	1994-1996	1997-1999	Too few samples collected from 1994-1996 to compare to 1997-1999.		
	1997-1999	2000-2004	Some improvement from 1997-1999 to 2005 in all weather where most results are near the daily target		
	2000-2004	2005			
Beech Road (US5)	1997-1999		No *E. coli* data were collected.		
	1994-1996	2000-2004	Little change in wet and mid-range conditions where most results do not exceed the daily target		Significant improvement in dry conditions where most results are near the daily target.
	2000-2004	2005	Slight worsening in wet condition, results exceed daily target.	Little change in mid-range and dry conditions, where most results remain near daily target.	
Plymouth Road (US7)	1994-1996	1997-1999	Too few samples collected from 1994-1996 to compare to 1997-1999.		
	1997-1999	2000-2004	Some improvement in wet and mid-range conditions, results are near the daily target.		Little change in dry conditions, where most results approaching daily target.
	2000-2004	2005	Little change in all weather conditions, results approaching daily target		

Table 10

Upper Rouge River Chronological Summary from ARC/RPO and MDEQ Data Load Duration Curves

Upper Rouge River					
Field ID	From	To	WET WEATHER (High-flow and Moist Conditions)	Mid-Range Flow	DRY WEATHER (Dry and Low-flow conditions)
Telegraph Road (U05)	1994-1996	1997-1999	No obvious change from 1994-1996 to 1997-1999 in all conditions, results typically exceed daily target.		
	1997-1999	2000-2004	Some improvement in wet conditions, results exceed daily target.	Slight worsening in mid-range and dry conditions, some results exceed daily target, but several results at or below the daily target.	
	2000-2004	2005	Slight worsening in moist and mid-range flow conditions.		Not much change in dry conditions and no previous data to compare in low flow conidtion.

Table 11
Middle Rouge River Chronological Summary from ARC/RPO and MDEQ Data Load Duration Curves

Middle Rouge River					
Field ID	**From**	**To**	**WET WEATHER (High-flow and Moist Conditions)**	**Mid-Range Flow**	**DRY WEATHER (Dry and Low-flow conditions)**
Hines/Ford Road (D06)	1994-1996	1997-1999	Too few samples collected from 1994-1996 to compare to 1997-1999.		
	1997-1999	2000-2004	Improvement in wet and mid-range conditions from 1997-1999 to 2000-2004, results near daily target.		Not much change in dry condition from 1997-1999 to 2000-2004, results near daily target. .
	2000-2004	2005	Might be slight worsening in wet condition, results exceed daily target.	Little change in mid-range and dry conditions, results approaching daily target.	

Table 12
Lower Rouge River Chronological Summary from ARC/RPO and MDEQ Data Load Duration Curves

Lower Rouge River					
Field ID	**From**	**To**	**WET WEATHER (High-flow and Moist Conditions)**	**Mid-Range Flow**	**DRY WEATHER (Dry and Low-flow conditions)**
Wayne Road (L06)	1994-1996	1997-1999	Little change in wet and mid-range conditions, results exceed daily target.		Too few samples to compare, results exceed daily target.
	1997-1999	2000-2004	Data not available.		
	2000-2004	2005	Little change in wet and mid-range conditions, results exceed daily target.		Too few samples to compare, results exceed daily target.
John Daly Road (G98)	1994-1996	1997-1999	Some improvement in wet and mid-range conditions, results exceed daily target.		Too few samples to compare
	1997-1999	2000-2004	Continuing improvement in wet and mid-range conditions, results approaching daily target.		Too few samples to compare
	2000-2004	2005	Some worsening in wet conditions, results exceed daily target.	Little change in mid-range conditions, results exceed daily target.	Too few samples to compare
Military Road (L05)	1994-1996	1997-1999	Slight improvement in wet and mid-range condtions, results exceed daily target.		Too few samples to compare
	1997-1999	2000-2004	Continuing improvement in wet conditions, results approaching daily target.	Slight worsening in mid-range conditions, results exceed daily target.	Too few samples to compare
	2000-2004	2005	Worsening in wet conditions, results exceed daily target.	Little change in mid-range conditions, results exceed daily target.	Too few samples to compare

4.3 Summary of Data Discussion

A comparison of *E. coli* data collected from 1994 to 2005 indicate improvement at some locations in both dry and wet conditions. However, it is evident from the data collected in 2005 by the MDEQ, and the data collected by the ARC and the RPO, that *E. coli* concentrations are still not meeting the targets and partial body contact standard throughout the watershed. DNA testing in 2005 and 2006 to help identify the source of the bacteria has suggested humans as a source of the high bacteria levels at some locations, but this testing was very limited. The *E. coli* LDCs and the BST data should prove useful to stakeholders when prioritizing efforts to address wet and dry weather sources of the high *E. coli* levels throughout the watershed.

5.0 SOURCE ASSESSMENT

The Section 303(d) listed reach for the Rouge River is approximately 91 miles and includes the Main, Upper, Middle, Lower, Bell, and Franklin Branches and Evans Ditch, in Wayne and Oakland Counties in Southeastern Michigan. The municipalities in the TMDL watershed are divided into SWMAs, as shown in Figure 2. Table 13 shows the land use distribution for the Rouge River watershed by SWMA (Southeast Michigan Council of Governments [SEMCOG], 2003). Table 14 shows the land distribution for the Rouge River watershed by community.

This TMDL is focused in Wayne and Oakland Counties, which are largely urbanized. Possible sources of *E. coli* include CSOs, SSOs, illicit connections and discharges, failing OSDSs, contributions from tributaries, and wildlife inputs from parks or other recreational areas where animals and waterfowl may congregate.

There are 1,558 NPDES-permitted discharges in the Rouge River watershed. The discharges include 33 individual permits, 308 certificates of coverage (COCs) under multiple general permits (Appendix L), and 1,217 notices of coverage under 1 Permit-by-Rule (Appendix M). Section 7.0 contains detailed permit information for each branch of the Rouge River. There are no Concentrated Animal Feeding Operations in the Rouge River watershed.

Subsections in this section focus on CSO and SSO discharges and illicit discharges.

Table 13
Land Use Distribution for Rouge River Watershed by SWMA, 2000

	Storm Water Management Areas (SWMA) as Percentages of Total Drainage Area							
Land Use Category	MAIN 1-2 103 square miles	MAIN 3-4 91 square miles	UPPER 64 square miles	MIDDLE 1 81 square miles	MIDDLE 3 32 square miles	LOWER 1 62 square miles	LOWER 2 33 square miles	TOTAL 466 square miles
Forest/Rural open	5.8	2.1	8.5	19.9	4.0	19.5	4.5	9.5
Urban open	5.4	6.8	7.3	5.5	5.7	5.5	6.1	6.0
Agricultural	0.2	0.0	0.4	9.4	0.1	25.2	2.2	5.2
Medium density residential	63.4	52.1	53.9	31.8	50.4	22.6	51.7	47.2
High density residential	5.2	4.3	5.2	4.1	4.8	1.4	2.7	4.1
Commercial	11.5	15.6	13.8	7.1	14.1	2.5	12.7	10.9
Industrial	1.5	13.8	4.2	8.9	12.1	9.4	8.6	7.8
Highways	2.0	4.0	2.6	2.9	0.7	1.8	1.2	2.5
Water/wetlands	4.9	1.4	4.2	10.4	8.0	12.1	10.3	6.6
TOTALS (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Table 14
Land Distribution for Rouge River Watershed by Community

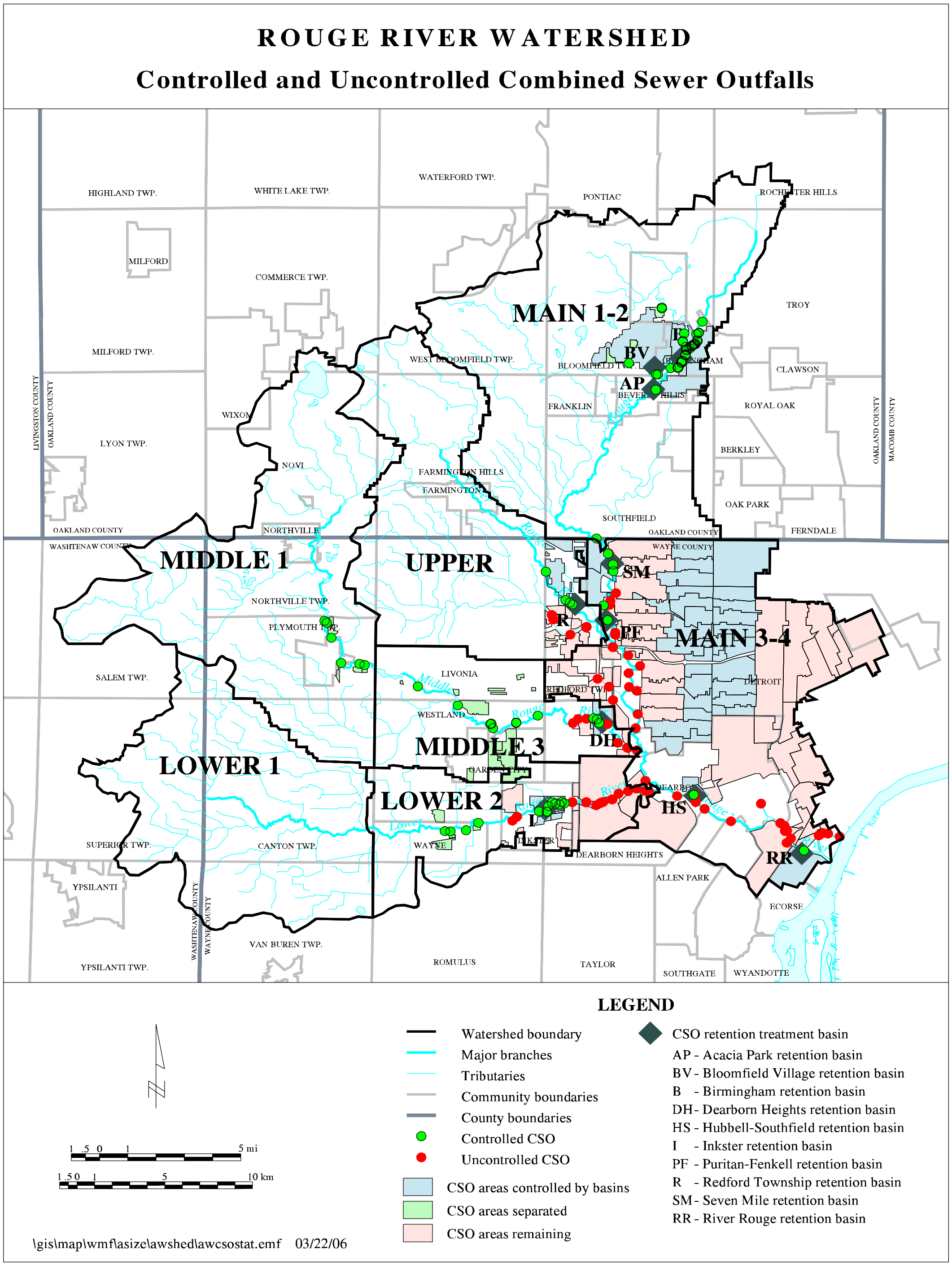
Community	Area (acres)	Land Distribution (Percent)	Community	Area (acres)	Land Distribution (Percent)
Allen Park	892	0.30	Northville	1,298	0.43
Auburn Hills	191	0.06	Northville Twp.	10,603	3.55
Beverly Hills	2,382	0.80	Novi	15,231	5.10
Bingham Farms	783	0.26	Oak Park	82	0.03
Birmingham	1,978	0.66	Orchard Lake	159	0.05
Bloomfield Hills	3,219	1.08	Plymouth	1,410	0.47
Bloomfield Twp.	16,303	5.46	Plymouth Twp.	10,251	3.44
Canton Twp.	23,123	7.75	Pontiac	450	0.15
Commerce Twp.	606	0.20	Redford Twp.	7,215	2.42
Dearborn	15,659	5.25	River Rouge	1,370	0.46
Dearborn Heights	5,301	1.78	Rochester Hills	1,977	0.66
Detroit	38,779	12.99	Romulus	2,458	0.82
Ecorse	5	0.00	Salem Twp.	10,339	3.46
Farmington	1,706	0.57	Southfield	14,982	5.02
Farmington Hills	21,311	7.14	Superior Twp.	10,371	3.48
Franklin	1,680	0.56	Troy	3,835	1.29
Garden City	3,752	1.26	Van Buren Twp.	8,421	2.82
Highland Park	902	0.30	Walled Lake	585	0.20
Inkster	3,696	1.24	Wayne	3,829	1.28
Lathrup Village	963	0.32	West Bloomfield Twp.	11,081	3.71
Livonia	22,952	7.69	Westland	12,457	4.17
Lyon Twp.	468	0.16	Wixom	548	0.18
Melvindale	1,726	0.58	Ypsilanti Twp.	1,097	0.37

5.1 Recent CSO and SSO Discharges

5.1.1 *Discharges by Subwatershed Management Area*

Controlled and uncontrolled CSOs are shown in Figure 8. A summary of the recent CSO and SSO discharges for each of the SWMAs is presented below (MDEQ, 2005).

Figure 8


ROUGE RIVER WATERSHED
Controlled and Uncontrolled Combined Sewer Outfalls
MAIN 1-2
MIDDLE 1
UPPER
MAIN 3-4
MIDDLE 3
LOWER 1
LOWER 2
LEGEND
Watershed boundary
Major branches
Tributaries
Community boundaries
County boundaries
Controlled CSO
Uncontrolled CSO
CSO areas controlled by basins
CSO areas separated
CSO areas remaining
CSO retention treatment basin
AP - Acacia Park retention basin
BV - Bloomfield Village retention basin
B - Birmingham retention basin
DH - Dearborn Heights retention basin
HS - Hubbell-Southfield retention basin
I - Inkster retention basin
PF - Puritan-Fenkell retention basin
R - Redford Township retention basin
SM - Seven Mile retention basin
RR - River Rouge retention basin
\gis\map\wmf\asize\awshed\awcsostat.emf 03/22/06

Main 1-2 SWMA

CSO Discharges. Although all CSOs are controlled, some may still discharge to the Rouge River during very large rain events. This discharge receives screening, primary treatment, and disinfection. In 2005, 10 treated CSO discharges to the Rouge River were reported by the Main 1-2 SWMA communities to the MDEQ.

SSO Discharges. In 2005, 5 SSOs to the Rouge River were reported by the communities in the Main 1-2 SWMA to the MDEQ.

Main 3-4 SWMA

CSO Discharges. In 2005 there were several discharges to the Rouge River from the remaining uncontrolled CSOs in the cities of Detroit and Dearborn. Additionally, the city of River Rouge reported 8 treated CSO discharges in 2005.

SSO Discharges. One SSO to the Rouge River was reported by the Main 3-4 SWMA communities to the MDEQ in 2005.

Upper SWMA

CSO Discharges. Three treated CSO discharges to the Rouge River were reported to the MDEQ by the Upper SWMA communities in 2005.

SSO Discharges. No SSOs to the Rouge River were reported by the communities in the Upper SWMA to the MDEQ in 2005.

Middle 1 SWMA

CSO Discharges. No CSOs were reported to the MDEQ by the Middle 1 SWMA communities in 2005.

SSO Discharges. In 2005, 4 SSOs to the Middle Branch of the Rouge River were reported to the MDEQ by the Middle 1 communities.

Middle 3 SWMA

CSO Discharges. In 2005, 2 treated CSO discharges to the Rouge River were reported by the Middle 3 SWMA communities to the MDEQ.

SSO Discharges. No SSOs to the Rouge River were reported by the communities in the Middle 3 SWMA to the MDEQ in 2005.

Lower 1 SWMA

CSO Discharges. No CSOs were reported by the Lower 1 SWMA communities to the MDEQ in 2005.

SSO Discharges. One SSO was reported by the Lower 1 SWMA communities in 2005.

Lower 2 SWMA

CSO Discharges. In 2005 there were several untreated discharges to the Rouge River from the remaining uncontrolled CSOs in the city of Dearborn and 3 treated discharges from the city of Inkster reported to the MDEQ.

SSO Discharges. No SSOs to the Rouge River were reported by the communities in the Lower 2 SWMA to the MDEQ in 2005.

5.1.2 *Impact of CSO and SSO Discharges on Instream E. coli Levels*

5.1.2.1 CSO Impact on Instream *E. coli* Levels, May through October 2005

An assessment of the 2005 MDEQ-collected *E. coli* data was performed to evaluate the CSO impact on instream *E. coli* levels. Note that the samples were collected on the same day and time each week regardless of a CSO discharge event and the study was not designed for the purpose of the assessment. To make this assessment, an instream velocity during wet weather events of 2.5 feet per second was assumed to predict the time of passage between sampling locations, which was estimated to be from 1 to 3 hours. In 2005, in the Main and Lower Branches of the Rouge River, CSOs discharged from several minutes to several hours, resulting in a range of total discharge volumes. Based on estimated times of passage and discharge durations, the planned sample collection dates did not typically align with the time period during which sampling would likely reflect a contribution from the CSO discharges to instream *E. coli* levels. It should be noted that some of the *E. coli* samples collected in 2005 might have been collected during wet weather conditions when CSOs were not discharging, but might have been affected by overland flow. Figures were prepared to evaluate the contribution of CSO discharges in the lower portion of the Main Branch and in the Lower Branch on instream *E. coli* levels (Appendix N).

The following describes the results of the assessment:

Main Branch. No CSOs were reported downstream of Bonnie Brook Golf Course (M15) that aligned with sampling activities from May through June and from August through October. However, downstream of Ann Arbor Trail (G42) there were 3 days in July when CSOs discharged and routine sampling might have measured their influence on *E. coli* levels. On 2 of the sampling dates there were CSO discharges prior to sampling, but due to time of passage it was considered unlikely that the discharge influenced *E. coli* levels and the downstream levels were not always greater than or less than upstream levels. On the sampling date when there were CSO discharges prior to sampling and it was considered likely, due to time of passage, that the discharge influenced the levels, the *E. coli* levels decreased from upstream to downstream.

Lower Branch. On 5 of the sampling dates when there were CSO discharges prior to sampling, downstream impact was considered unlikely due to time of passage; however, downstream *E. coli* levels were 1.5 to 3.5 times the upstream levels. On 2 of the sampling dates when there were CSO discharges prior to sampling, and it was considered likely, due to time of passage, that the discharge influenced the levels, the downstream *E. coli* levels were less than the upstream levels.

In summary no conclusions regarding the impact of CSOs on instream *E. coli* levels can be made based on the data collected in 2005. To measure the impact of CSOs on *E. coli* levels, a specific sampling program would have to be designed.

5.1.2.2 SSO Impact on Instream *E. coli* Levels, May through October 2005

There were SSO discharges to the Main, Middle, and Lower Branches of the Rouge River in 2005. Only 1 of these discharges occurred on a day that coincided with the 2005 MDEQ TMDL routine sampling program. This discharge occurred in the Lower Rouge on May 13, 2005. Figure L-9 in Appendix N shows the *E. coli* levels at upstream and downstream locations from the point of the SSO discharge. Also shown are other inflows from creeks, tributaries, etc. that might influence the upstream and downstream *E. coli* levels. The duration of the SSO discharge was only 70 minutes, the volume was small, and it does not appear to have influenced instream *E. coli* levels where samples were collected.

6.0 LOADING CAPACITY DEVELOPMENT

The loading capacity (LC) represents the maximum daily 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 expressed as a concentration, and daily maximum of 300 *E. coli* per 100 ml expressed as a daily load and concentration.

Concurrent with the selection of numeric endpoints, development of the LC requires identification of the critical conditions. The critical conditions are the set of environmental conditions (e.g., flow) used in developing the TMDL that result in attaining WQS and have an acceptably low frequency of occurrence. The critical conditions for the applicability of WQS in Michigan are given in Rule 323.1090 (Applicability of WQS). Rule 323.1090 requires that the WQS apply at all flows equal to or exceeding the water body design flow. In general, the lowest monthly 95% exceedance flow is used as the design condition for developing pollutant loadings. As described further in Section 7.0, this TMDL provides allowable *E. coli* loadings under a variety of flow conditions, including the 95% exceedance flow. However, the daily maximum and monthly geometric mean WQS concentration levels for *E. coli* presented in the numeric target section (e.g., 300 and 130 cts/100, respectively), or alternative endpoints that assure attainment of the *E. coli* standards (e.g., fecal coliform) will be used to establish any necessary NPDES permit limitations and nonpoint source goals for the purpose of determining compliance with this TMDL.

7.0 LOADING CAPACITY

The LC is 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. The overall LC is subsequently allocated into WLAs for point sources, LAs for nonpoint sources, and the MOS.

The LC is equal to:

Criteria x Flow x Y;

Where:
Criteria = WQS (300 *E. coli* per 100 ml)
Flow = cubic feet per second
Y = conversion factor [(28,317 ml/cubic feet)/100] x 60 seconds/minute x 60 minutes/hour x 24 hours/day

The LCs, along with the MOS, WLAs, and LAs, for each individual branch of the Rouge River are presented in Tables 15, 17, 19, and 21. In addition to the LC tables, a rationale table for each branch is provided to give detailed information used in the calculations (Tables 16, 18, 20, and 22). Uncontrolled CSO events (i.e., no treatment prior to discharge) are not addressed in the LC calculations and are given no allocation. These events are currently permitted discharges that are in the process of being corrected.

The LCs, WLAs, LAs and MOS are calculated based on the formula above using flow data from USGS gages within the watershed. Gage information and assumptions used to develop the flows are contained in Appendix O. The loads are presented under a variety of flow conditions, each of which assures attainment of the targets. The Rouge River flow conditions range from the 5% to 95% exceedance flows. An exceedance flow is a statistically determined flow that is exceeded a specific percentage of time. For example, the 95% exceedance flow represents a flow expected to be exceeded 95% of the time and, therefore, represents low flow conditions. A 5% exceedance flow would be expected to be exceeded only 5% of the time and, therefore, represents high flow conditions. Five flows (i.e., 5%, 25%, 50%, 75%, and 95%) were selected to develop LCs based upon the approach developed by Cleland (2006). Flows along a gradient of 0% to 100% were partitioned into flow zones (e.g., high, moist, midrange, dry, and low, respectively) and the 5 exceedance flows represent the midpoint of their respective flow conditions (i.e., 5% is the midpoint of the high flow zone).

7.1 <u>Main, Upper, and Middle Rouge</u>

The Main, Upper, and Middle Branches are presented together in this section due to similarities in their hydrology. For purposes of the allocation discussion, the Lower Branch is considered separately as it is dominated by effluent from the YCUA WWTP discharge under certain flow conditions (see Section 7.5). As indicated above, the LCs for all 4 branches were determined using the LC formula with allocation assignments made in the following order: MOS, WLAs for individual NPDES permits, and WLAs for general industrial storm water permits and general municipal separate storm sewer system (MS4) permits. Any remaining capacity was assigned to the LAs. Additional details on the calculations are provided in the sections below.

7.1.1 Main, Upper, and Middle Rouge MOS

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). An explicit MOS was calculated for the Main, Upper, and Middle Branches of the Rouge River; the Lower Rouge will be discussed separately.

Following the approach developed by Cleland (2006), the MOS for the high, moist, mid and low flow zones were based on the difference between the LC as calculated at the midpoint of each of these 4 flow zones and the LC calculated at the minimum flow in each zone. The MOS for the dry flow zone was based on the difference between the LC as calculated at the midpoint of the dry flow zone (i.e., the 95% exceedance flow) and the LC calculated at the 99% exceedance flow (rather than at the minimum drought flow in the dry zone). The minimum drought flow (i.e., the 100% exceedance flow) was not deemed appropriate to use as this flow represents the lowest flow of record for the respective water body and is therefore not representative of typical drought flow conditions. An adequate MOS is provided because the LC is typically much less at the minimum flow of each zone as compared to the midpoint. The MOS ensures that allocations will not exceed the load associated with the minimum flow in each zone.

7.1.2 *Main, Upper, and Middle Rouge WLAs*

The WLAs are presented in Tables 15, 17, and 19. There are 76 permitted NPDES discharges to the Main Branch of the Rouge River including 14 individual permits and 62 COCs under 6 general permits (Figure 9). There are 70 permitted NPDES discharges to the Upper Branch including 3 individual permits and 67 COCs under 6 general permits (Figure 10). There are 118 permits to the Middle Branch including 8 individual permits and 110 COCs under 9 general permits (Figure 11). Appendix L contains the permits and information describing the general permits.

The permits with discharges potentially containing *E. coli* (i.e., municipal or industrial general storm water permits or individual permits authorizing discharge of storm water) or expected to contain *E. coli* (i.e., WWTPs or CSO RTBs) were assigned a WLA. The remaining permits with discharges that are not considered a source of *E. coli* to the Rouge River (i.e., industrial non-storm water discharges) were assigned a WLA of zero. The WLAs for the individual permits were based on the actual or estimated facility flow. The WLAs for the general industrial storm water permits were calculated using the Long-Term Hydrological Impact Assessment (L-THIA) Web application developed by Purdue University and the USEPA (Purdue University and USEPA, 2007). L-THIA estimated the annual fecal coliform contributions based on the acreage of industrial land use in each branch. Annual loads of fecal coliform were converted to counts per day and a literature conversion factor of 0.77 was used to convert fecal coliform to *E. coli* (Rasmussen and Ziegler, 2003). For the Middle Branch Rouge, the remaining allocation was apportioned between the WLA for the MS4 permittees and the LA by allocating 46% of the remaining assimilative capacity to the MS4 permittees, a figure representative of the percent of watershed covered by MS4 permits. The Permit-by-Rule addresses discharges from construction-related disturbances of land. Because these sites are temporary, the number of sites is ever-changing, and the flow associated with the sites cannot be determined, these sites are not allocated a load under the WLA. Rather, all sites will be required to meet the concentration-based targets.

7.1.3 *Main, Upper, and Middle Rouge LAs*

The LAs for the Main and the Upper Rouge are zero as all portions of the watersheds are covered under municipal or industrial permits. The Middle Rouge LA is 54% of the remaining LC after all other allocations are assigned.

Table 15
LC for the Main Branch of the Rouge River
loads expressed as (cfu/day)

	NPDES permit # (if applicable)	**High**	Moist	Mid	Low	Dry
Flow Exceedance Percentage		5%	25%	50%	75%	95%
Flow (cfs)		1180	406	226.3	140.9	90.7
LC		8.66E+12	2.98E+12	1.66E+12	1.03E+12	6.66E+11
MOS		3.08E+12	9.56E+11	2.82E+11	2.74E+11	1.02E+11
WLA – Individual permits:						
Detroit WWTP:	MI0022802					
Hubbell/Southfield RTB (71cfs)	"	5.21E+11	5.21E+11	5.211E+11	0.00E+00	0.00E+00
Puritan/Fenkell RTB (6.1 cfs)	"	4.48E+10	4.48E+10	4.48E+10	0.00E+00	0.00E+00
7 Mile RTB (0.54 cfs)	"	3.96E+09	3.96E+09	3.96E+09	0.00E+00	0.00E+00
River Rouge CSO RTB (6.1 cfs)	MI0028819	4.48E+10	4.48E+10	4.48E+10	0.00E+00	0.00E+00
Birmingham CSO/RTB	MI0025534	4.48E+10	4.48E+10	4.48E+10	0.00E+00	0.00E+00
Oakland Co. Acacia Park CSO/RTB	MI0037427	5.14E+10	5.14E+10	5.14E+10	0.00E+00	0.00E+00
Bloomfield Village CSO/RTB	MI0048046	4.77E+10	4.77E+10	4.77E+10	0.00E+00	0.00E+00
WLA - General Industrial Storm Water Permits and Individual permits asterisked in Appendix L, Table L-1	MIS210000 **MIS220000, See Appendix L**	1.14E+10	1.14E+10	1.14E+10	0.00E+00	0.00E+00
WLA – General MS4 permits (including MDOT)	MI0057364, MIG619000, MIS040000	4.31E+12	1.25E+12	6.09E+11	0.00E+00	0.00E+00
WLA - Individual or general permits not authorizing storm water		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
LA		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table 16
Main Branch Rouge River Allocation Rationale

Allocations	Rationale
WLA	
Detroit WWTP - Hubbell/Southfield RTB (71 cfs)	Flow based on average of 134 discharge events from 05/03 to 11/06
Detroit WWTP – Puritan/Fenkell RTB (6.1 cfs)	Estimate - No flow data. Puritan/Fenkell flow has been estimated to be equal to Birmingham CSO/RTB flow.
Detroit WWTP - 7 Mile RTB (0.54 cfs)	Flow based on average of 5 discharge events from 2005.
River Rouge CSO RTB (6.1 cfs)	Flow based on average of 9 discharge events from 07/02 to 11/06
Birmingham CSO/RTB (6.1 CFS)	Flow based on average of 10 discharge events from 12/97 to 11/06
Oakland Co. Acacia Park CSO/RTB (7.0 CFS)	Flow based on average of 8 discharge events from 12/02 to 11/07
Bloomfield Village CSO/RTB (6.5 CFS)	Flow based on average of 5 discharge events from 12/02 to 11/08
General Industrial Storm Water Permits and Individual permits asterisked in Appendix L, Table L-1	**Load based on 2000 SEMCOG industrial land-use data and L-Thia (M FC/YR * 1,000,000/365*0.77 *E. coli*/FC)**
General MS4 permits (including MDOT)	Remainder of allocation minus MOS
Individual or general permits not authorizing storm water	No allocation – These permits are not considered a source of *E. coli*
LA (None - 100% coverage under MS4 Permits)	No allocation - Entire watershed falls within jurisdiction of municipal or industrial permits

Table 17
LC for the Upper Rouge River
loads expressed as (cfu/day)

	NPDES permit # (if applicable)	**High**	Moist	Mid	Low	Dry
Flow Exceedance Percentage		5%	25%	50%	75%	95%
Flow (cfs)		185	55	28.9	17.5	9.9
LC		1.36E+12	4.01E+11	2.12E+11	1.29E+11	7.26E+10
MOS		5.59E+11	1.32E+11	3.78E+10	3.78E+10	2.04E+10
WLA – individual permits:						
Commerce Twp WWTP	MI0025071	3.38E+10	3.38E+10	3.38E+10	3.38E+10	3.38E+10
Wayne Co/RDFrd/Livonia CSO	MI0051535	2.24E+10	2.24E+10	2.24E+10	0.00E+00	0.00E+00
WLA - General Industrial Storm Water Permits and Individual permits asterisked in Appendix L, Table L-2	MIS210000, See Appendix L	5.13E+09	5.13E+09	5.13E+09	0.00E+00	0.00E+00
WLA – General MS4 permits (including MDOT)	MI0057364, MIG619000, MIS040000, MIS710000	7.40E+11	2.08E+11	1.13E+11	5.70E+10	0.00E+00
WLA – Individual or general permits not authorizing storm water	MIG080000, MIG250000	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
LA		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table 18
Upper Branch Rouge River Allocation Rationale

Allocations	Rationale
WLA	
Commerce Twp WWTP (4.6 CFS)	Based on NPDES design flow
Wayne Co/REDfd/Livonia CSO (3.0 CFS)	Flow based on average of 9 discharge events from 02/00 to 11/06 (Wayco/Redford/Livonia).
General Industrial Storm Water Permits and Individual permits asterisked in Appendix L, Table L-2	**Load based on 2000 SEMCOG industrial land-use data and L-Thia (M FC/YR * 1,000,000/365*0.77 *E. coli*/FC)**
General MS4 permits (including MDOT)	Remainder of LC not assigned to other WLAs
Individual or general permits not authorizing storm water	No allocation – these permits are not considered a source of *E. coli*
LA	No allocation - Entire watershed falls within jurisdiction of municipal or industrial permits

Table 19
LC for the Middle Rouge River
loads expressed as (cfu/day)

	NPDES permit # (if applicable)	**High**	Moist	Mid	Low	Dry
Flow Exceedance Percentage		5%	25%	50%	75%	95%
Flow (cfs)		293	98	49.2	26.3	12.0
LC		2.15E+12	7.23E+11	3.61E+11	1.93E+11	8.84E+10
MOS		7.87E+11	2.57E+11	7.23E+10	7.23E+10	4.56E+10
WLA – individual permits						
Oakland Co Walled Lake/Novi WWTP	MI0024287	3.97E+10	3.97E+10	3.97E+10	3.97E+10	3.97E+10
Wayne Co/Dearborn Heights CSO	MI0051489	3.70E+10	3.70E+10	3.70E+10	0.00E+00	0.00E+00
Salem Twp WWTP	MI0054798	8.07E+08	8.07E+08	8.07E+08	8.07E+08	8.07E+08
WLA - General Industrial Storm Water Permits and Individual permits asterisked in Appendix L, Table L-3	MIS210000, MIS220000, MIS319000, See Appendix L	2.23E+10	2.23E+10	2.23E+10	0.00E+00	0.00E+00
WLA – General MS4 permits (including MDOT)	MI0057364, MIG619000, MIS040000, MIS710000	5.82E+11	1.68E+11	8.71E+10	0.00E+00	0.00E+00
WLA – Individual or general permits not authorizing storm water	MIG080000, MIG250000, MIG670000	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
LA		6.84E+11	1.99E+11	1.02E+11	8.00E+10	2.22E+09

Table 20
Middle Branch Rouge River Allocation Rationale

Allocations	Rationale
WLA	
Salem WWTP (0.11 cfs)	Based on NPDES design flow
Oakland Co Walled Lake/Novi WWTP (5.4 cfs)	Oakland Co Walled Lake/Novi WWTP - based on NPDES design flow
Wayne Co/Dearborn Heights CSO (5.3 cfs)	Flow based on average of 6 discharge events from 07/00 to 11/06
General Industrial Storm Water Permits and Individual permits asterisked in Appendix L, Table L-3	**Load based on 2000 SEMCOG industrial land-use data and L-Thia (M FC/YR * 1,000,000/365*0.77 *E. coli*/FC)**
General MS4 permits (including MDOT)	46% of the remaining LC not assigned to WLAs
Individual or general permits not authorizing storm water	No allocation – These permits are not considered a source of *E. coli*
LA	54% of the remaining LC

Table 21
LC for the Lower Branch of the Rouge River
loads expressed as (cfu/day)

	NPDES permit # (if applicable)	**High**	Moist	Mid	Low	Dry
Flow Exceedance Percentage		5%	25%	50%	75%	95%
Flow (cfs)		313	104	82.2	44.7^	44.7^
LC		2.30E+12	7.63E+11	6.03E+11	3.28E+11	3.28E+11
MOS		8.10E+11	2.28E+11	Implicit	Implicit	Implicit
WLA – individual permits:						
Dearborn CSO		1.91E+10	1.91E+10	1.91E+10	0.00E+00	0.00E+00
YCUA	MI0042676	3.28E+11	3.28E+11	3.28E+11	3.28E+11	3.28E+11
Wayne/Inkster/Dearborn Hts CSO*	MI0051462	1.91E+10	1.91E+10	1.91E+10	0.00E+00	0.00E+00
Wayne Co/Inkster RTB/CSO	MI0051471	8.37E+10	8.37E+10	8.37E+10	0.00E+00	0.00E+00
Inkster/Dearborn Hts CSO*	MI0051837	1.91E+10	1.91E+10	1.91E+10	0.00E+00	0.00E+00
WLA - General Industrial Storm Water Permits and Individual permits asterisked in Appendix L, Table L-4	MIS210000, MIS220000, MIS319000, See Appendix L	2.00E+10	2.00E+10	2.00E+10	0.00E+00	0.00E+00
WLA - MS4 (including MDOT)	**MI0057364** MIG619000, MIS040000	6.49E+11	3.04E+10	7.43E+10	0.00E+00	0.00E+00
WLA - individual or general permits not authorizing storm water	MIG250000, MIG670000	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
LA		3.49E+11	1.64E+10	4.00E+10	0.00E+00	0.00E+00

*flows were estimated
^flow = YCUA design flow

Table 22
Lower Branch Rouge River Allocation Rationale

Allocations	Rationale
WLA	
Dearborn CSO (2.6 cfs)	Flow based on average of 197 discharges event in 2006
YCUA (44.7 cfs)	Based on NPDES design flow
Wayne Inkster RTB/CSO (11.4 cfs)	Flow based on average of 16 discharge events from 12/99 to 11/06
Wayne/Inkster/Dearborn Hts CSO (2.6 cfs)	Estimate - No flow data. Wayne/Inkster/Dearborn Hts CSO flow has been estimated to be equal to Dearborn Hts CSO flow.
Inkster/Dearborn Hts CSO (2.6 cfs)	Estimate - No flow data. Inkster/Dearborn Hts CSO flow has been estimated to be equal to Dearborn Hts CSO flow.
General Industrial Storm Water Permits and Individual permits asterisked in Appendix L, Table L-4	**Load based on 2000 SEMCOG industrial land-use data and L-Thia (M FC/YR * 1,000,000/365*0.77 *E. coli*/FC)**
MS4 (including MDOT)	65% of the remaining LC not assigned to WLAs
Individual or general permits not authorizing storm water	No allocation – These permits are not considered a source of *E. coli*
LA	35% of the remaining LC

Figure 9
NPDES permitted discharges to the Main Branch of the Rouge River (Note: figure does not contain MS4 permits or permits-by-rule).

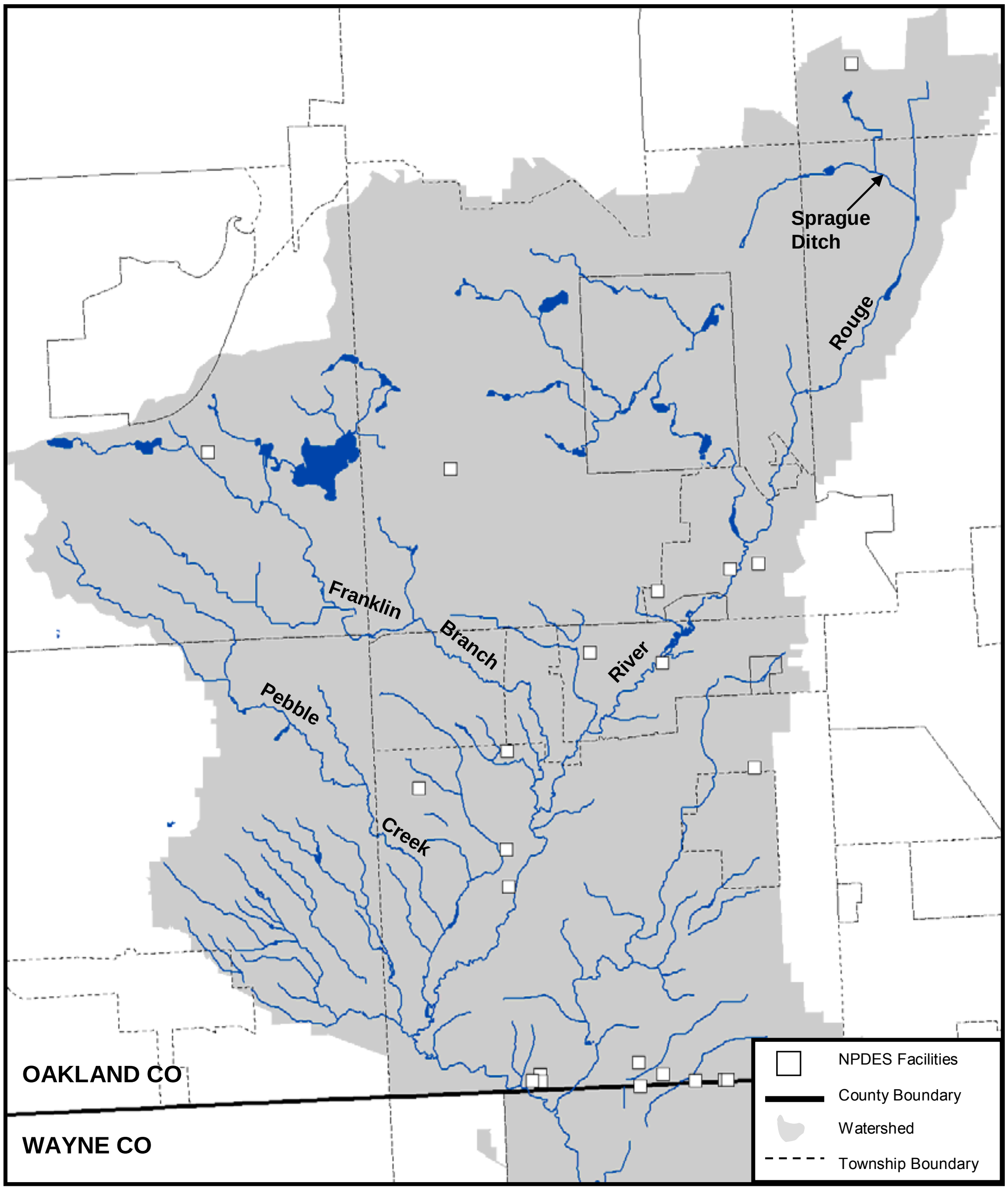


Figure 10
NPDES permitted discharges to the Upper Branch of the Rouge River (Note: figure does not contain MS4 permits or permits-by-rule).

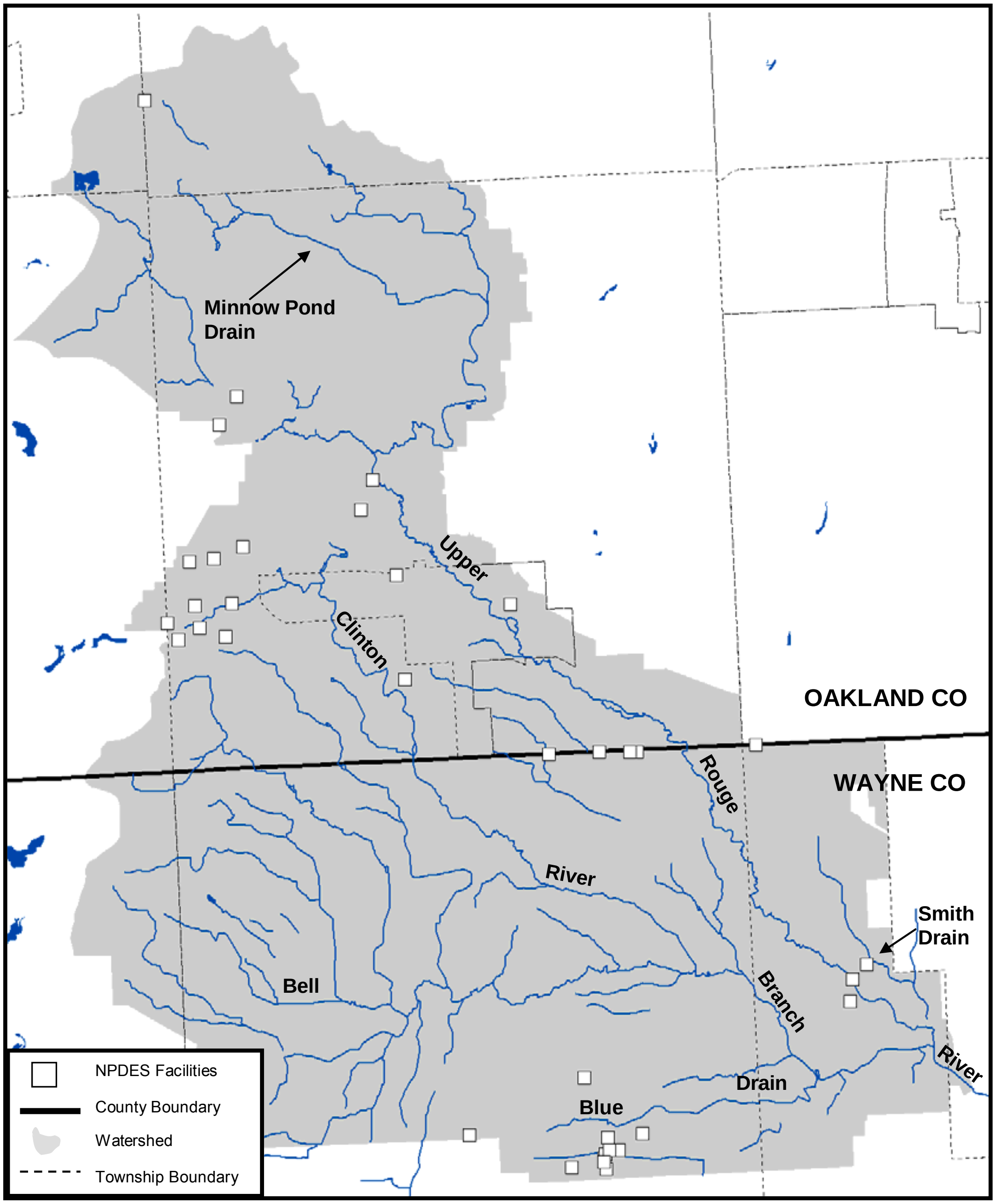
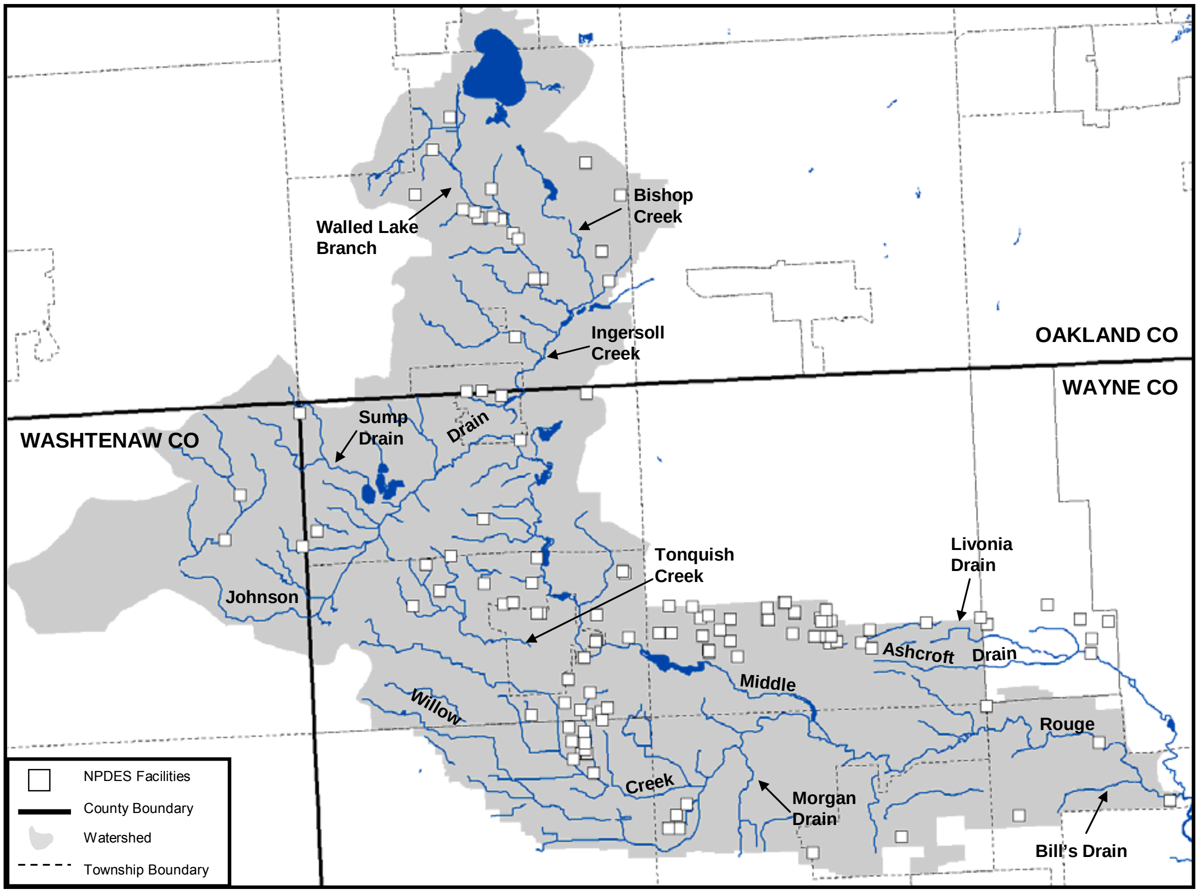


Figure 11
NPDES permitted discharges to the Middle Branch of the Rouge River (Note: figure does not contain MS4 permits or permits-by-rule).



7.2 Lower Rouge

7.2.1 *Lower Rouge WLAs*

The flow of the Lower Branch of the Rouge River is dominated by YCUA under low and dry flow conditions. No other NPDES permitted facilities are expected to discharge during low and dry events; therefore all of the LC was assigned to YCUA. Permits known or believed to contain *E. coli* were assigned a WLA. The remaining permits (i.e., Ford-Wayne Assembly Plant and Visteon Headquarters-Van Buren) have been assigned a WLA of zero. The WLAs for the general industrial storm water permits were calculated using the L-THIA Web application (Purdue University and USEPA, 2007). The L-THIA estimated the annual fecal coliform contributions based on the acreage of industrial land uses in each branch. Annual loads of fecal coliform were converted to counts per day and a literature conversion factor of 0.77 was used to convert fecal coliform to *E. coli* (Rasmussen and Ziegler, 2003). The WLAs for the MS4 permits in the Lower Rouge River were calculated based on the municipal jurisdictions covered by the MS4 permits or approximately 65% of the remaining allocation. Any leftover allocation was assigned to the LA.

7.2.2 Lower Rouge LAs

The Lower Rouge LA is the remaining LC after all other allocations are assigned (i.e., 35%).

7.2.3 *Lower Rouge MOS*

The MOS accounts for any uncertainty of lack of knowledge concerning the relationship between pollutant loading and water quality, including pollutant decay rate if applicable. The MOS can either be implicit (i.e., incorporated into the WLA of LA through conservative assumptions) or explicit (i.e., expressed in the TMDL as a portion of the loadings).

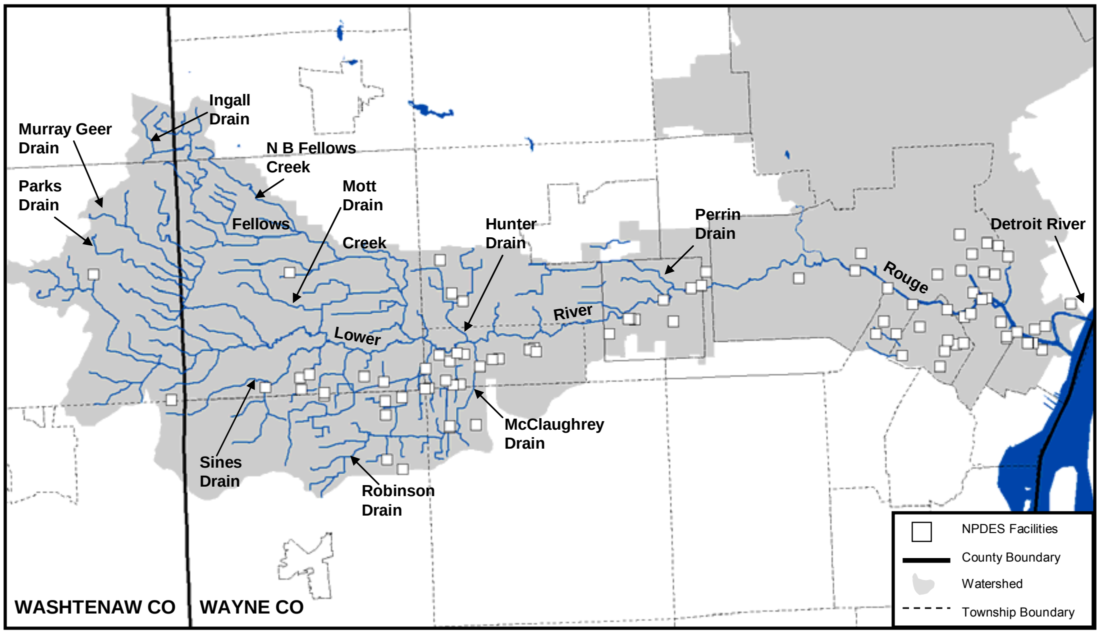
An explicit margin of safety was developed for the moist (25%) and high (5%) flow regimes using the approach described for the Upper, Main and Middle Rouge. However, for the mid to dry flow regimes (50 – 95%, respectively), the flow in the Lower Rouge is dominated by the YCUA WWTP and an explicit MOS cannot be determined using a similar approach. Therefore, an implicit MOS is used for these lower flow regimes.

An implicit MOS for the lower flow regimes is based on the limited capability of pathogen organisms to ordinarily survive outside of their hosts and therefore organism counts are expected to be lower than the allocations. In addition, the flow of the Lower Rouge is dominated by the YCUA discharge during lower flow regimes. This facility is required to meet its NPDES permit limits for fecal coliform, which, as discussed earlier, will ensure that the *E. coli* WQSs are also met.

7.2.4 *Lower Rouge NPDES Permits*

There are 77 permitted NPDES discharges to the Lower Branch of the Rouge River including 8 individual permits and 69 COCs under 7 general permits (Figure 12). Appendix L contains the permits and information describing the general permits.

Figure 12
NPDES permitted discharges to the Lower Branch of the Rouge River (Note: figure does not contain MS4 permits or permits-by-rule).



8.0 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 maximum of 1,000 *E. coli* per 100 ml for the partial body contact season. *E. coli* allocations developed to protect during the total body contact season are also expected to assure attainment of the partial body contact standard.

9.0 MONITORING

E. coli was monitored weekly at 62 stations on the Rouge River and tributaries from May through October 2005. Future monitoring will take place as part of the 5-year rotating basin monitoring as resources allow, and when corrective actions have occurred to suggest that WQS may be met. When these results indicate that the water body may be meeting WQS, sampling will be conducted at the appropriate frequency (as defined in the Numeric Target section) to determine if the targets are being met.

10.0 REASONABLE ASSURANCE ACTIVITIES

The Rouge River has suffered from typical urban watershed stressors including CSOs, SSOs, nonpoint sources, and industrial discharges, all of which influence the water quality and natural flow regime. The restoration of the Rouge River began by focusing on the primary public health pollutant threat, CSOs. At the start of the Rouge Project in 1992, 168 CSOs were identified, with a tributary service area of approximately 59,300 acres (approximately 20% of the watershed). The CSO control program, while at the heart of the Rouge Project, is only 1 element of the overall Rouge River restoration effort. The impressive improvements in water quality and recreational use in the Rouge River can also be attributed to the multitude of other Rouge Project programs including illicit connection elimination, storm water management activities, and developing better public, industry, and community awareness of pollution control and prevention (Cave, 1999; Cave, 2001; RPO, 2002; RPO, 2003; RPO, 2004b; RPO, 2005; and RPO, 2006). These programs and others are all part of the watershed approach being successfully implemented in the Rouge River watershed.

The permittees listed in Appendix L are responsible for meeting their NPDES permit limits. The WWTPs and CSO RTBs are responsible for meeting their fecal coliform limits. Compliance is determined based on reviews of Discharge Monitoring Report data by the MDEQ. As already discussed, CSO elimination efforts are ongoing and will continue to reduce *E. coli* contributions to the Rouge River. The statewide Michigan Department of Transportation (MDOT) MS4 permit requires the permittee to reduce the discharge of pollutants to the maximum extent practicable and employ BMPs to comply with TMDL requirements. In addition, permits-by-rule (Appendix M) and the general permits for noncontact cooling water and wastewater from cleanup of water contaminated with gasoline and related petroleum products require that Michigan's WQS are not violated as a result of the discharge. The MDEQ may require the permittee to provide additional sampling or monitoring as deemed necessary to assure adequate operation of the treatment system.

10.1 Industrial Storm Water

Federal regulations require certain industries to apply for an NPDES permit if storm water associated with industrial activity at the facility discharges into a separate storm sewer system or directly into surface water. A storm water permit is not required if storm water does not discharge from the facility or is discharged into a sewer system that leads to a WWTP. The industrial storm water permits identified in Appendix L 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 State of Michigan began issuing industrial storm water permit coverage in 1994. There are 3 types of permits available in Michigan: a generic baseline general permit, a generic general permit with monitoring requirements, or a site-specific individual permit. There are approximately 4,000 facilities statewide with storm water discharge authorization, with approximately 265 within the Rouge River watershed. Michigan's storm water permit authorization requires facilities to obtain a certified operator who will have supervision and control over the control structures at the facility, eliminate any unauthorized non-storm water discharges, and develop and implement a storm water pollution prevention plan for their facility that includes structural and nonstructural control measures. Prior to obtaining permit coverage, applicants must certify that they do not have any unauthorized discharges.

MDEQ staff conduct inspections of a percentage of permitted industrial facilities annually. Inspections are utilized to ensure that facilities comply with the regulations, and they result in a further reduction in unauthorized discharges and illicit connections. Additionally, as additional facilities obtain industrial storm water permits, more illicit discharges will be eliminated.

10.2 Municipal Storm Water

The USEPA and most water resources professionals advocate holistic and adaptive watershed management approaches for the protection and restoration of aquatic ecosystems by encouraging pollution control strategies that are developed through collaborative partnerships within a hydrologic boundary. Michigan was one of the first states to embrace and help develop the concept of watershed-based general storm water permitting.

The USEPA's Storm Water Phase II Rules require that all municipalities operating MS4s within urbanized areas obtain municipal storm water permits, unless this requirement is waived by the NPDES permitting authority. As of February 2007, 48 local municipalities within the Rouge River watershed have obtained Phase II MS4 permit coverage, either by obtaining their own permit or becoming nested under a county, city, village, or township, if allowable. Counties, cities, villages, and townships are not permitted to become nested, and thus must obtain their own permits, if subject to MS4 regulation. The Rouge River municipalities that currently have permit coverage include counties, cities, villages, townships, school districts, colleges and universities, airport authorities, and the MDOT. The majority of these municipalities have had permit coverage since 1997 (voluntary permit between 1997 and mid-2003; nonvoluntary permit from 2003 to present), and have developed extensive illicit discharge elimination programs. A number of additional school districts and 1 city (River Rouge) within the watershed are currently in the process of obtaining MS4 permit coverage. As mentioned, these permits require activities that reduce *E. coli* inputs to surface waters through public education, a storm water management plan, and illicit connection identification and elimination requirements.

In 1997, as part of the Rouge Project, stakeholders in Southeastern Michigan worked with the MDEQ to develop a voluntary watershed-based general permit for storm water discharges. The permit was originally voluntary because there was no legal requirement for the storm sewer operators in the Rouge River watershed to have a permit. Now a regulatory requirement, the MDEQ offers a watershed-based general permit as one of two options for compliance with the NPDES Phase I and II storm water regulations (MDEQ, 2006). The other option is a jurisdictional permit.

In the Rouge River watershed, 48 individual municipal entities and 3 counties selected the watershed-based general storm water permit. Additionally, in August 2003, the communities and counties in the Rouge River watershed formed the Rouge River Watershed Local Management Assembly (Assembly of Rouge Communities) to continue the restoration of the Rouge River watershed into the future.

In 2004, the ARC supported the passage of state legislation to authorize local governments to form watershed alliances. This legislation was subsequently signed into law as the Watershed Alliance Act, 2004 PA 517 (Watershed Alliance Act). In November 2005, the Assembly of Rouge Communities became the public entity, ARC, when 20 eligible members approved bylaws (modeled after the former Memorandum of Agreement for operation of the assembly) developed under the Watershed Alliance Act. As of April 30, 2006, 41 ARC members had approved the bylaws. The ARC collaborates on storm water management planning and permitting commitments to develop integrated plans that take advantage of economies of scale and produce more cost-effective solutions. Each member contributes financial support for storm water management compliance activities such as public involvement and education, water quality monitoring, and illicit discharge elimination programs. For more information about the Alliance of Rouge Communities, see the Web site http://www.rougeriver.com/alliance/.

The Rouge River watershed is approximately 466 square miles and includes all or parts of 48 communities and 3 counties. To manage this large area more effectively under the MS4 watershed permit, local units of government decided to divide the Rouge River watershed into subwatersheds (SWMAs) based on the 4 main branches of the Rouge River—the Main Branch, the Upper Branch, the Middle Branch, and the Lower Branch—and certain political jurisdictions.

Long-term watershed management plans have been developed for all 7 SWMAs, and implementation of BMPs and other pollution prevention activities have been underway under these plans since 2001. All 7 watershed management plans include at least 1 goal that addresses pathogens, including:

- Remove sources of pollution that threaten public health.
- Reduce sanitary wastewater pollution.
- Increase opportunities for passive and active recreational uses.

Selected CSO and SSO control projects, illicit discharge elimination activities, OSDS programs, public education and involvement activities, and other watershed projects are summarized in the following subsections to demonstrate the holistic approach being taken to improve water quality and reduce *E. coli* levels in the Rouge River watershed.

10.2.1 *CSO Control*

CSO controls are being implemented in the Rouge Watershed through 3 phases as established by NPDES permits applicable to the Rouge Watershed:

- Phase I: Elimination of raw sewage and the protection of public health for approximately 40% of the combined sewer area.

- Phase II: Elimination of raw sewage and the protection of public health for the remaining combined sewer area.

- Phase III: Meet state WQS in the Rouge River for dissolved oxygen, physical characteristics, total residual chlorine, and biological health.

Under Phase I, 6 communities separated their sewers and 8 communities constructed 10 RTBs. The RTBs capture most wet weather flows for later conveyance to the Detroit Publicly-Owned Treatment Work for treatment. Flows from very large wet weather events that are not captured by the RTBs receive screening, skimming, settling, and disinfection prior to discharge. These CSO control projects have effectively eliminated or controlled the discharge of untreated sewage from approximately half of the watershed CSOs. The completed RTBs control overflows at a rate of about 4 billion gallons per year with a commensurate improvement in water quality, improvements in the aesthetics of the river, and increased recreational use. Eighty-five (85) CSOs are planned for control during Phase II. Phase III of the CSO control program will include additional controls if state WQS for dissolved oxygen, physical characteristics, total residual chlorine, and biological health are not yet met after the completion of Phase II. Table 23 summarizes the number of CSOs that have been controlled from 1995 through 2006. Phase I will be complete when the 4 CSO outfalls in the city of Dearborn, which are currently under construction, are controlled. Three Phase II CSO outfalls have been controlled by the city of Dearborn Heights and other Phase II CSO projects are currently in various stages of planning, design, and construction.

Table 23
Combined Sewer Overflow Outfalls Controlled

CSO Control Progress in the Rouge River Watershed, 1995 - 2006		
Year	**Number of CSO Outfalls Controlled**	**Phase I or Phase II of Project**
2006	0	Not Applicable
2005	3	Phase II
2004	0	Not Applicable
2003	0	Not Applicable
2002	1	Phase I
2001	0	Not Applicable
2000	0	Not Applicable
1999	4	Phase I
1998	35	Phase I
1997	28	Phase I
1996	8	Phase I
1995	3	Phase I
Total of 79 Phase I		
Total of 3 Phase II		

10.2.2 *SSO Control*

Several SSO correction programs have been recently established, as required by state and federal law, to eliminate SSOs that occur in the Rouge River watershed. These programs have been included in Administrative Consent Orders and a court order, and are designed to ensure compliance with the MDEQ-issued SSO Policy Statement (December 27, 2002) and a subsequent clarification statement. In addition, after meetings with some concerned Southeast Michigan communities (as facilitated by the SEMCOG), the MDEQ issued a letter dated April 7, 2006, to clarify any misconceptions about how the MDEQ would implement the SSO Policy Statement. Table 24 lists some SSO correction projects in the Rouge River watershed from 1999 through 2006. Additional information regarding these projects and other SSO projects can be accessed on the Rouge River Web site at http://www.rougeriver.com.

Table 24
SSO Correction Projects

SSO Progress in the Rouge River Watershed, 1999 - 2006	
2006	OCDC Farmington to Evergreen SSO Interceptor.
	Farmington Hills East Lincolnshire SSO relief project.
	Farmington Hills/Members of the Evergreen/Farmington sewage disposal system/OCDC hydrologic/hydraulic model.
	Allen Park SSO Outfall Closure and Wet Weather Pump Station projects.
	City of Farmington footing drain disconnection program in the Chatham Hills subdivision.
	City of Westland rear yard catch basin disconnect program and pilot footing drain removal program.
	West Bloomfield Sanitary System Sewer Evaluation Survey pilot study.
	Troy sanitary sewer improvements to Evergreen Farmington System.
2005	OCDC EFSDS Segment III – Walnut No. 1 Pumping Station Improvement Project.
	City of Farmington Hills Lincolnshire Skye Pump Station project.
	Van Buren Township and other communities analysis of wet weather sanitary flow.
2004	OCDC completed 20% of the construction of a project to reduce SSO at the existing Walnut No. 1 Pumping Station.
	Garden City evaluated and modified in-line storage.
2003	Auburn Hills disconnected 50% of their footing drains and find it removed more than 60% of its total peak inflow rate into the existing sanitary discharge system.
	City of Farmington Hills completed a project that solved an ongoing SSO issue and alleviated the potential for future basement backups.
2002	The Rouge Project staff participated in the MDEQ SSO Work Group, which helped the MDEQ to develop additional guidance and policy to communities regarding SSO management.
	OCDC's received two grants: "Edwards Relief Drain Siphon" and "Farmington to Evergreen SSO Interceptor with CSO Regulator Adjustments."
	Wayne County Department of Public Works received a Rouge Program grant for "Two Balancing Chambers to Improve the Efficiency of the Lower Rouge Interceptor."
	City of Dearborn received a downspout disconnection program grant.
	City of Melvindale received elimination and sanitary sewer evaluation study grant.
	City of Livonia Sunset Hills Sanitary Sewer project.
	City of Farmington Hills Kendallwood sanitary sewer system study.
2001	MDEQ determined that the state policy should be reviewed and invited SEMCOG and other participants from the Rouge effort to assist them.
	Rouge Project staff participated in the MDEQ SSO Task Force.
2000	Rouge Steering Committee formed a SSO Prevention Subcommittee and developed a report that analyzed the SSO.
	The SSO Task Force (SEMCOG , Wayne County Department of Environment, OCDC, several communities, and the MDEQ) prepared a policy-level approach for assessing means to control sanitary sewer overflows SSOs.
1999	Work was completed to reduce SSOs in communities in the Middle 3 SWMA.
	Garden City study to better define the characteristics of SSOs and their impact on the river.
	Wayne County "Coordinate Complaint Response" program resulted in the elimination of significant SSOs in the Rouge River watershed.
	Garden City planned and developed a downspout disconnection program.
	The city of Westland sanitary sewer projects eliminated 15 SSOs.

10.2.3 *Illicit Discharge Elimination*

Under municipal storm water permits, permittees are required to develop and implement illicit discharge elimination plans (IDEPs) to prohibit and effectively eliminate illicit discharges (including discharges of sanitary wastewater) to the permittee's separate storm water drainage system for the regulated area. Municipalities are also required to implement storm water education programs for the public, municipal staff, contractors, and the business/industrial community.

Most communities in the Rouge River watershed have been implementing their IDEPs for several years. Typical activities include outfall surveys, sampling of storm sewer discharges and receiving waters, dye testing of facilities, inspection of OSDSs, inspecting/televising the storm sewer system, inspecting/televising the sanitary sewer system, sanitary sewer lining, review of construction plans to prevent misconnection, and complaint hotlines. Most communities in the watershed have also been implementing storm water education programs for several years. Municipalities have developed education programs that teach people within the watershed about stewardship of the Rouge River, proper disposal of waste materials, including pet waste, and maintenance of septic systems, among other topics. Many municipalities have also posted signs at road stream crossings noting the name of the stream and have implemented storm drain marking programs. Counties are collaborating with local municipalities to conduct illicit discharge investigations. The city of Plymouth and Wayne County, for example, worked cooperatively to identify and eliminate illicit connections throughout the community, while Northville Township and Wayne County jointly investigated the Highland Lakes development for possible illicit connections (none were found), and dye-tested new township facilities with Wayne County. As the illicit discharge elimination and public education programs continue to mature within the Rouge River watershed, pathogen input to the watershed will continue to be reduced. Table 25 is not meant to be all-inclusive, but represents the types of illicit discharge elimination activities occurring throughout the watershed. For additional information on the activities identified below, as well as other activities, see the Rouge River watershed Web site at http://www.rougeriver.com, or the individual annual reports submitted to the MDEQ by the permittees.

Table 25
Illicit Discharge Elimination Progress

Illicit Discharge Elimination Progress, 1998-2006	
IDEP Activity	**Examples in the Rouge River watershed**
Visual Inspection of Streams	Washtenaw County has inspected all Rouge River watershed drains in the county
	Approximately 174 miles of drains were visually inspected by the Wayne County Department of Public Works in 1999
	Oakland County has completed an inventory of all OCDC drains in the Rouge River watershed (approximately 450 outfalls)
Water Quality Monitoring	Washtenaw County quarterly monitoring of 19 Rouge River locations for *E. coli*, surfactants, and other parameters. Detected and eliminated discharges.
	Wayne County staff supported illicit discharge elimination efforts in the communities of Canton, Livonia, and Westland by collecting of over 160 *E. coli* samples. OCDC sampled *E. coli* in 31 county drain outfalls in 2005.
Complaint Hotline Reporting	In 2006 complaints led the city of Livonia to two illicit connections that were eliminated.
	Wayne County Compliance and Public Affairs "24-Hour Hot Line" (888-223-2363) handled over 590 calls in 1999.
	OCDC investigated 43 complaints in 2005, identified 28 illicit discharges, and eliminated 14 (10 were pending further investigation and 4 were spills or no known source).
Dry Weather Outfall Screening	Most communities have completed at least one round of screening, which led to the detection and elimination of a number of illicit discharges (e.g. In 2003 in Northville Township, two suspected illicit discharges were investigated and eliminated).
	Inkster examined 9 outfalls and 19 storm drain laterals in 2000. Testing showed 11 of the 19 laterals had *E. coli* levels above 2,200 cfu/100 ml, but none of the outfalls were above 2,000 cfu/100 ml. Range in laterals was 2,220 to 793,000 cfu/100 ml. The city was working on finding the sources of the high *E. coli*.
	In 1999, the city of Westland inspected, photographed, and numbered 209 outfalls and had signs installed at the outfalls. They used television equipment to look for illicit discharges. Two sources of illicit discharges were found and eliminated.
Combined Approach (based on monitoring results, complaints, problems found during routine field operations, or community partnership)	Wayne County has conducted advanced illicit discharge investigations since 1987 and has inspected 7,173 facilities countywide and identified 1,922 illicit connections in 525 facilities. Confirmation of corrective action has occurred at 480 of these facilities. Confirmation of corrective action is pending at 45 facilities.
	The city of Northville corrected 70 improper connections.
	The city of Wayne documented and corrected 4 illicit discharges within its boundaries.
	The city of Inkster eliminated 12 illicit discharges and 3 failing septic tanks.
Geographic Information System (GIS)/ Mapping	Livonia updated their GIS to support their illicit discharge elimination plans.
	Storm water drainage paper maps have been updated by many municipalities, such as Garden City, to assist in illicit discharge investigation and public education.
Illicit Discharge Elimination Training Program	Wayne County developed a modular training program in 1999 to provide training for county and local community staff for locating and eliminating illicit discharges to surface waters. 5 modules and 2 specialty sessions have been developed and presented to 1,300 municipal staff (including many from within the Rouge River watershed and over 75 Wayne County staff) and other interested parties.
"Working for Clean Water---It Begins with You" Video	Developed by Wayne County and used by municipalities to educate field staff about the importance of clean water and how to recognize signs of illegal/inappropriate discharges. Over 300 copies were distributed in 2005, with an estimated audience of 1,300. In 1999 4 referrals by Wayne County Roads staff were confirmed to be illicit discharges.
Building Inspections/ Review of Construction Plans	County staff tested all community-owned facilities to ensure that these facilities do not have illicit connections. Construction plans to prevent misconnection are also utilized for this purpose.
Inspecting/Televising of Storm/Sanitary Sewers	Led the city of Wayne to slip-line over a mile of aging sanitary sewer to prevent seepage of sanitary sewage into storm sewer systems in 2004.
Software for Tracking Illicit Discharges	Developed by the RPO and modified by Canton Township and Washtenaw County in 1999 is currently being used by many counties and local communities.

10.2.4 *On-Site Sewage Disposal System Management*

Under the MS4 permits, municipalities are required to minimize seepage from on-site sewage disposal systems into their storm water drainage systems. Many Rouge municipalities have established comprehensive programs to achieve this goal and fulfill permit requirements in a variety of ways, some of which are summarized in Table 26. Table 26 is not meant to be all-inclusive, but representative of the types of OSDS management activities occurring throughout the watershed. For additional information on the activities identified below, as well as other activities, see the Rouge River watershed Web site at http://www.rougeriver.com, or the individual annual reports submitted to the MDEQ by the permittees.

Table 26
On-Site Disposal System Management

OSDS Management, 1998-2006	
OSDS Activity	**Examples in the Rouge River watershed**
Septic-Related Ordinances	Washtenaw County and Wayne County enacted new ordinances in 1999 for the managements of OSDSs (effective January 1, 2000), which require the inspection of all residential OSDSs by private evaluators at the time of sale of a property. These regulations require that OSDSs be repaired or connected to sanitary sewer prior to property transfer.
	In Wayne County from 2001-2005, inspectors found an average of 29% of septic systems (179 of 616 inspected) to be failing at the time of property transfer.
	The Washtenaw County Environmental Health Department inspected, at the point of property transfer, 407 septic systems from 2001-2002 and 2004-2005 within the Rouge River watershed portion of Washtenaw County. 82 (19%) were determined to be failing. A surprising finding was that some of the surface discharges were from new plumbing.
	The OCDC drafted a regulation for regular inspection of OSDSs in 2002; however, this regulation has not yet been passed.
Regulating Systems	Westland passed an ordinance prohibiting septic systems **within** the city.
	Southfield passed an ordinance requiring landowners with septic systems to either convert to sanitary sewer or have an inspection of the septic system every 3 years.
	Several other municipalities, including Bloomfield Township, require connection to the sanitary sewer if the septic system is found to be failing and the sanitary sewer runs within 200 feet of the property.
Inspections of Septic Systems	The city of Livonia inspected all septic systems and updated their locations using GIS mapping. 10 septic systems were eliminated and connected to a sanitary sewer.
	The city of Southfield contracted with the Oakland County Health Department to conduct evaluations of the septic tanks and septic fields in the city. Since 1999, 983 sites have been inspected. Of those that did not pass, 133 have corrected the failure by connecting to a sanitary sewer, 43 are pending legal action, and 15 are considered to be illicit discharges into the Rouge River watershed.
Tools to Assist in OSDS Program Implementation	Septic evaluation tools, inspection technique guides, and evaluation profiles.
	Training of inspectors.
	Databases identifying OSDS locations in communities.
	GIS is being used to track septic systems in a number of communities.
Sanitary Sewer Line Extension	Several communities, including Inkster, Westland, Southfield, and others have extended their sanitary sewer lines to areas that were previously on septic systems, resulting in the abandonment of existing failing septic systems.
Public Education to Identify Signs of Failing Septic Systems	Septic maintenance workshops in 2006 in the city of Northville and Bloomfield Township. Several others planned in 2007.
	Brochures on septic system maintenance, such as the one developed by Bloomfield Township, have been distributed within some municipalities.
	Some permittees, such as Plymouth Township, have posted septic maintenance materials on their Web sites.

10.2.5 *Public Education and Involvement*

Under the MS4 permits, municipalities are required to develop a public education plan for the purpose of encouraging the public to reduce the discharge of pollutants in storm water to the maximum extent practicable. Many Rouge River municipalities have established comprehensive programs to achieve this goal and fulfill permit requirements in a variety of ways, some of which are summarized below. The following discussion is not meant to be all-inclusive, but representative of the types of activities occurring throughout the watershed. For additional information on the activities identified below, as well as other activities, see the Rouge River watershed Web site at http://www.rougeriver.com, or the individual annual reports submitted to the MDEQ by the permittees.

10.2.6 *1998-2006 Public Education and Involvement*

Municipalities are undertaking efforts, using various types of media, to educate the public about water quality. Water quality and/or riparian protection brochures are distributed to new residents in many communities, including Northville and Bloomfield Townships. Communities within the Main 1-2 SWMA periodically publish a newsletter titled Waterside Living and distribute it to riparian landowners throughout the watershed. Several communities have undertaken outreach efforts to educate homeowner associations about water quality. For example, the Washtenaw County Drain Commissioner's "Homeowner's Association Handbook, A Guide to Water Quality Protection for Homeowner Associations and Households" was distributed to Rouge River watershed townships as a water quality education tool for homeowner associations. The city of Westland had several posters designed and displayed in city buildings and in shopping malls to educate the public about the Rouge River. In addition, they also mailed a brochure to all homeowners and commercial and industrial establishments sharing information on how to improve water quality in the Rouge River.

The Southeast Michigan Partners for Clean Water was formed to protect and improve the quality of water resources through a coordinated and consistent storm water management effort. This organization includes representatives from counties, municipalities, watershed councils, the private sector, and water quality professionals in Southeast Michigan. The partners promote picking up pet waste and keeping pollutants out of storm drains, among other topics, using numerous materials that have been developed as part of the Regional 7 Simple Steps to Clean Water Campaign.

Many municipalities are also utilizing cable and radio public service announcements to educate the public about water quality. The OCDC, for example, has been airing cable shows for 3 years that provide tips on how to improve water quality and protect the environment. The Van Buren Township Environmental Department, as well as many other communities, also use the municipal Web site, newsletter, and/or community newspaper to further education on environmental issues. In 2002, Van Buren Township published articles on many topics including septic system maintenance. Among Web sites developed to increase storm water education within the watershed, the Rouge River project Web site was developed with the intent of being a primary tool for information dissemination about watershed activities.

Among several videos that have been produced within the watershed for watershed education, the Rouge River Public Involvement Team developed a 10-minute video titled “Reclaiming the Rouge: A Partnership in Restoration and Preservation.” This video was produced by the RPO to describe the Rouge Project and to highlight the many successes throughout the Rouge River watershed. Featured projects included educational activities in Salem Township, downspout disconnection in Livonia, stream bank restoration in Dearborn, the construction of CSO RTBs in Oakland and Wayne Counties, activities of the Friends of the Rouge (FOTR), and many other projects and programs. A 15-minute public education video, “Storm Sewers Are Not Garbage Cans,” was also developed by Farmington Hills that covers how the actions of homeowners can impact the river. Guidelines for car washing, environmentally friendly lawn and garden care, preservation of streamside buffers, proper hazardous waste disposal, and other homeowner activities that can affect the river are reviewed in the video. Two copies were distributed to each Upper Subwatershed Advisory Group member with the intent that it would be shown on local cable television channels, distributed for public viewing through area libraries, and presented at meetings of local service clubs and neighborhood associations.

Most municipalities also display and distribute educational information within municipal buildings and at municipal events. The Wayne County Department of Environment, for example, distributed approximately 65,000 pieces of public information materials and information relating to water pollution issues at community events or festivals, staff training sessions, workshops, leadership presentations, departmental presentations, or office display racks.

A number of festivals that include water quality protection themes are held annually within the watershed. The Rouge River Water Festival is held annually for fifth grade students, where students visit exhibits and sessions related to water quality, native plants, composting, the water cycle, wetlands, and stream bank erosion. The Wayne County Festival, hosted annually at the University of Michigan-Dearborn, hosted 3,600 fifth grade students from 66 elementary schools in 12 Rouge River watershed communities and 3 downriver communities in 2005. The Oakland County Festival, hosted annually at Cranbrook Institute of Science, hosted approximately 1,300 students in 2005. An annual festival is also hosted in the Johnson Creek subwatershed by Northville Township and the Johnson Creek Protection Group. In 2005, native plantings were demonstrated at Johnson Creek Day.

Rouge Rescue, an annual river cleanup day, is hosted on the first Saturday in June by the FOTR, a nonprofit organization that, since 1986, has been dedicated to promoting restoration and stewardship of the Rouge River through education and citizen involvement. FOTR programs also include volunteer watershedwide monitoring (volunteers conduct frog and toad surveys twice per month at several hundred one-quarter sections in the watershed); volunteer macroinvertebrate surveys 3 times per year at approximately 30 sites watershedwide; information and outreach workshops; and restoration projects. The FOTR also coordinates the Rouge Education Project, a program that promotes awareness and stewardship of the Rouge River watershed through school-based water quality monitoring, investigation, and problem solving. Schools collect and analyze river data and encourage taking action to improve the health of the Rouge River watershed based on their findings. Another example of a Rouge River watershed education and monitoring effort is that initiated with lake association groups in Bloomfield Township. The Forest Lake Outlet Watershed, a group of riparian landowners from multiple area lakes, in conjunction with Bloomfield Township, developed management strategies and set long- and short-term goals in an effort to improve water quality. The Forest Lake Outlet Watershed group also conducts water quality testing on several open water bodies.

The FOTR also coordinated a watershedwide storm drain marking program that enabled the marking of thousands of storm drains watershedwide through 2006 (individual communities have subsequently taken over program management). In 2004, for example, more than 280 volunteers, organized by the FOTR, marked a total of 2,250 storm drains in 8 communities during 22 projects.

Several environmental incentive programs have also been developed. The RiverSafe Homes program, for example, is under development by the Washtenaw County Drain Commissioner's Office to provide homeowners the opportunity to self assess their water quality protection practices and be awarded a "RiverSafe Home" plaque for display. A Rouge Friendly Business program was also developed and implemented within the watershed.

Several Rouge River municipalities have instituted unique programs to reduce pathogen input to storm water. The city of Plymouth provides "Mutt Mitts" in public parks to assist with proper disposal of pet waste. A number of municipalities have also passed ordinances that require proper pet waste disposal.

A number of surveys have been conducted to gauge public knowledge of storm water issues, including a 2004 survey by SEMCOG of 3,720 households within Southeast Michigan concerning their knowledge of sources of pollution, watershed awareness, and other similar topics. This survey indicated a large percentage (43%) of those surveyed didn't know where storm water goes after it enters a storm drain or roadside ditch. Only 14% of those surveyed knew that they lived in a watershed. However, the survey did indicate that the majority of residents are willing to take action to improve water quality, such as promptly picking up their pet's waste (79%), implying that water quality improvements may be realized if educational efforts are implemented. Results from a Public Involvement Survey of 1999 showed that public involvement techniques being used in the watershed were working. Almost half of the respondents indicated that they knew of the Rouge Project, a majority said that they were changing their practices on lawn fertilizing, and a majority felt that continuing actions by government would be needed to sustain the restoration. Future surveys will determine the effectiveness of current education efforts.

10.3 Other Projects

Reasonable assurance activities that are not included in the above categories are discussed in this subsection. The following discussion is not meant to be all-inclusive, but representative of the types of activities occurring throughout the watershed. For additional information on the activities identified below, as well as other activities, see the Rouge River watershed Web site at http://www.rougeriver.com or the individual annual reports submitted to the MDEQ by the permittees.

10.4 2006 Other Projects

Wayne County established a grant program to support activities by communities and agencies that obtained MS4 permits in the Rouge River. This program allocated several million federal dollars to the 7 subwatersheds for illicit discharge elimination, public education, and subwatershed management plans.

Additionally, a number of projects have been implemented within the Rouge River watershed to improve water quality and provide storm water detention. These projects include:

- Detention pond retrofit projects in Northville Township to provide outlet control, wetland plantings, prairie seeding, and create a wet pond among tasks.

- Establishment of a regional storm water detention facility in the city of Livonia, constructed to manage storm water and provide significant pollutant removal from a 2,700-acre watershed, which is approximately 65% developed.

- Riparian zone improvement in Canton. In April, roughly 150 students, parents, teachers, and friends volunteered their time to plant native trees, flowers, and seeds along the banks of Truesdell Creek, a site on the grounds of Field Elementary School in Canton that is used as an outdoor classroom over the school year.

- Construction of a swale with an underdrain on a gravel road as an alternative to constructing enclosed storm drains in the city of Beverly Hills to provide system storage, storm water attenuation, groundwater recharge, and solid and nutrient removal through vegetative linings.

- Construction of rain gardens at Comcast Communications in Plymouth Township. The rain gardens provide benefits such as groundwater recharge, wildlife habitat, chemical filtration of phosphates and nitrates, sediment removal, and reduction of runoff and erosion.

- Retrofitting 4 detention basins in Canton Township. The designs included a combination of regrading, dredging, wetland plantings, tree and shrub plantings, habitat improvements, and outlet structure modifications. Canton's Public Works Division completed the grading work, while community staff and residents installed the plantings during volunteer planting days in the spring.

- Construction of the Fellows Creek Naturalization and Flow Reduction regional storm water wetland. In addition to reducing flashiness, this wetland also filters pollutants in the storm water runoff, thus improving the storm water quality. A walking path was constructed around the perimeter of the wetland with access points to areas of the stream where in-stream habitat is enhanced. Educational signage was installed describing in-stream habitat enhancements, descriptions of fish and macroinvertebrates species that might be observed, wetland features, and other habitat that may exist in the wetland.

- Wayne County Parks and the Department of Environment Watershed Management Division implemented of a variety of stream bank stabilization methods to improve the aesthetics, recreational desirability, and water quality of the Nankin Mill race.

- Van Buren Township constructed a recreational and interpretive area within a historically important wooded wetland complex. The township also worked with Visteon Corporation to design and construct a wetland fringe for an existing 36-acre (former gravel pit) lake. This project was completed in order to protect water quality, mitigate the impact of storm water pollutants on the lake, and provide fish and wildlife habitat for the lake.

- Oakland County Parks and Recreation grounds maintenance staff at Glen Oaks Park have maintained and expanded vegetative buffers and planted shade trees along the stream to enhance riparian habitat and provide thermal protection for the stream.

Several municipalities within the Rouge River watershed have adopted storm water ordinances. These municipalities include:

- *Wayne County.* The Wayne County Commission adopted the Wayne County Storm Water Management Ordinance and Administrative Rules in October 2000. These documents, along with the Wayne County Storm Water Standards Manual, are now being fully implemented to address storm water issues in the county. The ordinance requires that storm water management measures be incorporated into new development or redevelopment projects.

- *Washtenaw County.* Washtenaw County has developed model ordinances for local units of government for regulating storm water, natural features, storm water system use (what can be discharged to a storm sewer), and reduction of phosphorus from new developments.

- *The city of Novi.* The city of Novi adopted a storm water ordinance that not only manages increased storm water runoff from new developments, but also addresses the water quality aspect of storm water runoff.

Inventory projects have been undertaken in several portions of the Rouge River watershed, including:

- *The Lower 1 SWMA.* Assessment of 125 wetlands in the 6 communities of the Lower 1 SWMA was completed. Communities were provided with maps, reports, and digital information so that the analysis of the project, as well as recommendations for protecting wetland functions, could be accessed as needed.

- *The Main 1-2 SWMA.* The OCDC completed an inventory of detention ponds in the Main 1-2 SWMA, and made recommendations for improvements to the existing detention facilities to increase their pollutant removal efficiency.

- *The Main 1-2 SWMA.* The OCDC performed a stream bank inventory of the Rouge River and its tributaries in the area of the Main 1-2 SWMA, including open county drains. The inventory sites were located using a global positioning system, photographed, and surveyed to include the following parameters: condition of the bank, apparent cause of erosion, amount of erosion, slope ratio, river conditions, and soil texture.

- *Northville Township.* Northville Township inspected all privately-owned detention basins in 2003 and required maintenance to be performed as needed.

- *Westland, Livonia, and Bloomfield Townships.* These communities have also completed detention basin inventory projects.

Acknowledgements:

This report was prepared in partnership with Camp, Dresser, and McKee and the MDEQ, Water Bureau. Additional contributions to this document were provided by Phil Argiroff, Hae-Jin Yoon, and Betsy Nightingale, of the MDEQ's Water Bureau, Southeast Michigan District Office.

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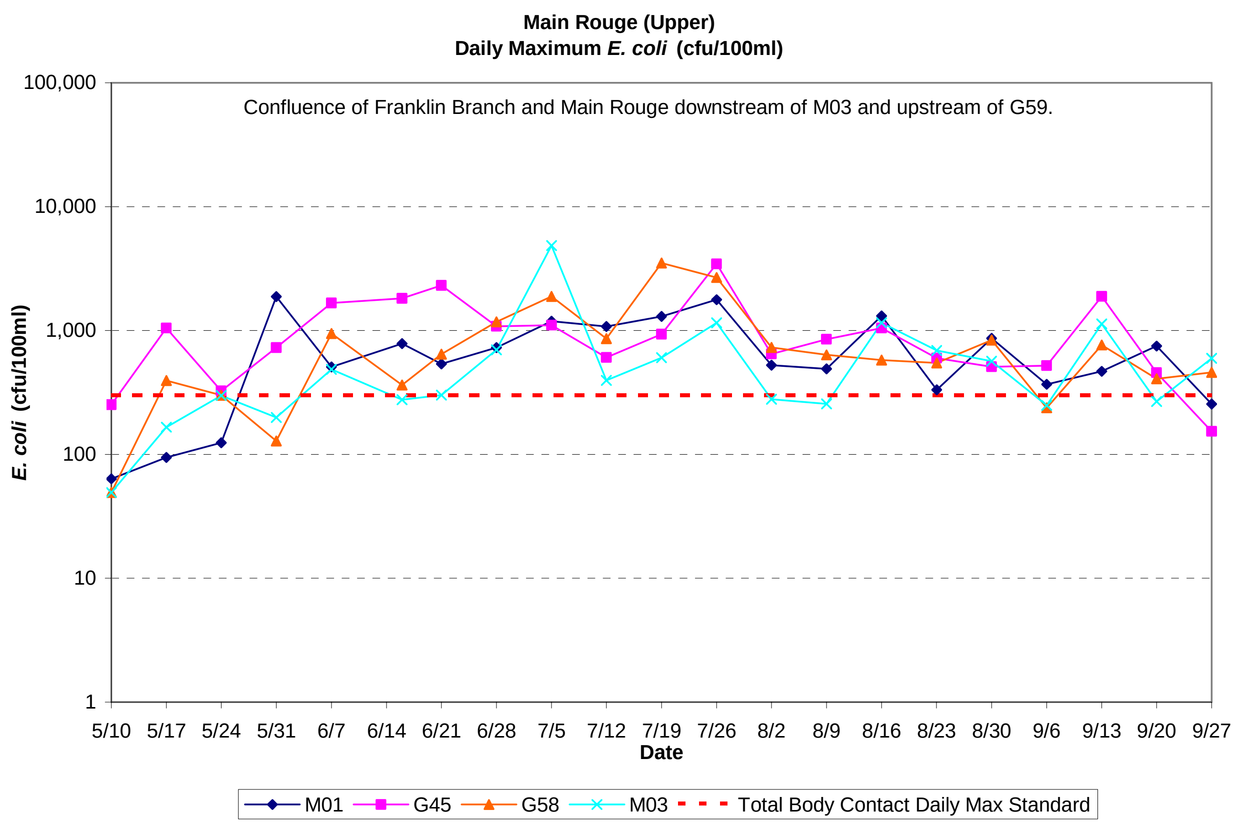
APPENDIX A

GRAPHICAL DEPICTIONS
OF THE
DAILY MAXIMUMS

Figure A-1



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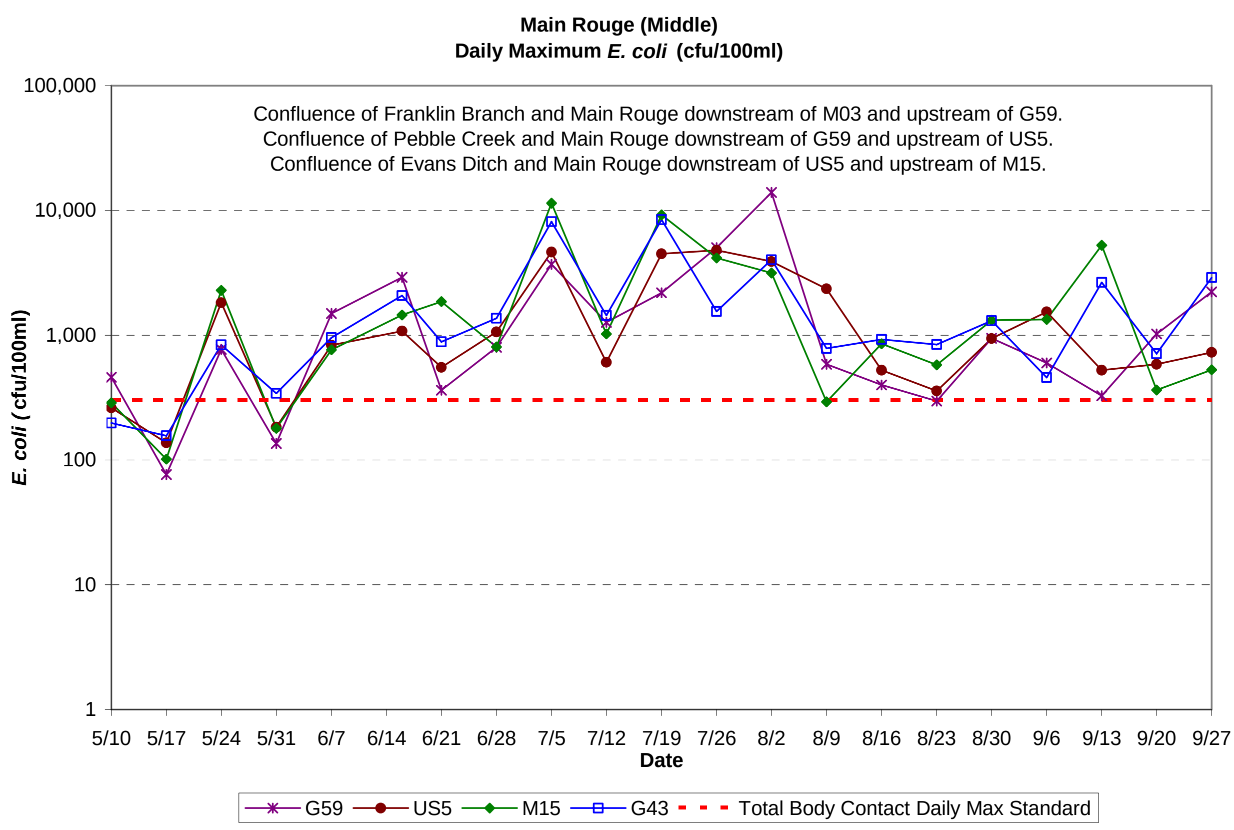

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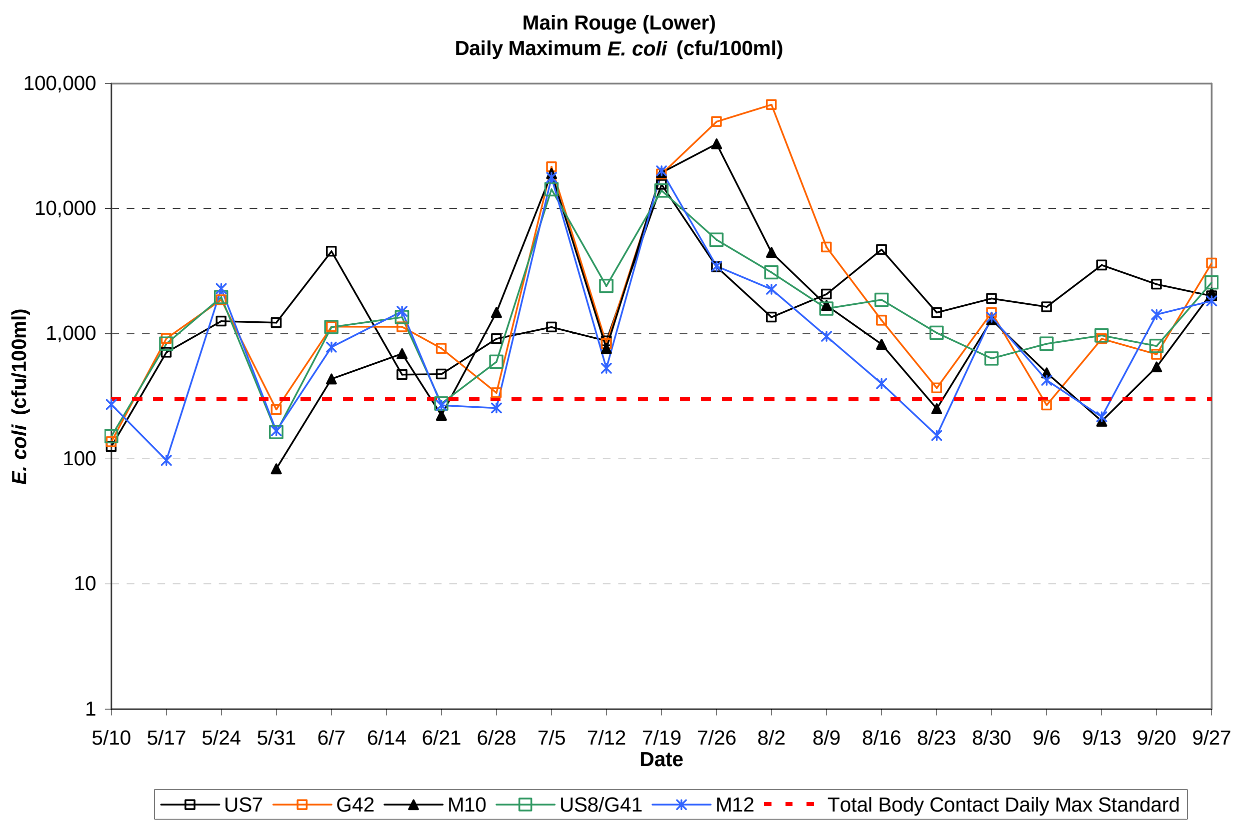

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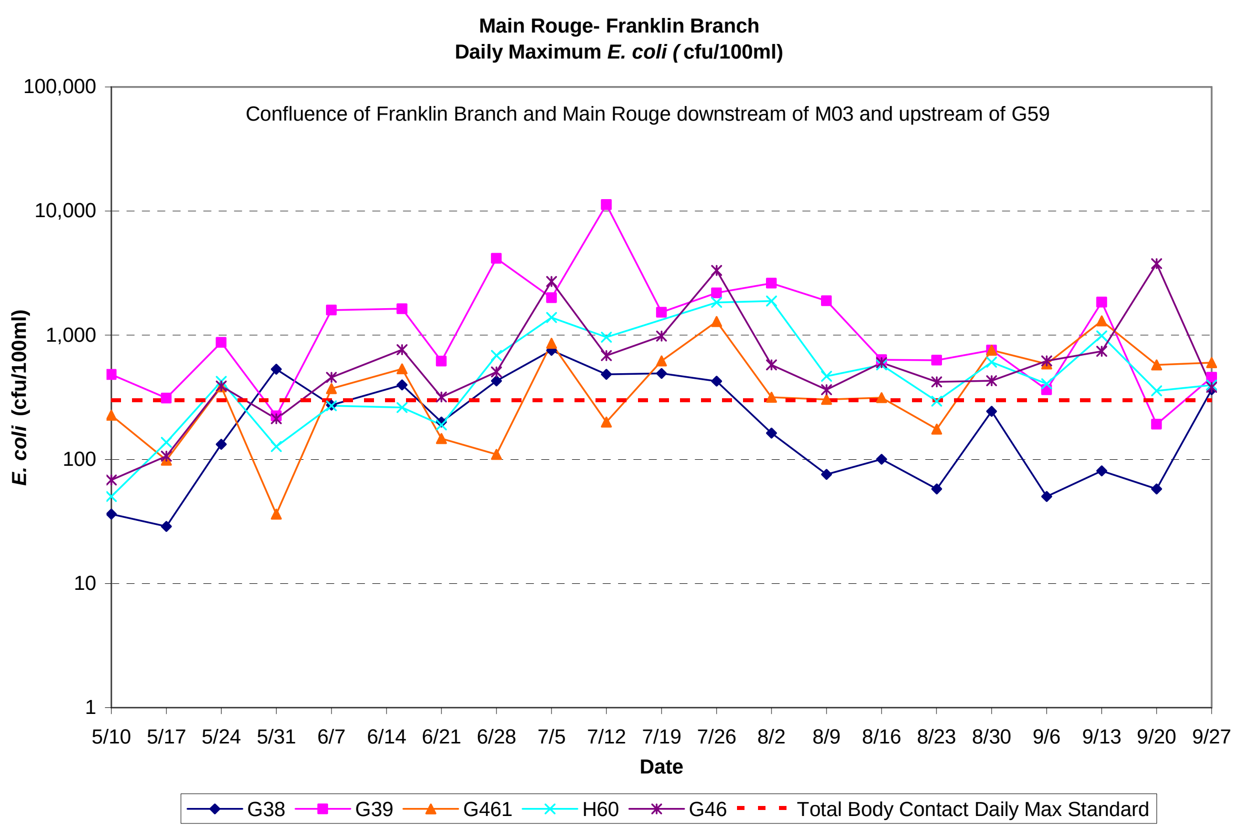

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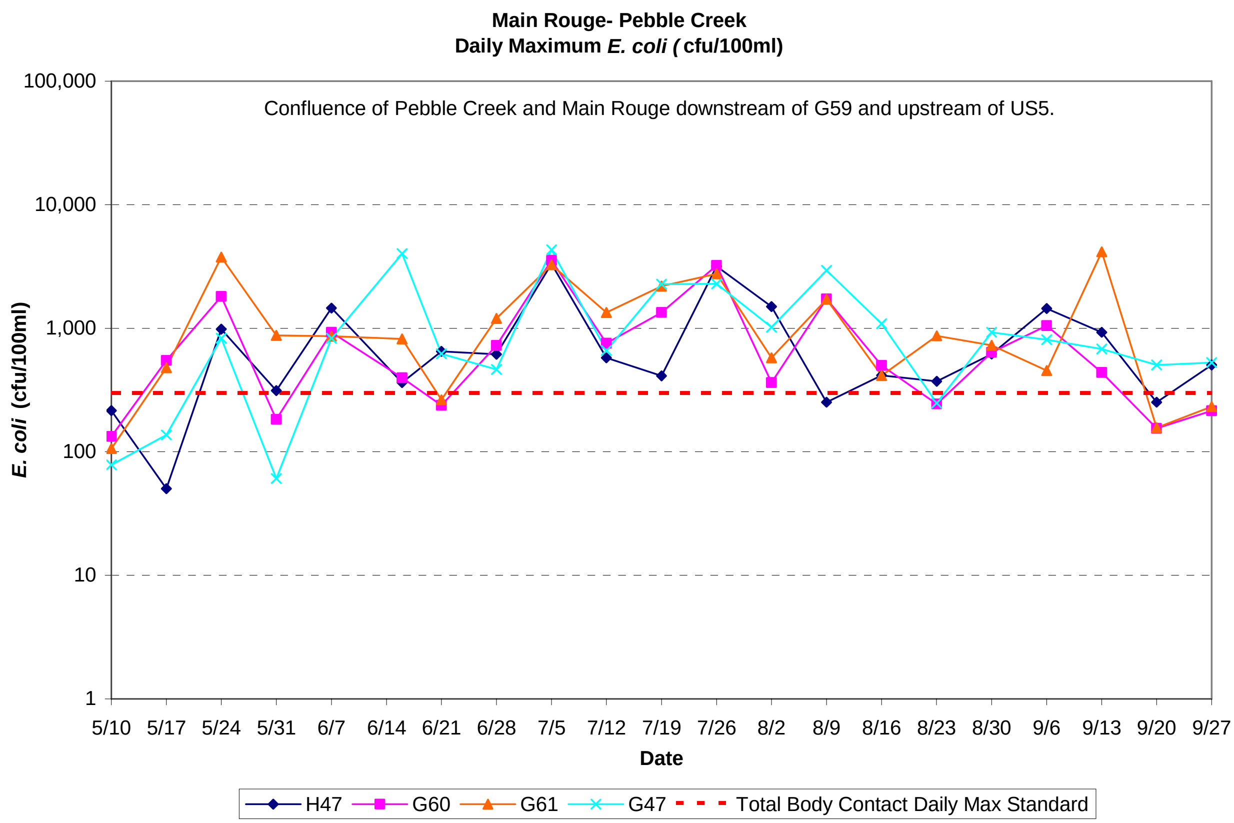

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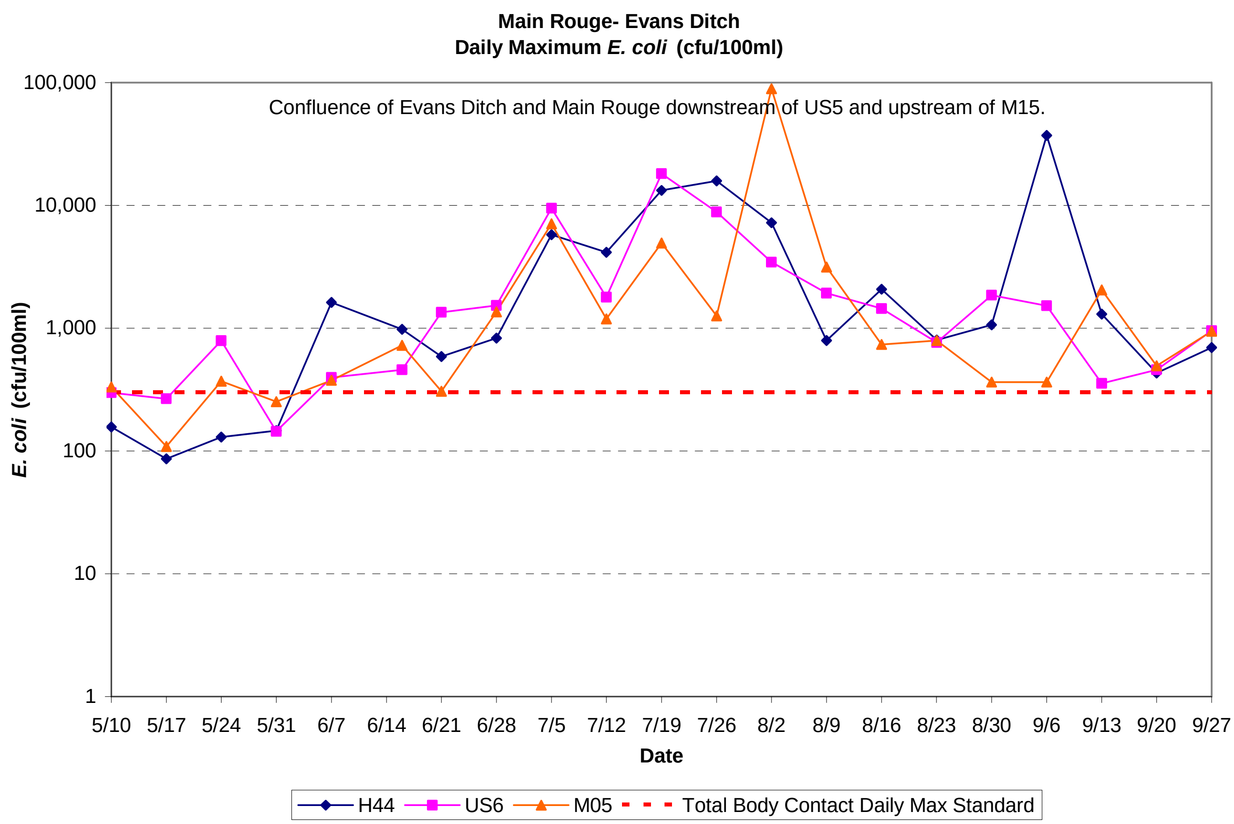

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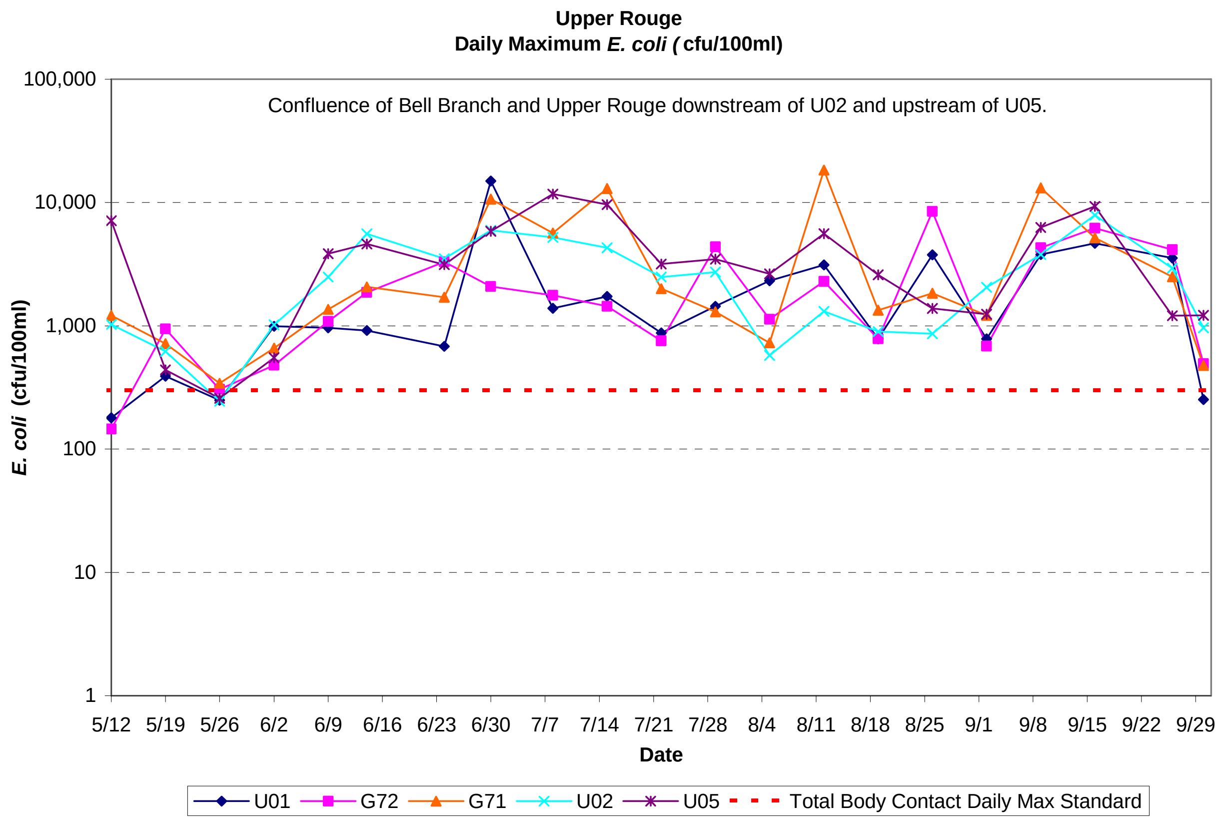

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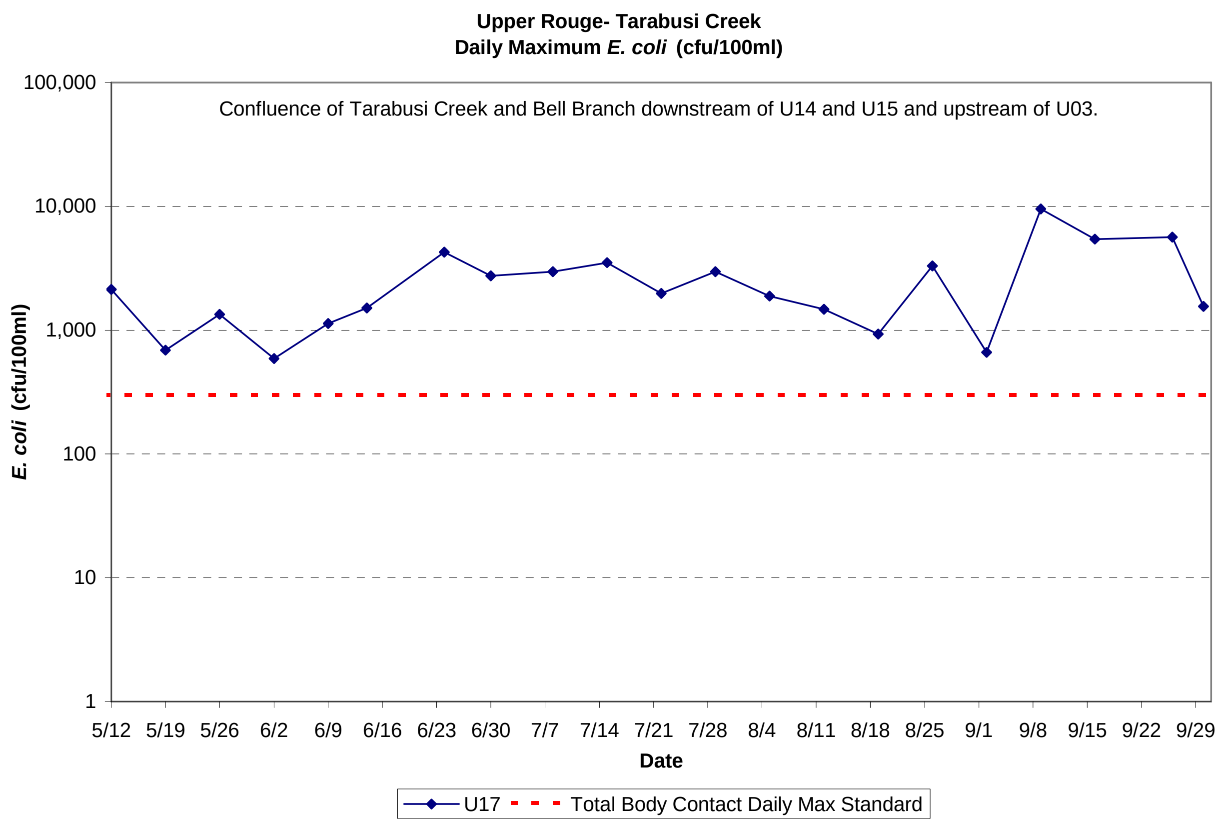

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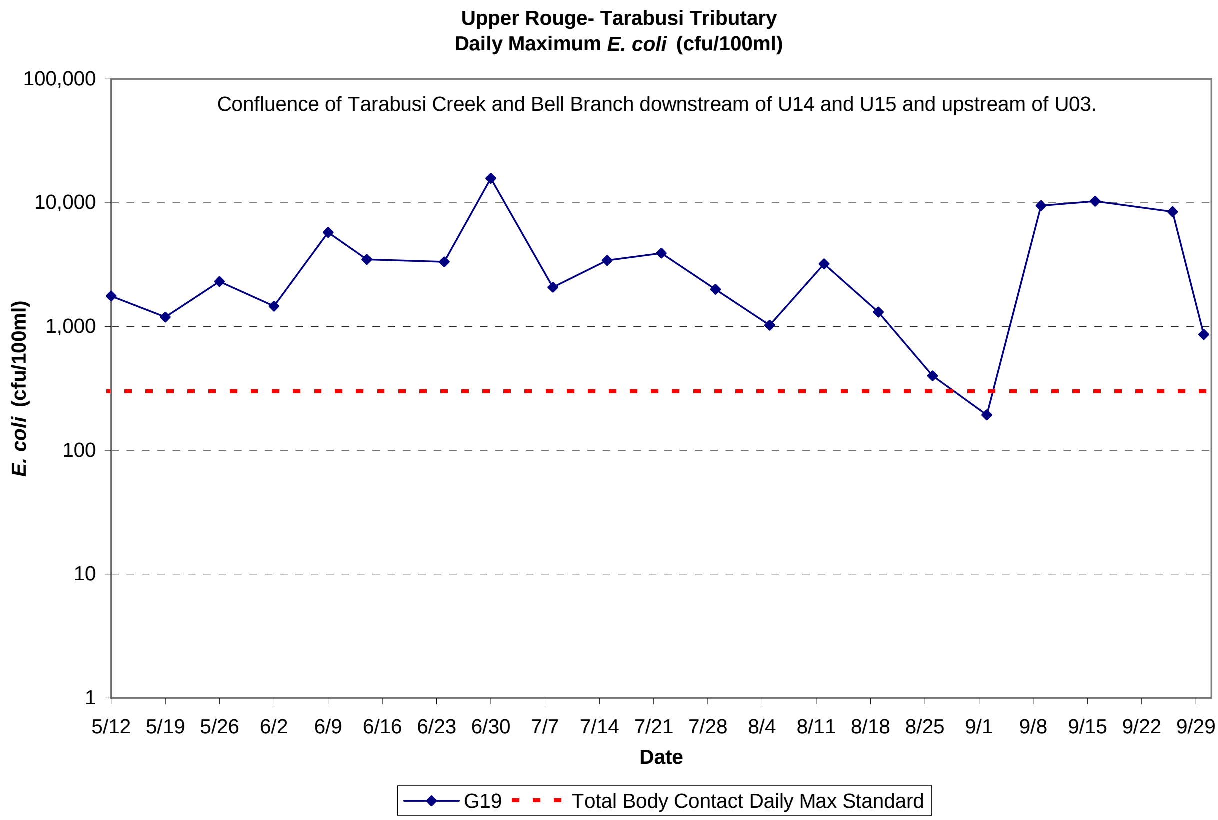

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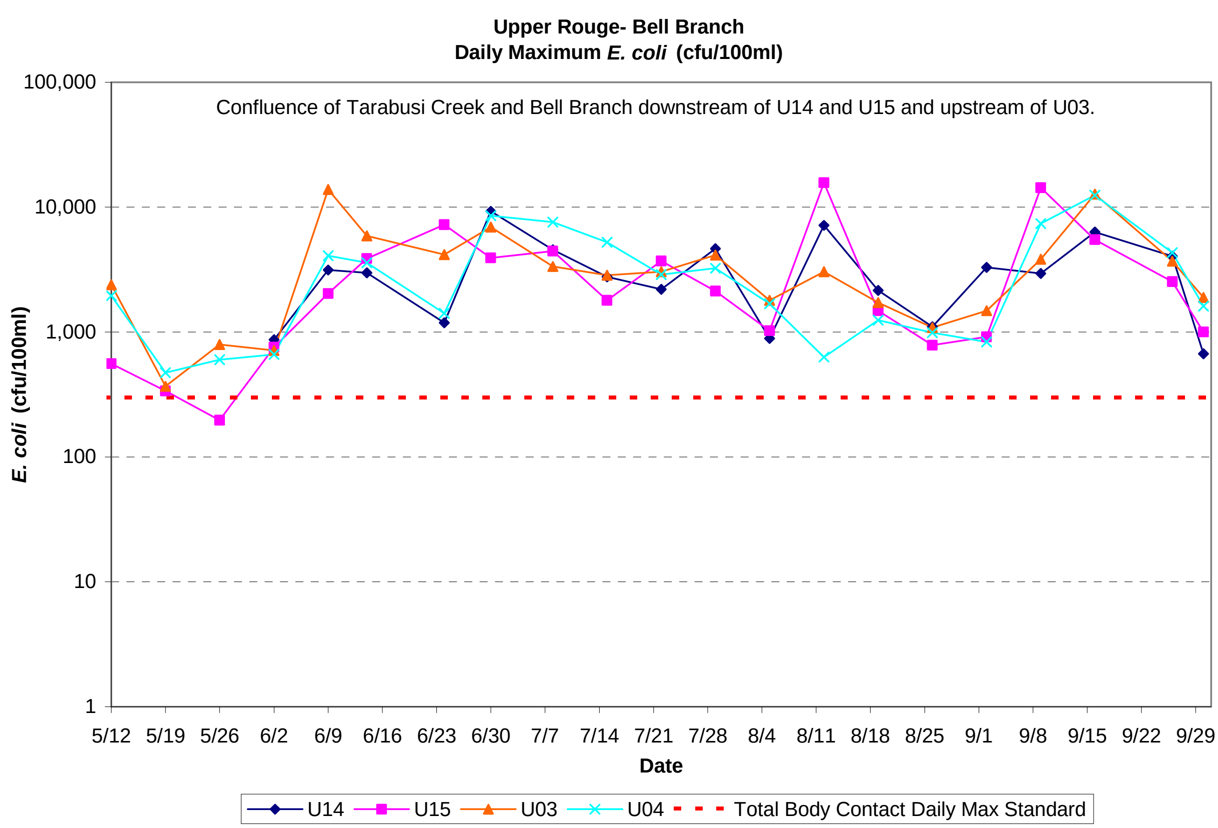

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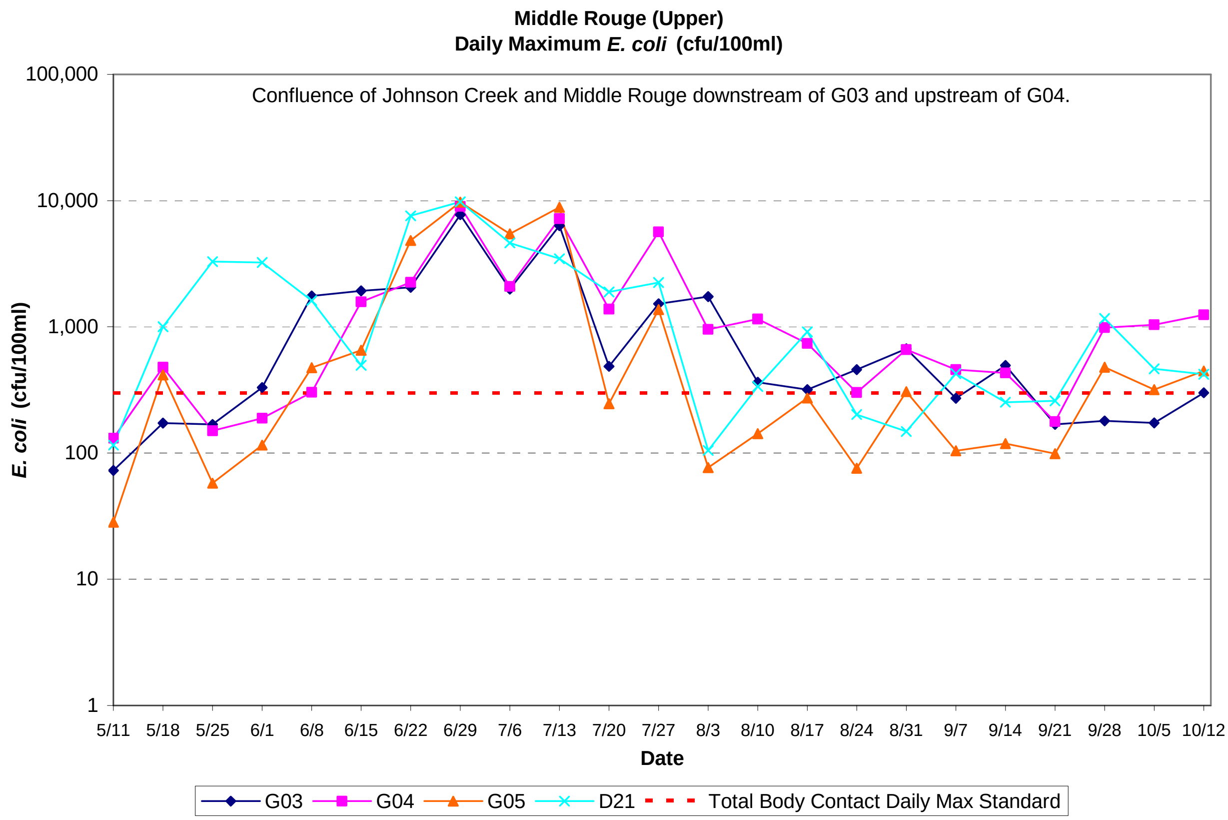

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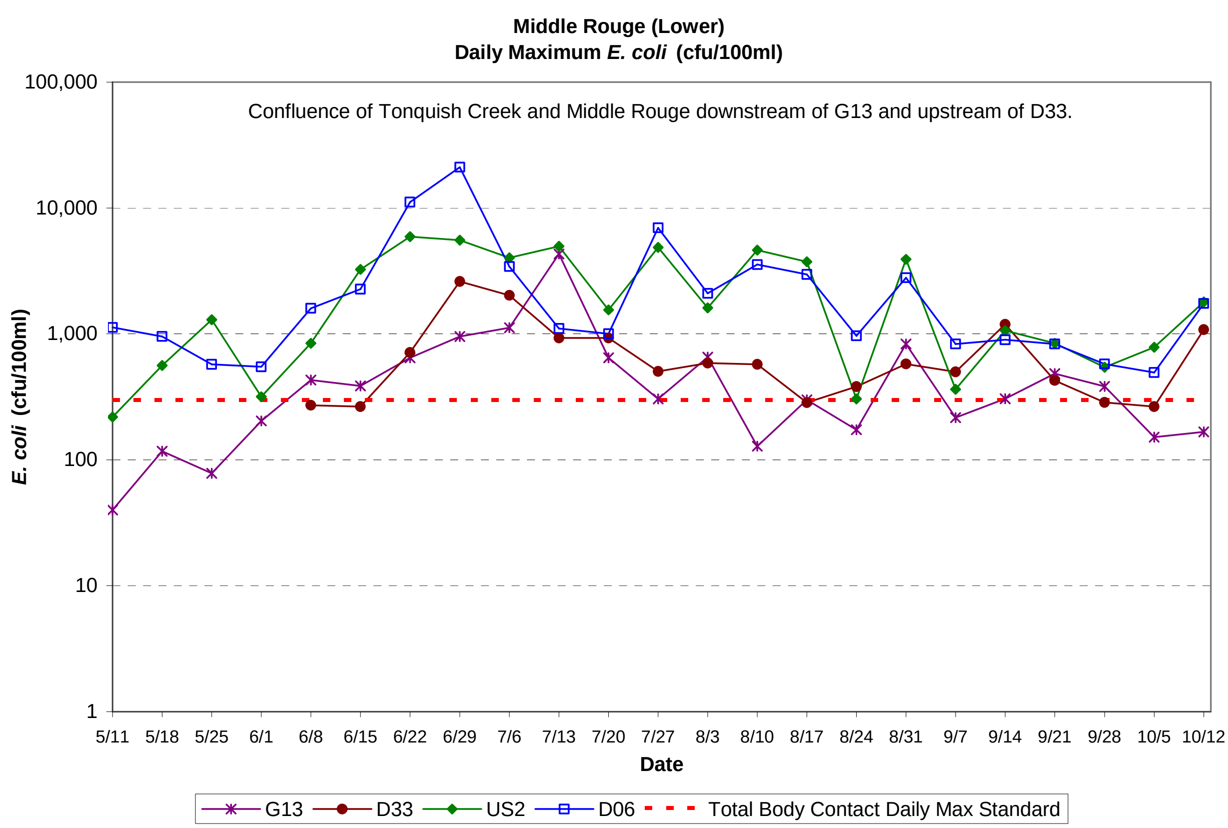

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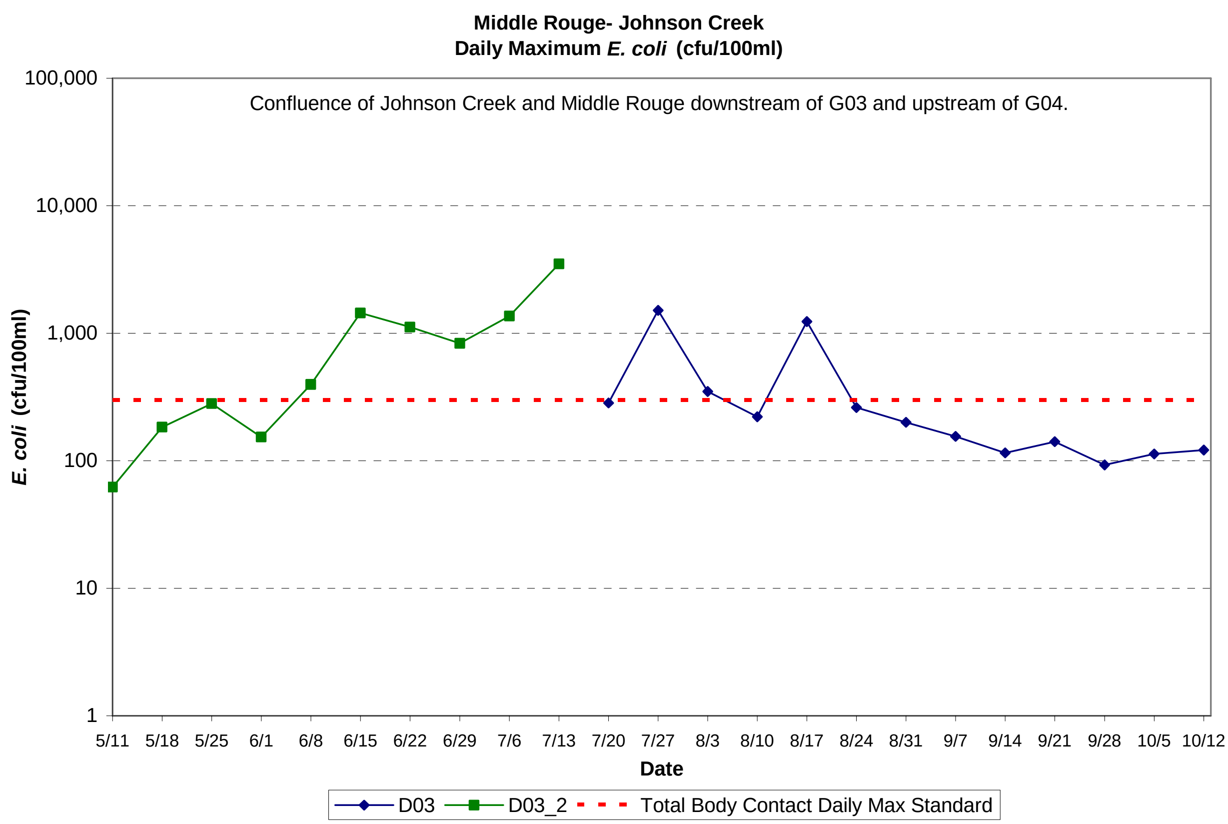

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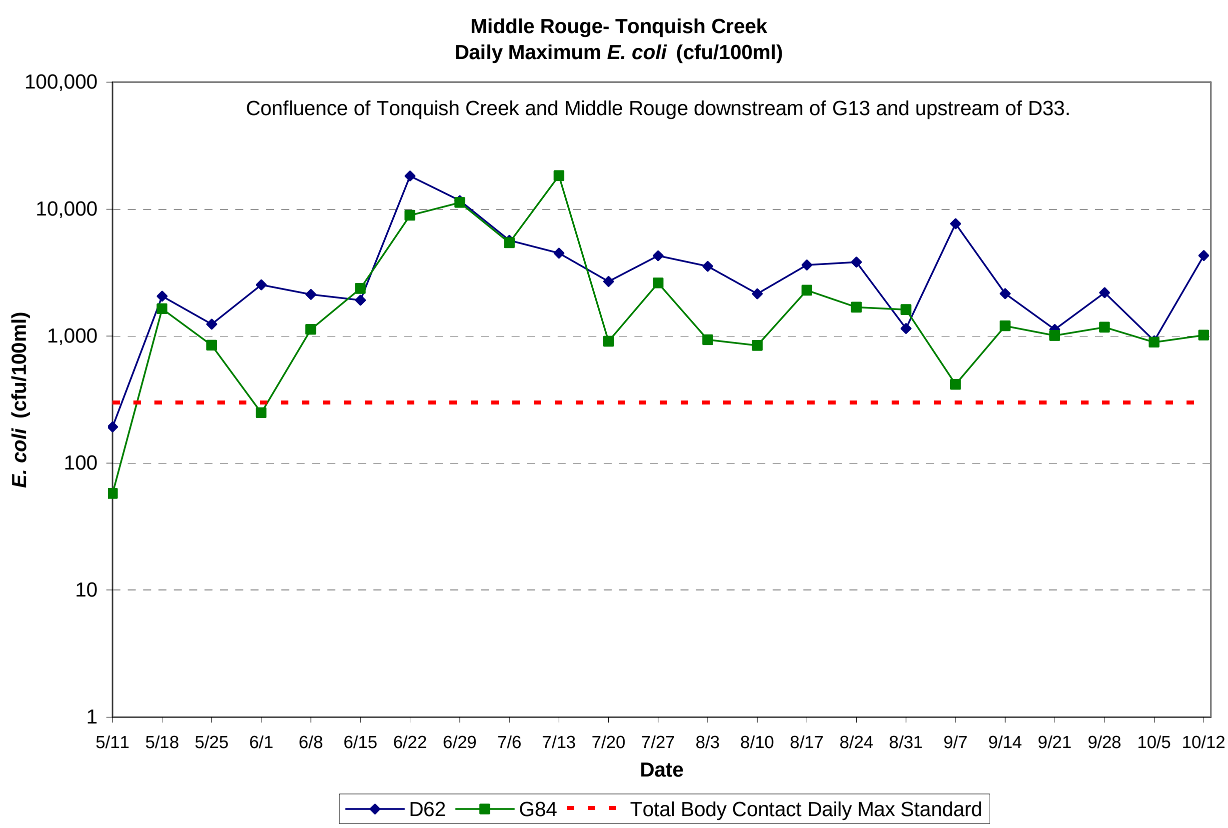

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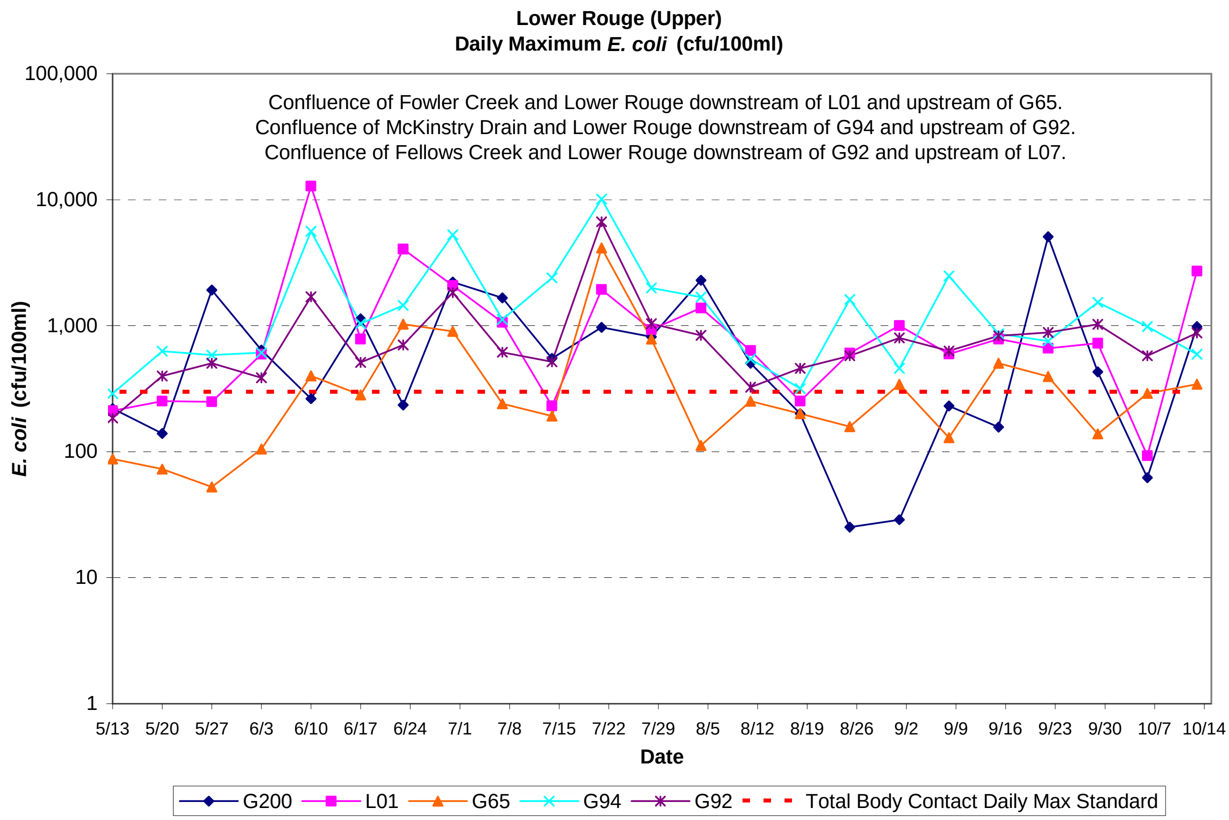

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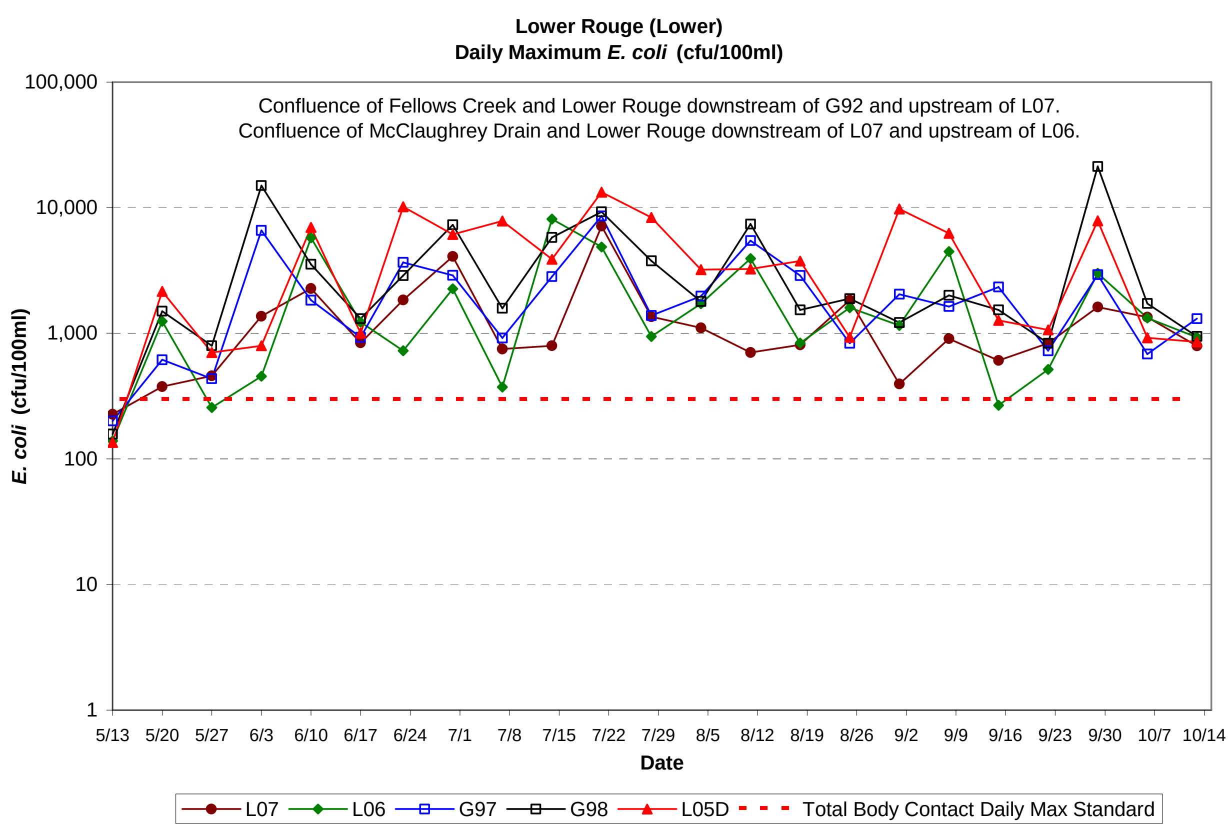

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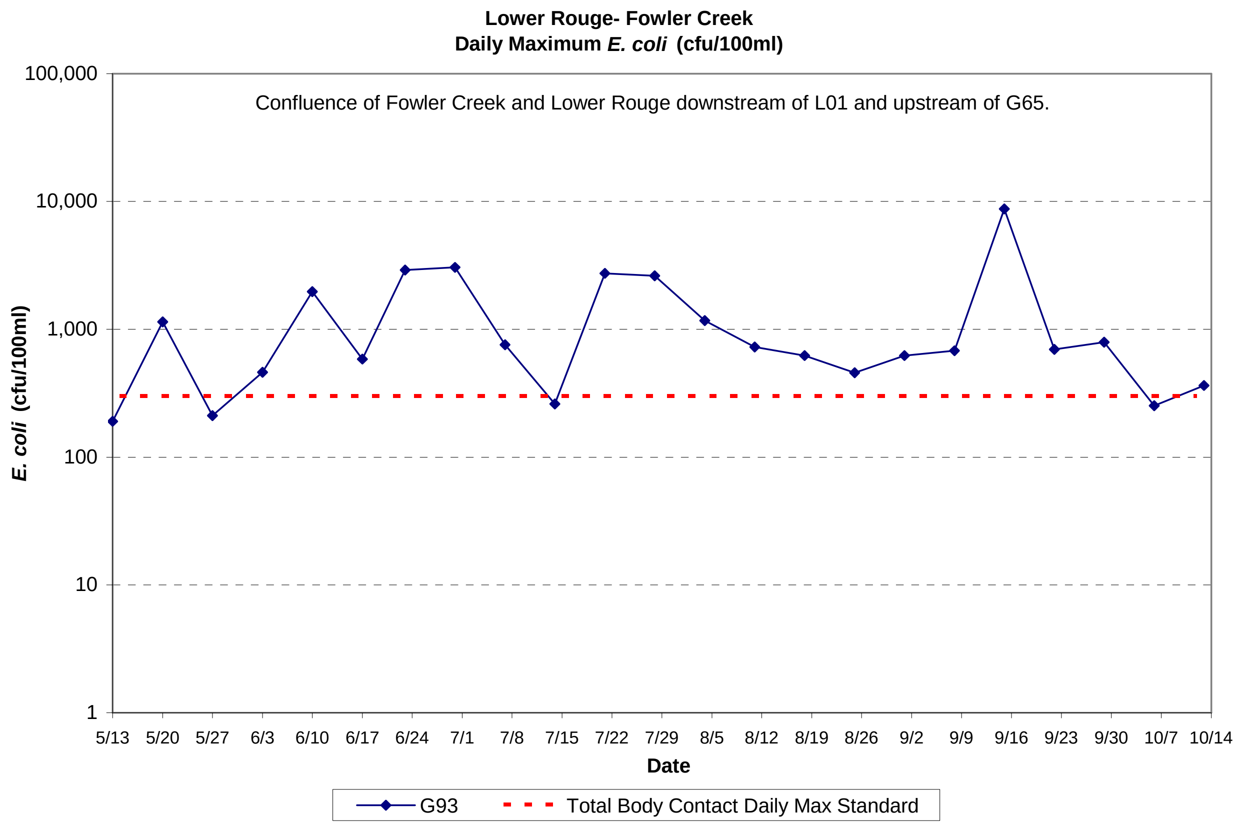

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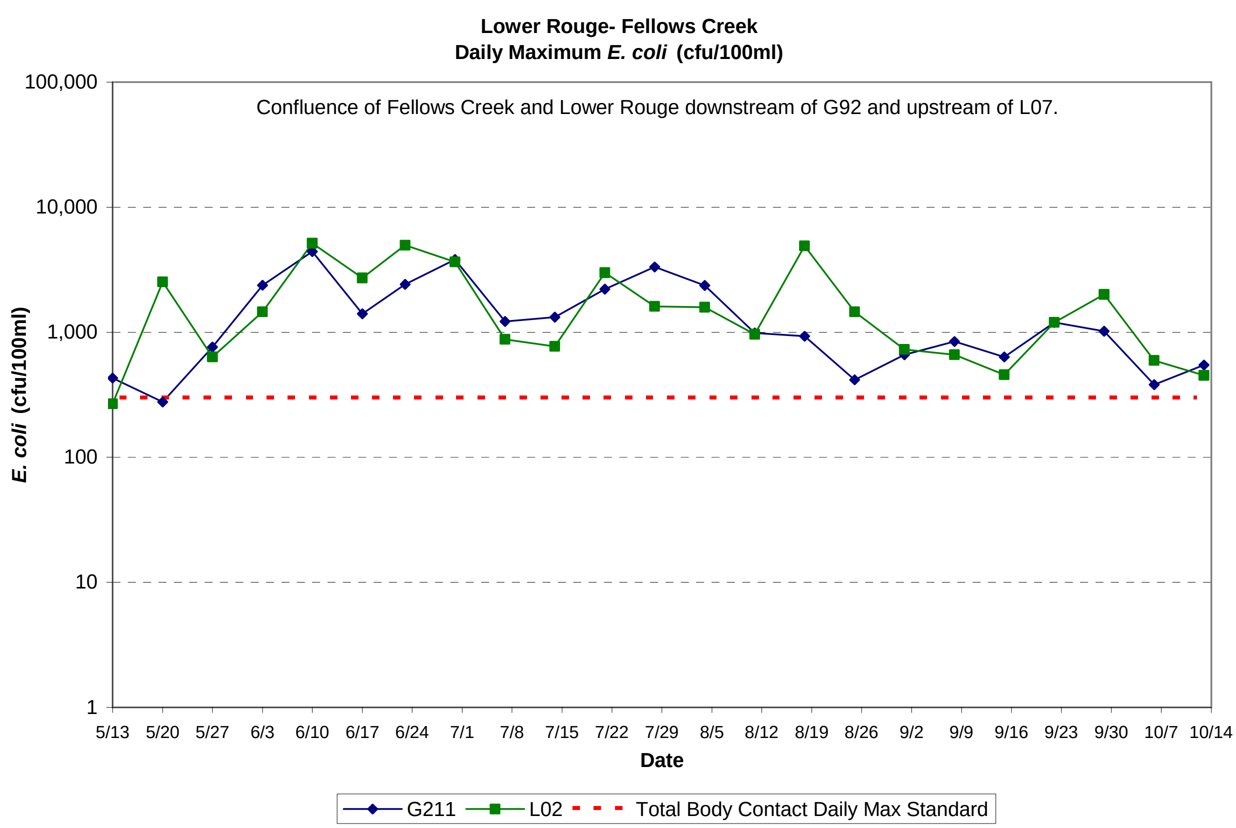

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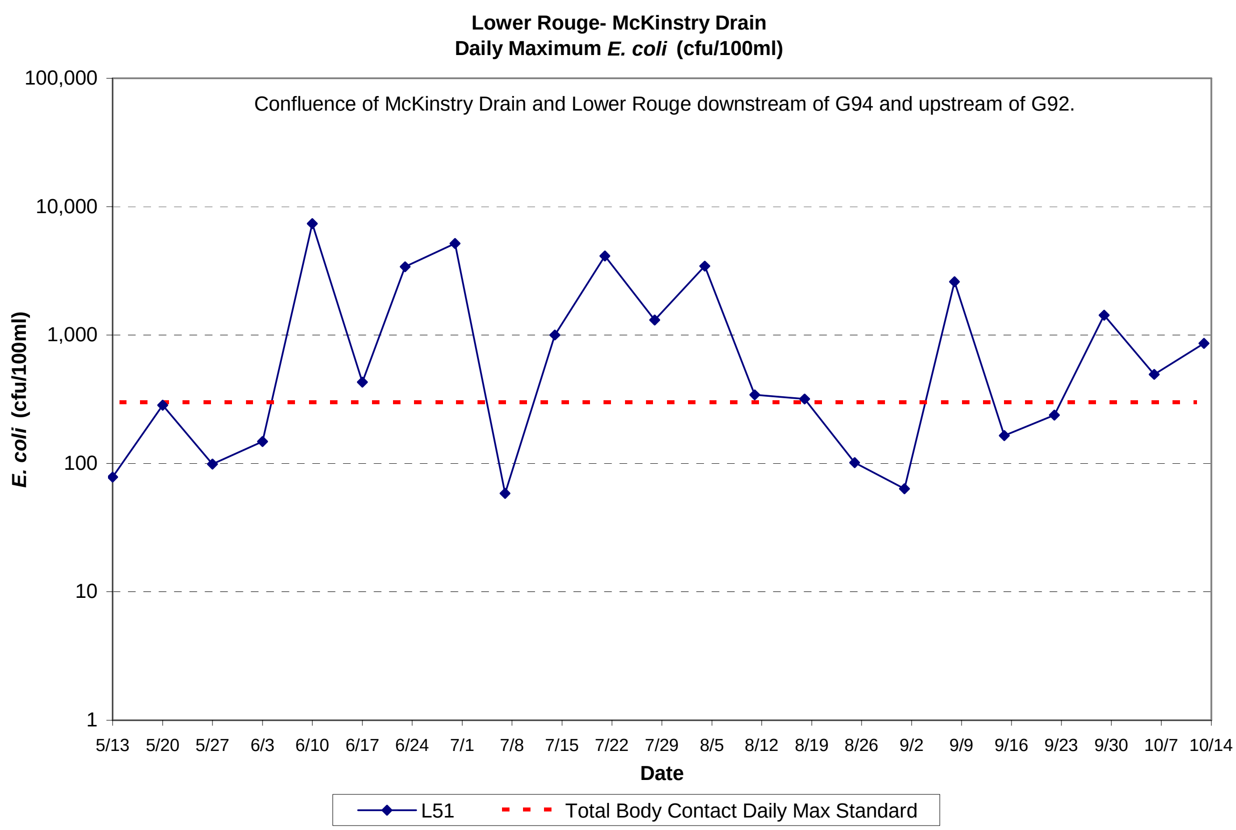

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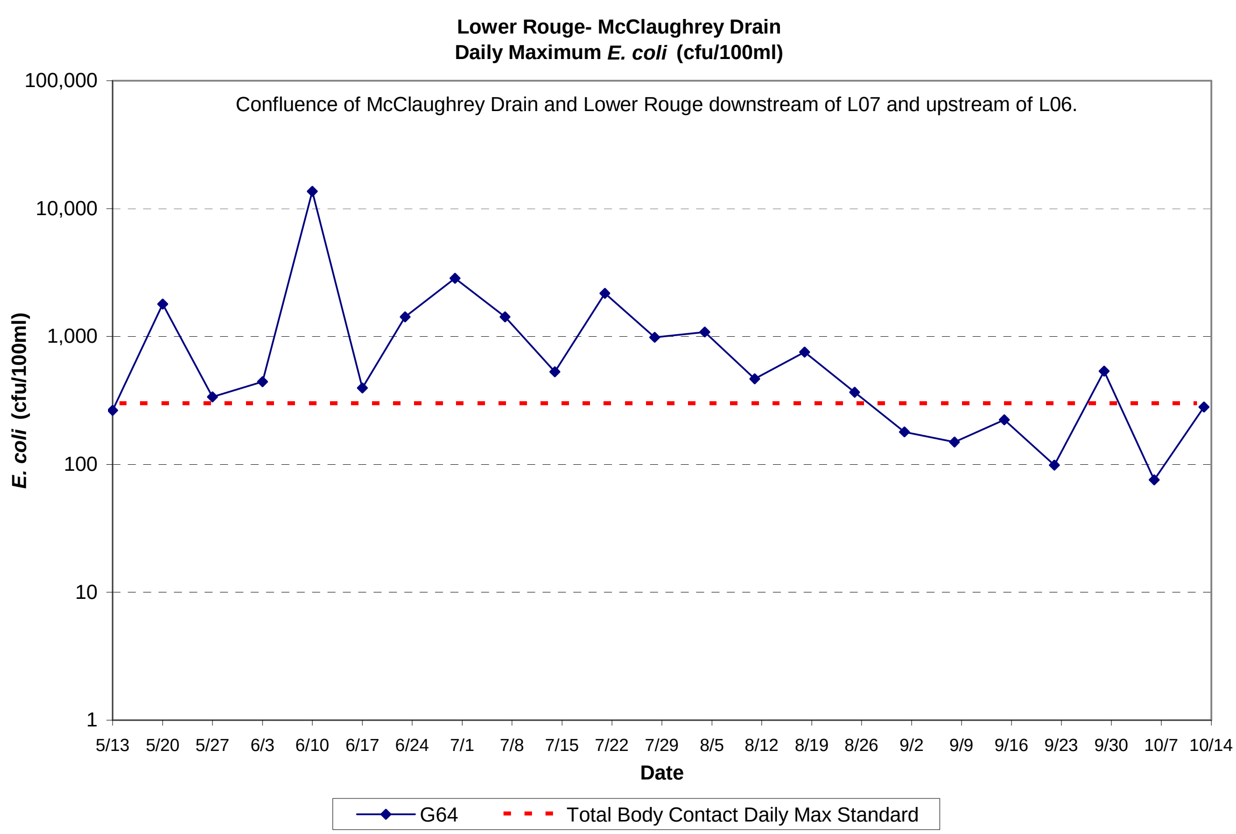
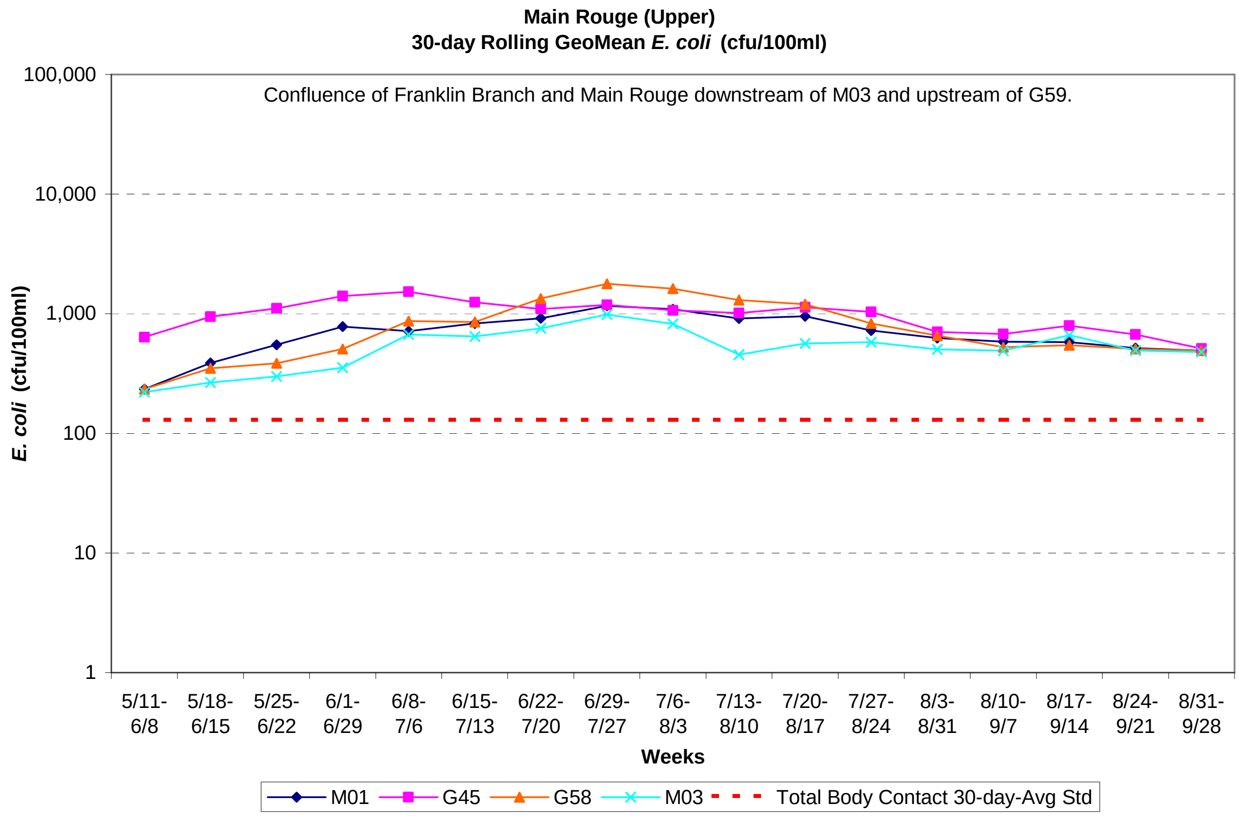


APPENDIX B

GRAPHICAL DEPICTIONS
OF THE
30-DAY ROLLING
GEOMETRIC MEANS

Figure B-1



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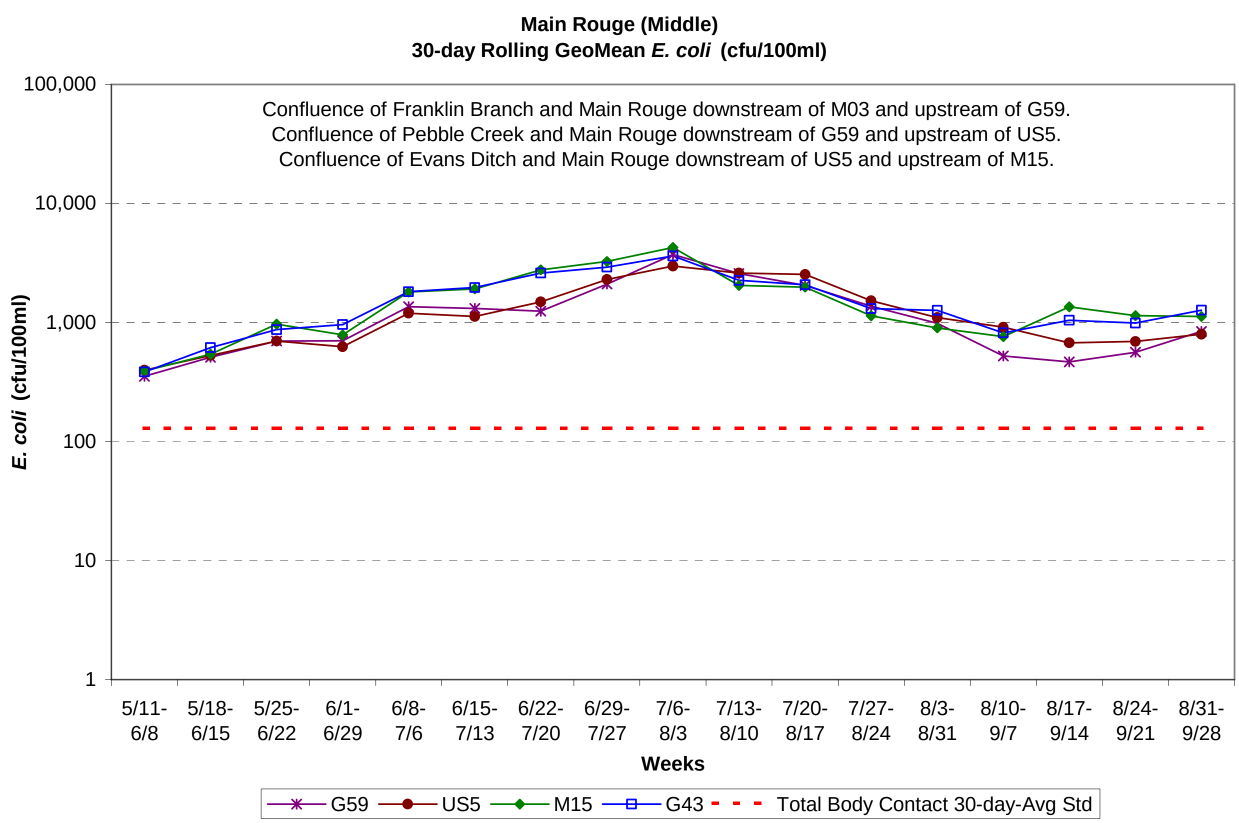

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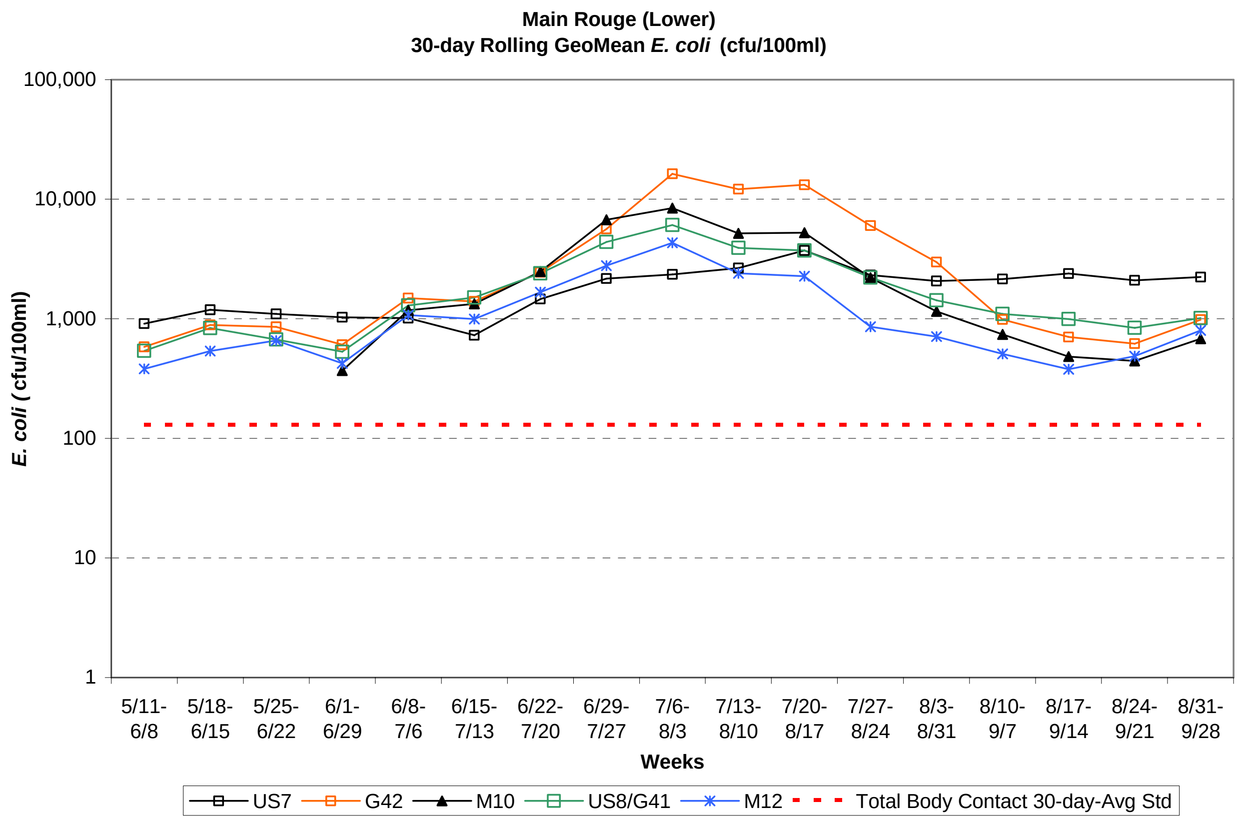

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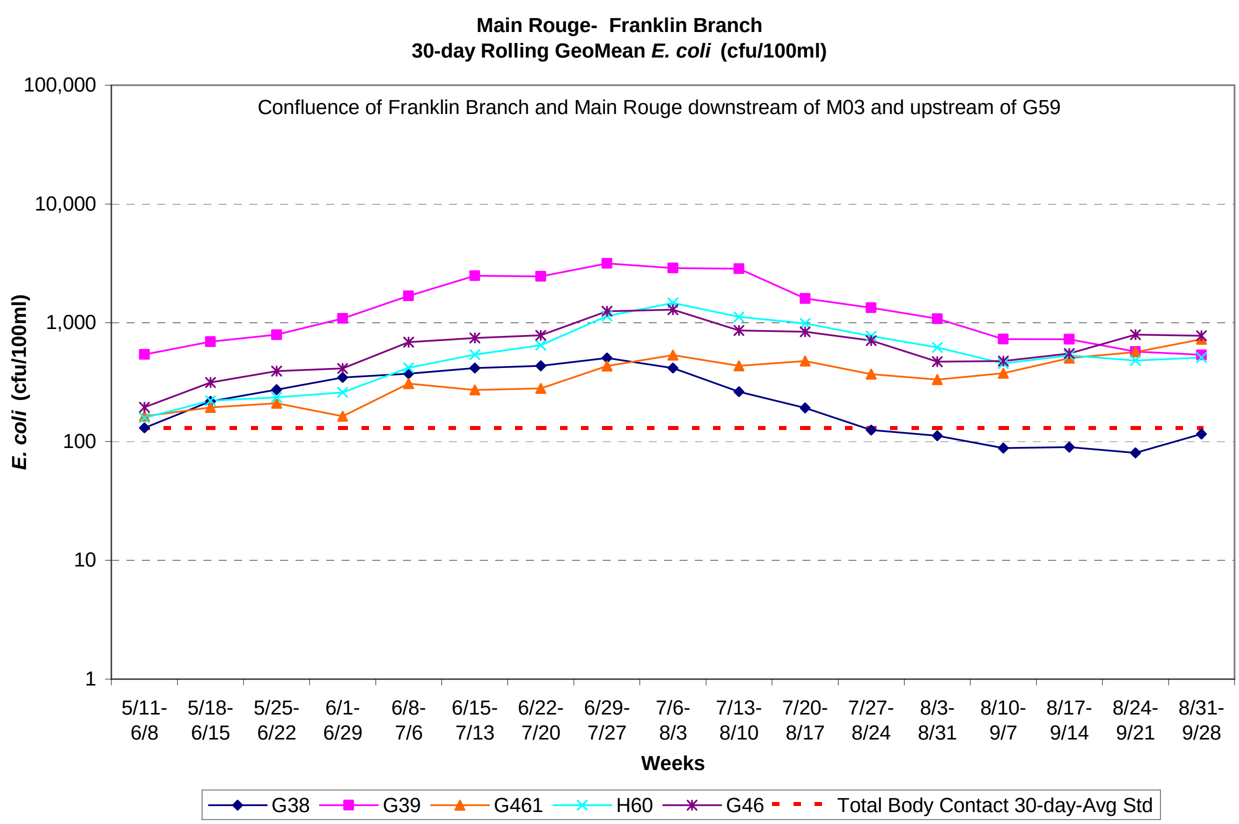
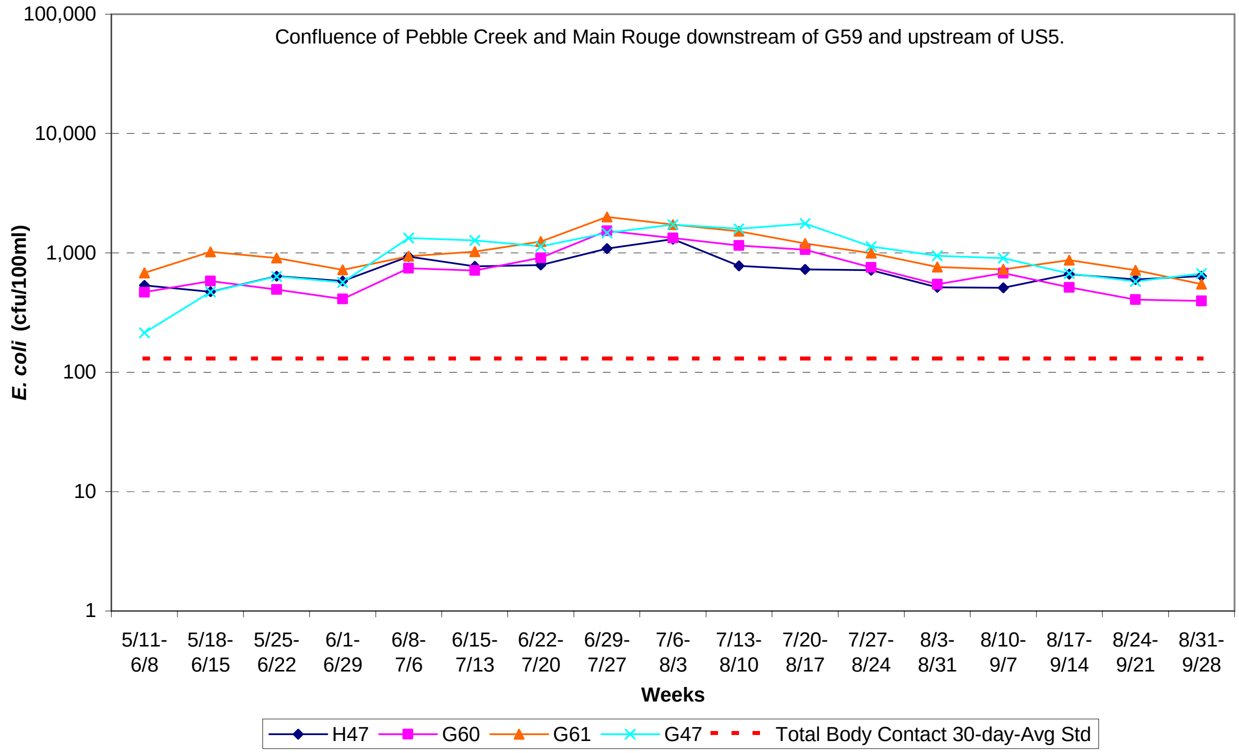


Figure B-5

Main Rouge- Pebble Creek
30-day Rolling GeoMean *E. coli* (cfu/100ml)



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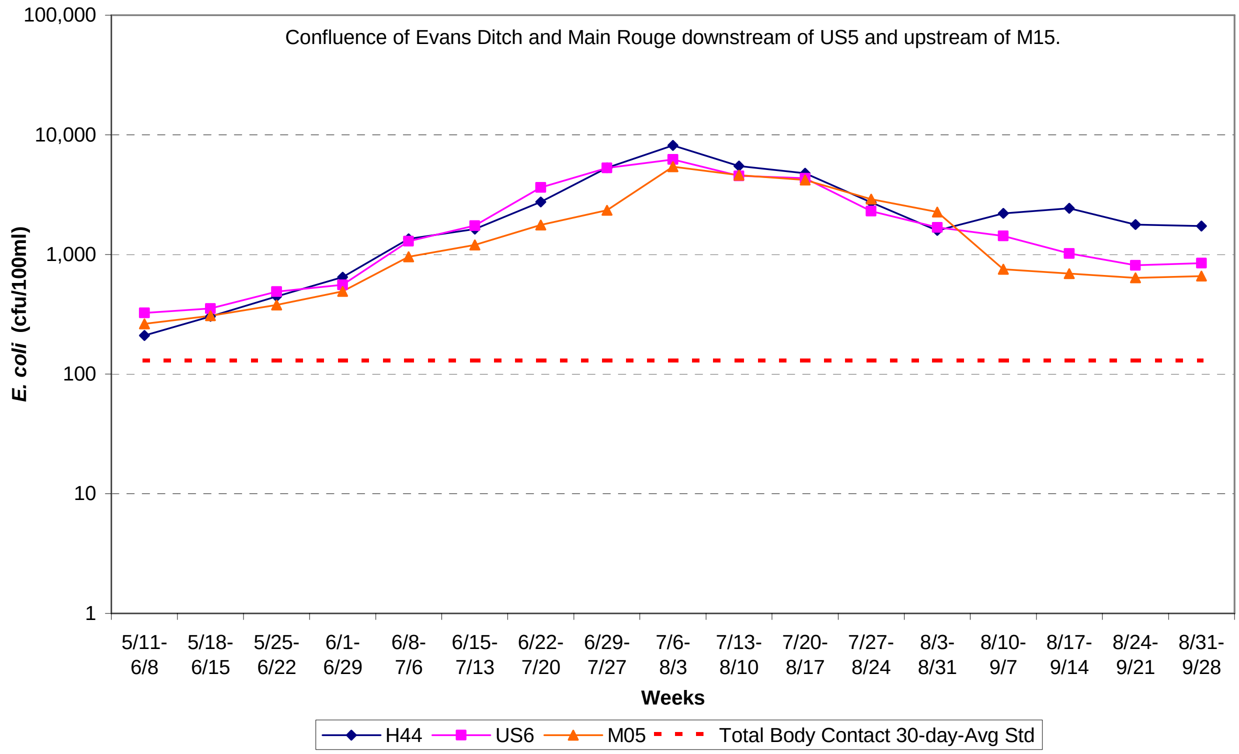
Main Rouge- Evans Ditch
30-day Rolling GeoMean *E. coli* (cfu/100ml)



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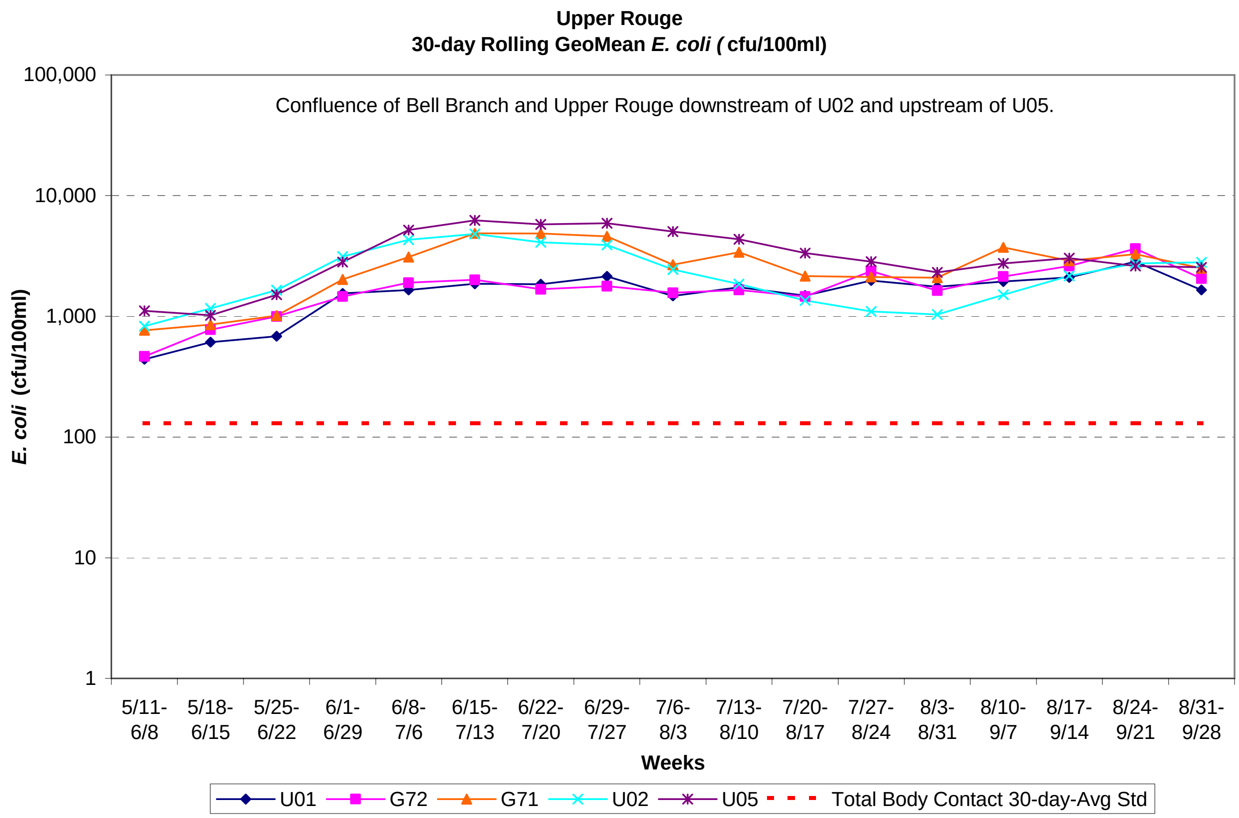

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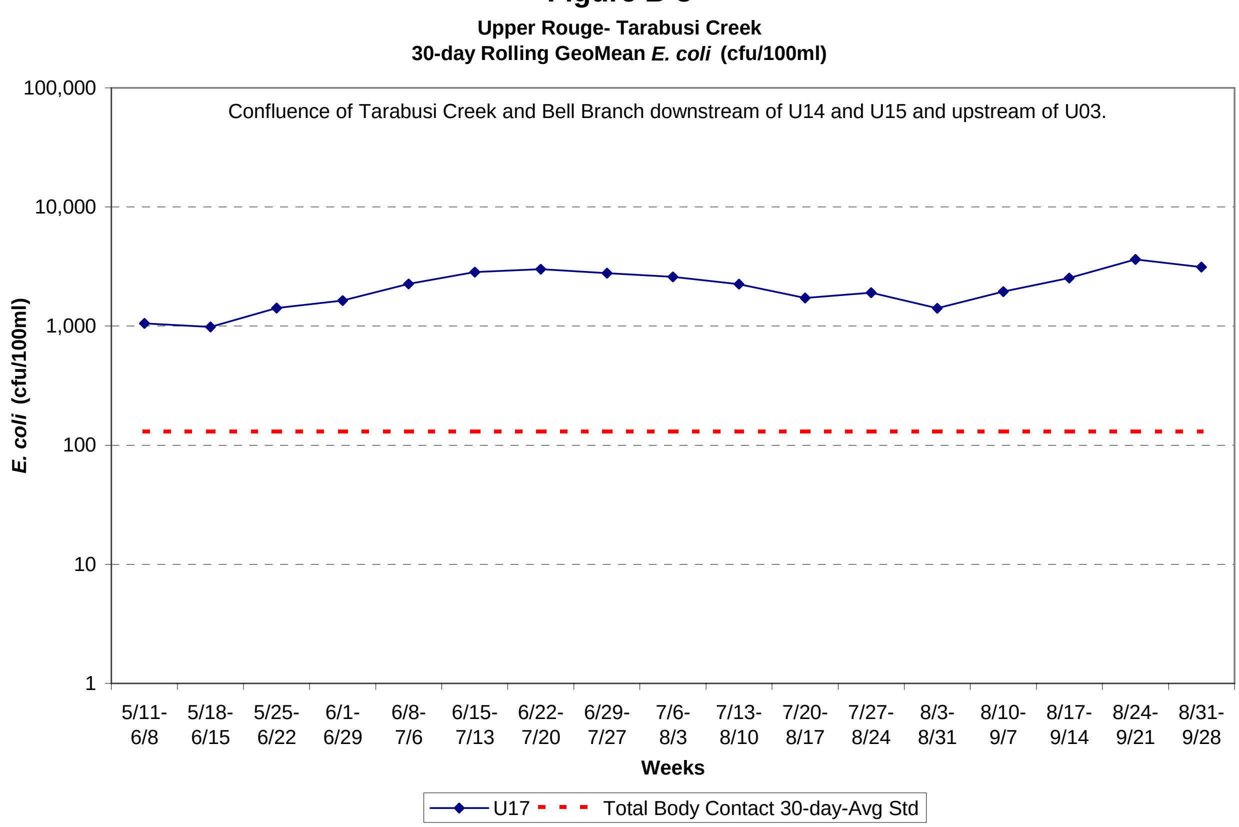

Figure B-9

Upper Rouge- Tarabusi Tributary
30-day Rolling GeoMean *E. coli* (cfu/100ml)

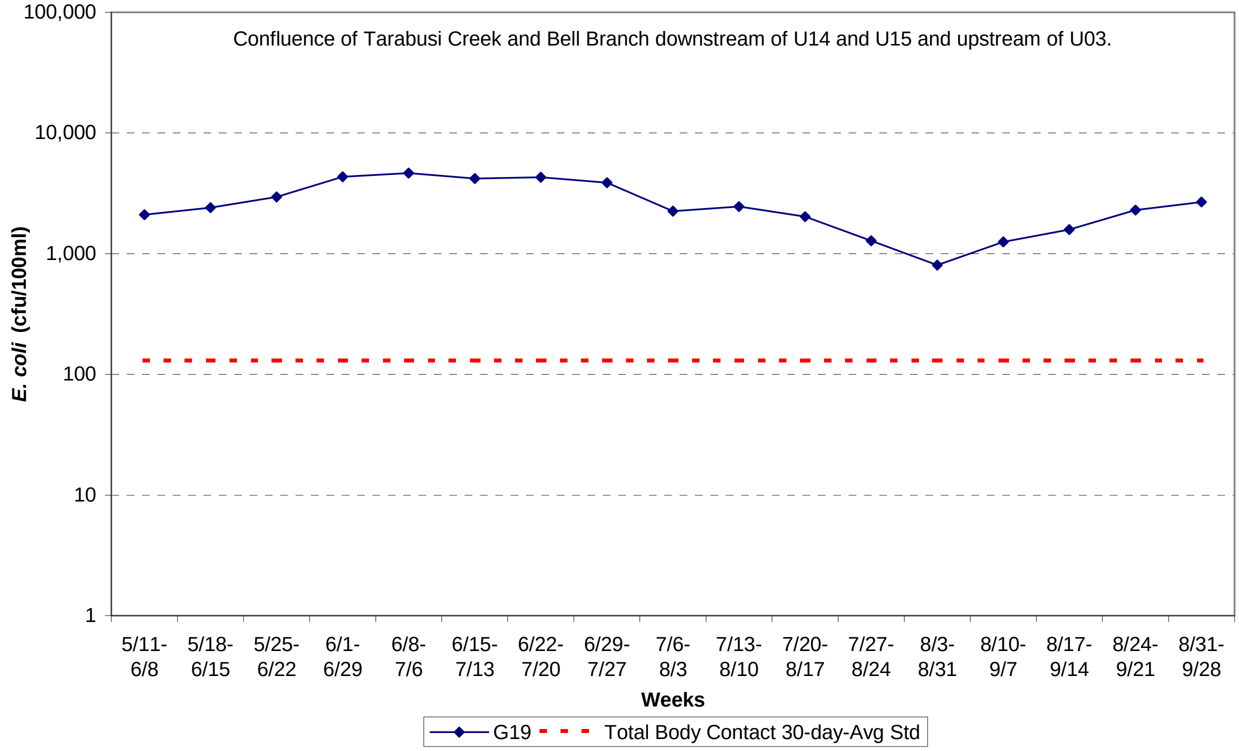

Figure B-10

Upper Rouge- Bell Branch
30-day Rolling GeoMean *E. coli* (cfu/100ml)

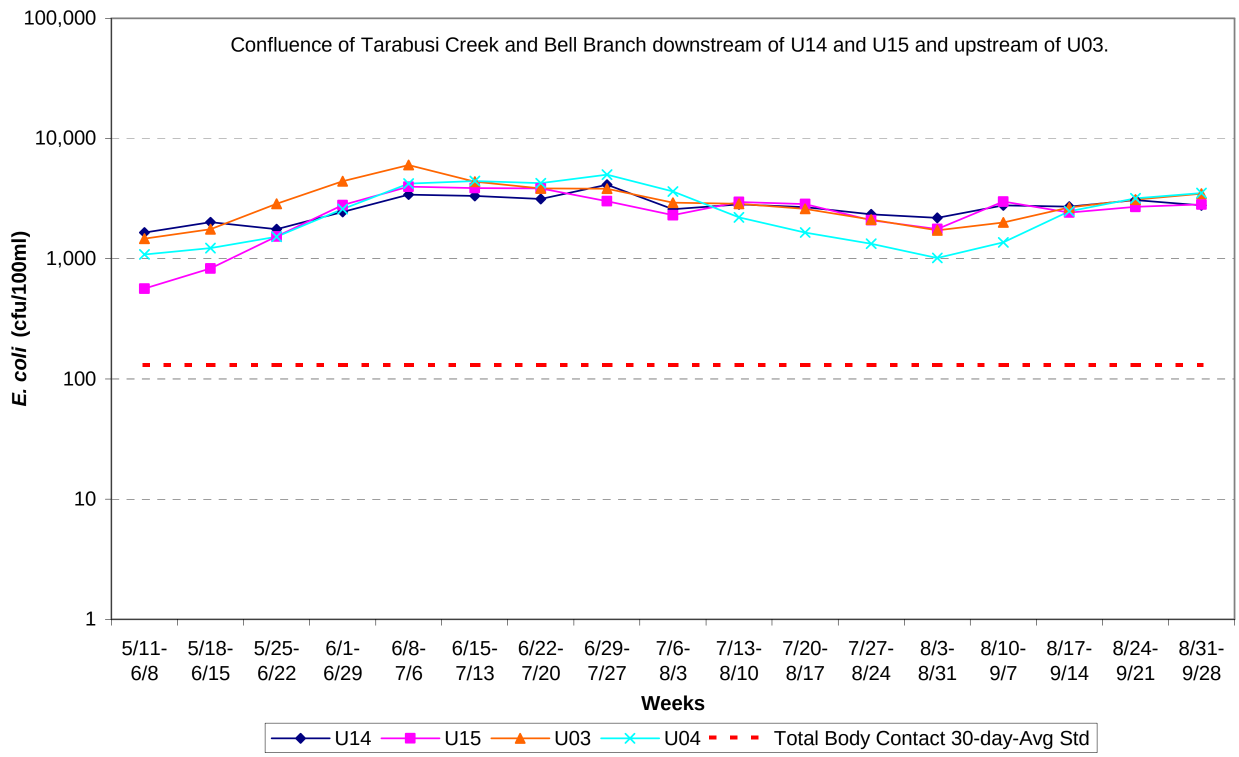

Figure B-11

Middle Rouge (Upper)
30-day Rolling GeoMean *E. coli* (cfu/100ml)

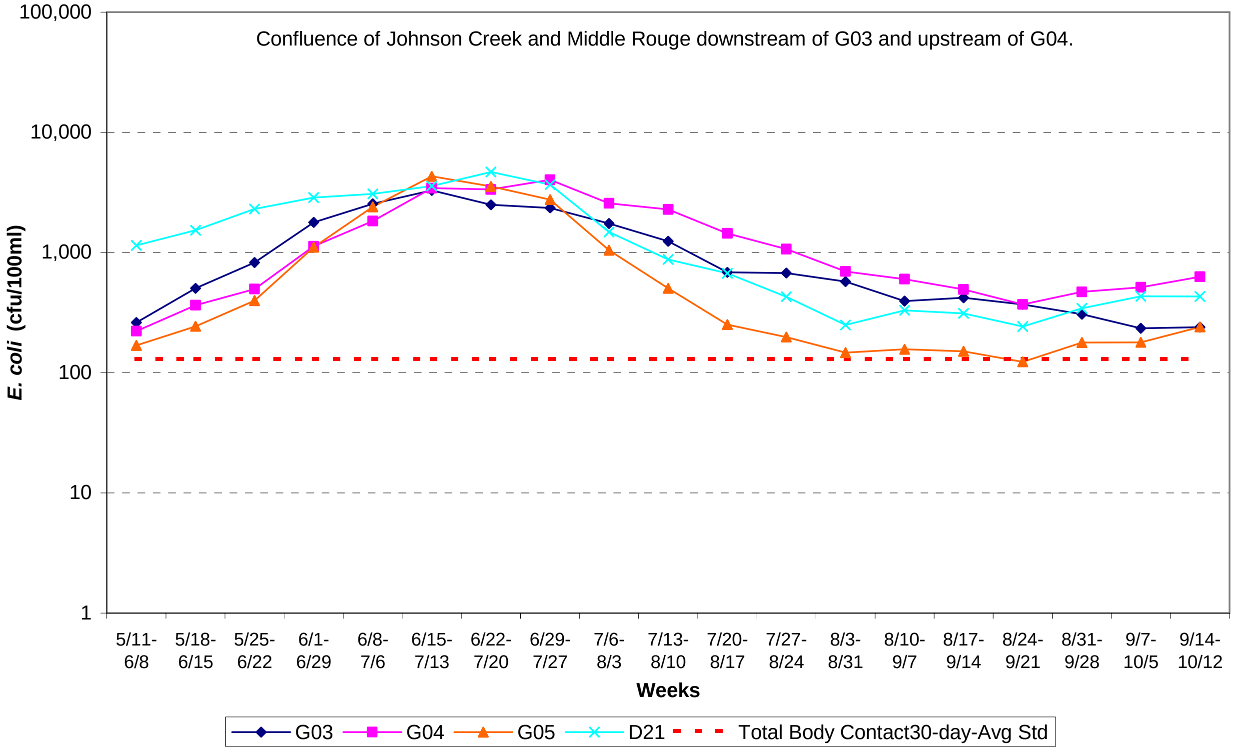

Figure B-12

Middle Rouge (Lower)
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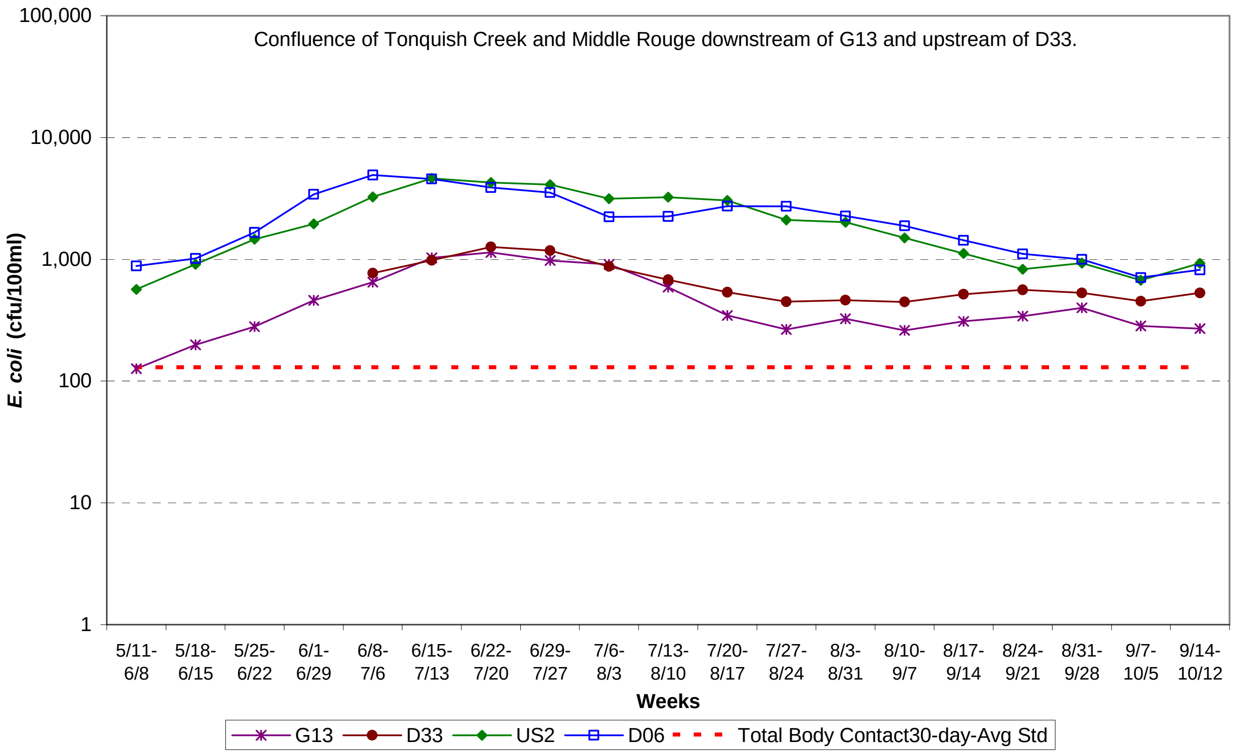

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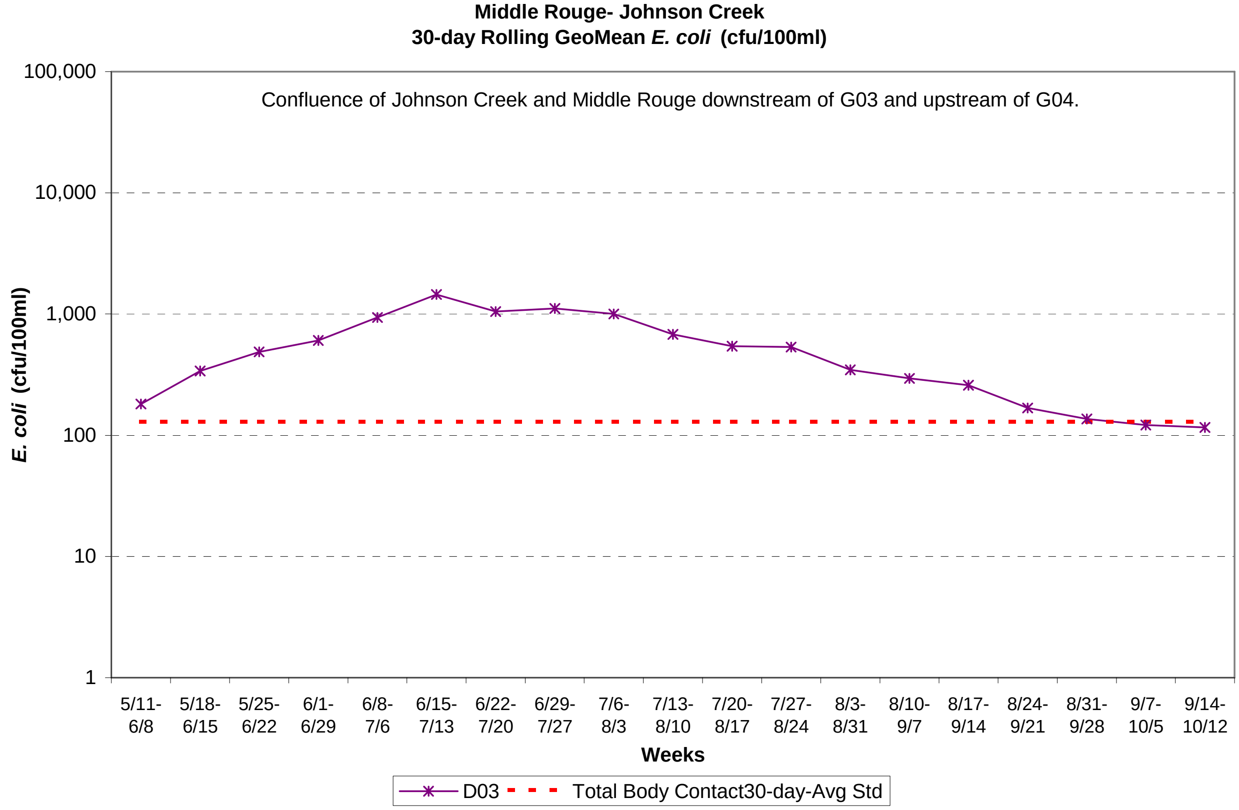

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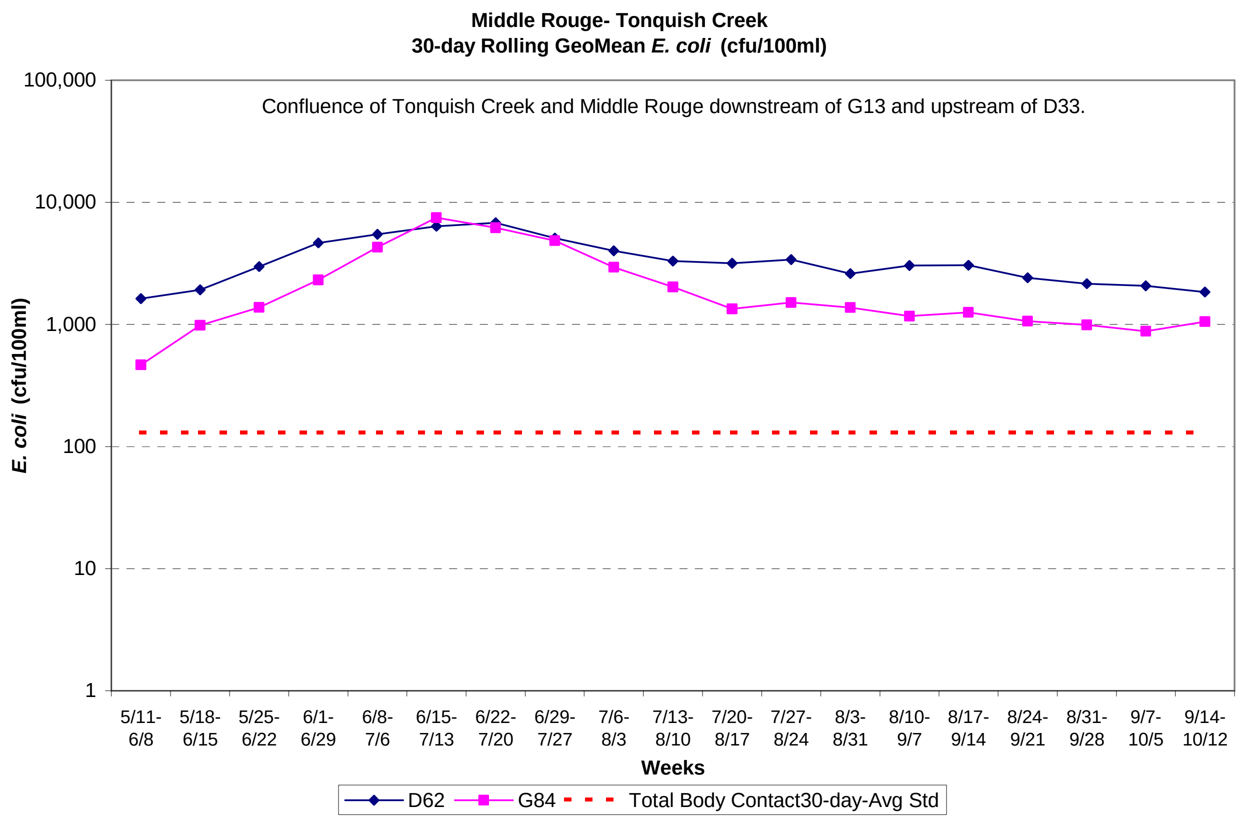

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Lower Rouge (Upper)
30-day Rolling GeoMean *E. coli* (cfu/100ml)

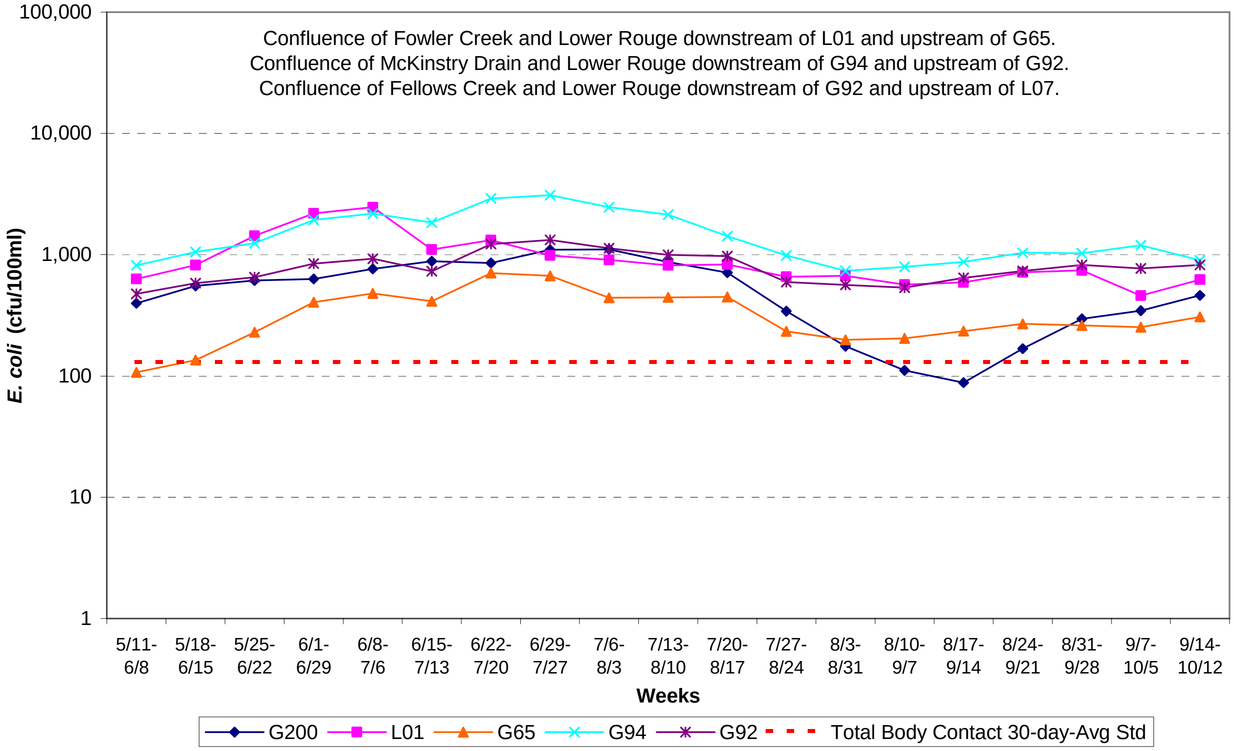


Figure B-16

Lower Rouge (Lower)
30-day Rolling GeoMean *E. coli* (cfu/100ml)

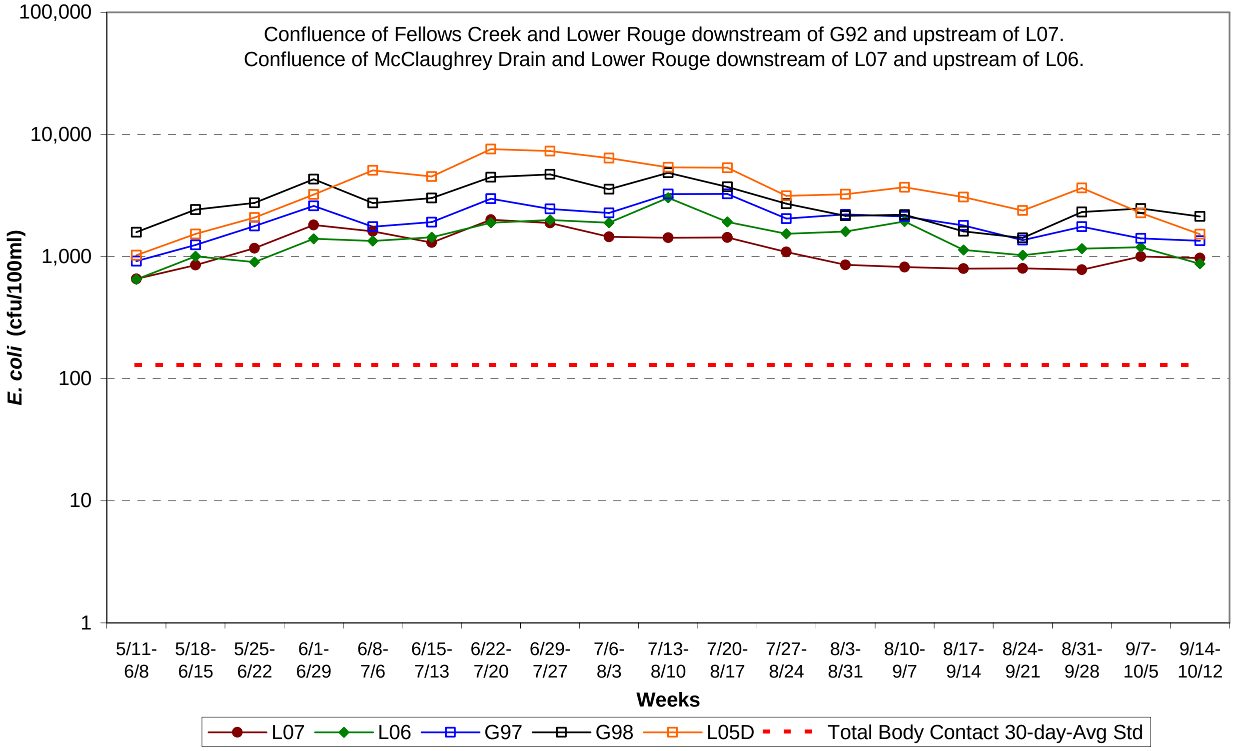


Figure B-17

Lower Rouge- Fowler Creek
30-day Rolling GeoMean *E. coli* (cfu/100ml)

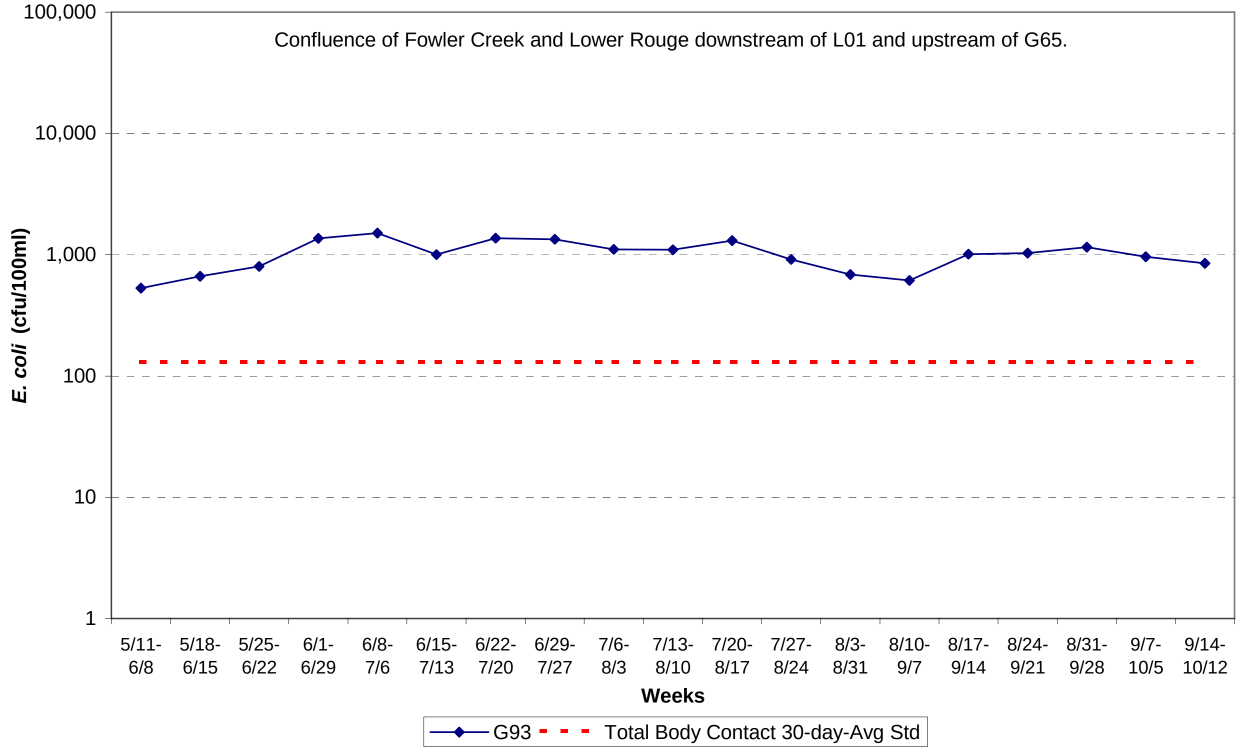
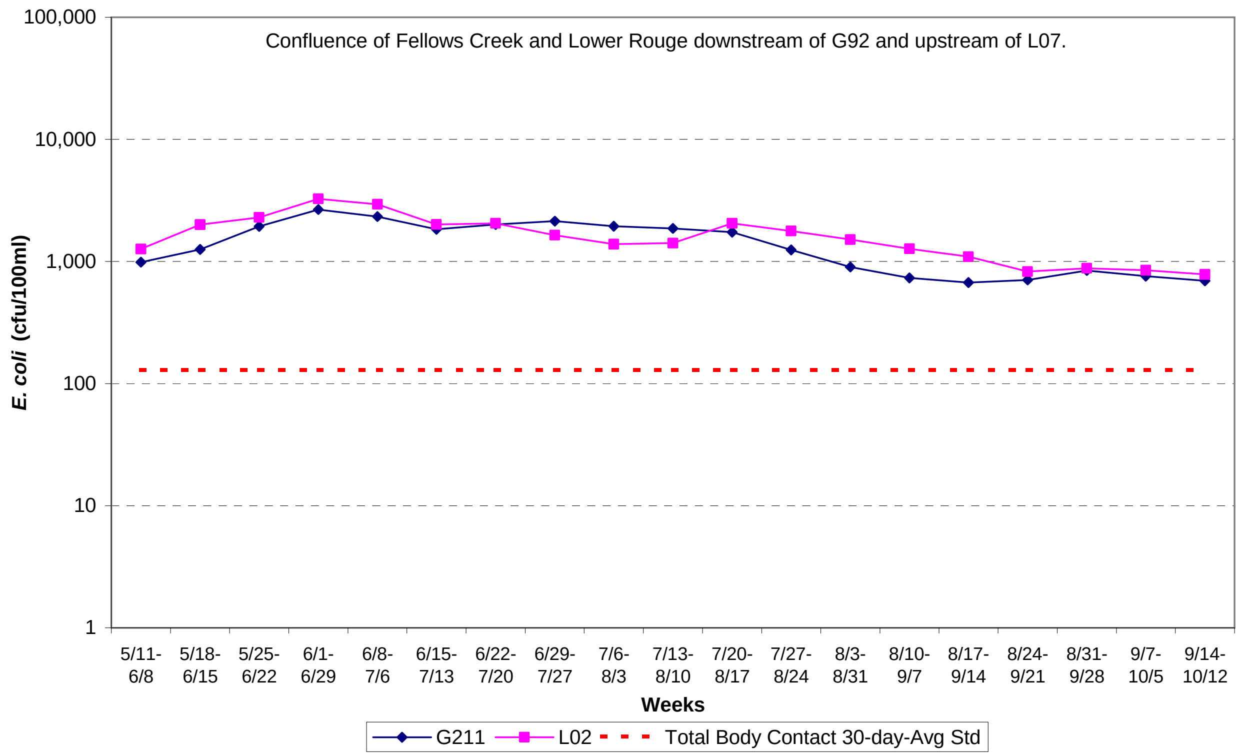


Figure B-18

Lower Rouge- Fellows Creek
30-day Rolling GeoMean *E. coli* (cfu/100ml)



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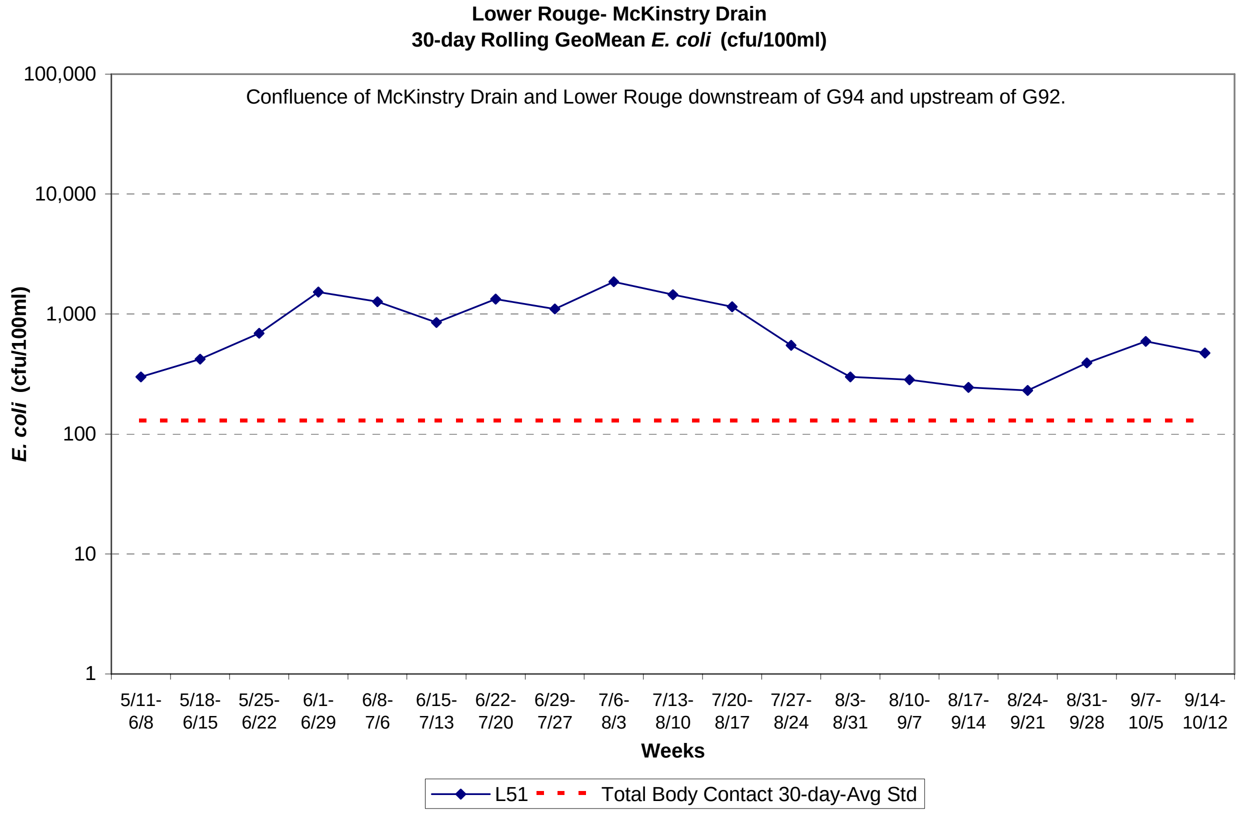

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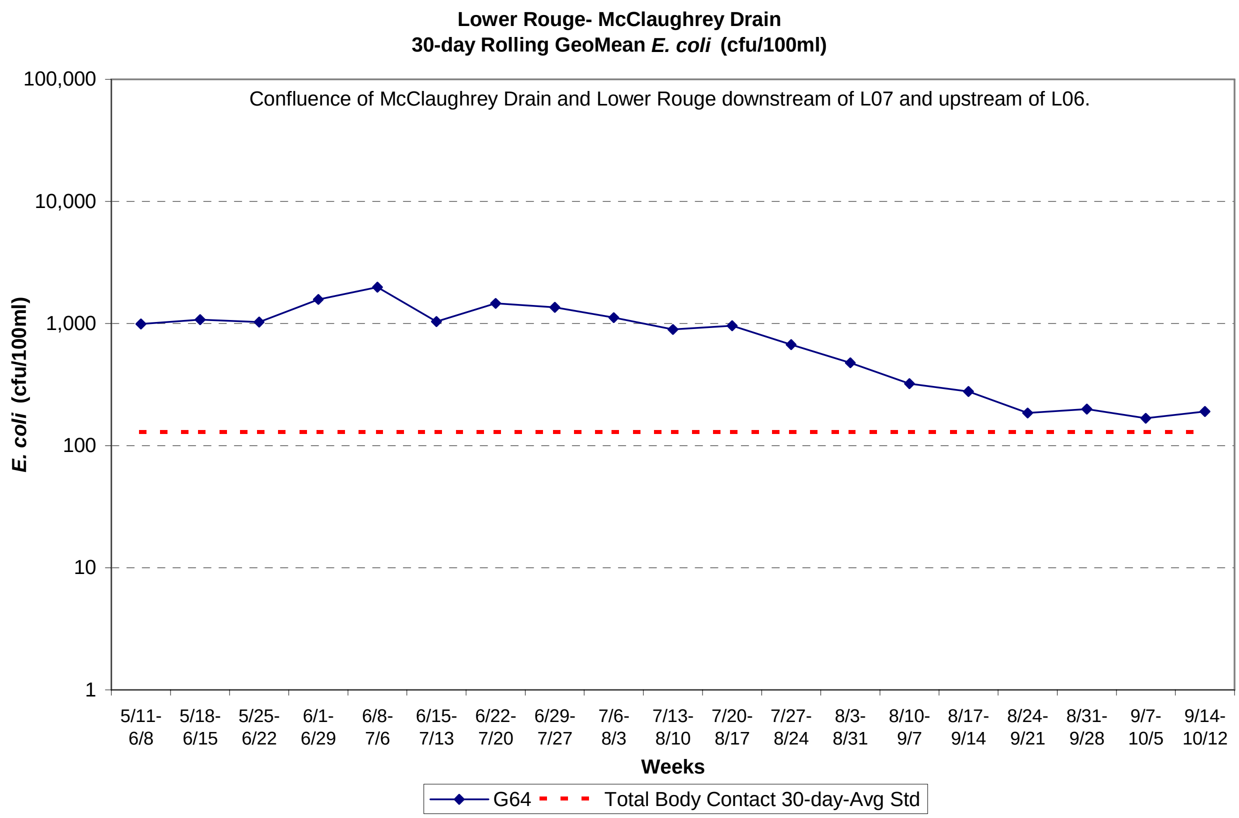


APPENDIX C

MAIN ROUGE RIVER
MDEQ 2005 *E. coli* MONITORING DATA

SAMPLING LOCATIONS,
SAMPLING DATES,
E. COLI RESULTS,
DAILY MAXIMUMS, AND
30-DAY ROLLING GEOMETRIC MEANS

***Table C-1.* Main Rouge at Adams Road *(M01)* MDEQ 2005 *E. coli* Monitoring Data (cfu/100 ml).**

Main Rouge at Adams Road (M01)							
Collection Date	Result	Daily Maximum	30-Day Rolling Geomean	Collection Date	Result	Daily Maximum	30-Day Rolling Geomean
5/10/2005	40	63	---	7/26/2005	2,000	1,776	1,166
5/10/2005	80			7/26/2005	2,800		
5/10/2005	80			7/26/2005	1,000		
5/17/2005	60	94	---	8/2/2005	600	524	1,092
5/17/2005	140			8/2/2005	400		
5/17/2005	100			8/2/2005	600		
5/24/2005	400	124	---	8/9/2005	620	489	914
5/24/2005	40			8/9/2005	420		
5/24/2005	120			8/9/2005	450		
5/31/2005	2,400	1,878	---	8/16/2005	1,800	1,310	950
5/31/2005	1,380			8/16/2005	2,400		
5/31/2005	2,000			8/16/2005	520		
6/7/2005	180	508	235	8/23/2005	80	332	723
6/7/2005	1,300			8/23/2005	1,140		
6/7/2005	560			8/23/2005	400		
6/16/2005	500	782	388	8/30/2005	560	864	626
6/16/2005	760			8/30/2005	640		
6/16/2005	1,260			8/30/2005	1,800		
6/21/2005	520	538	549	9/6/2005	460	368	583
6/21/2005	1,000			9/6/2005	180		
6/21/2005	300			9/6/2005	600		
6/28/2005	600	728	782	9/13/2005	340	468	578
6/28/2005	460			9/13/2005	520		
6/28/2005	1,400			9/13/2005	580		
7/5/2005	1,400	1,189	714	9/20/2005	600	749	517
7/5/2005	600			9/20/2005	700		
7/5/2005	2,000			9/20/2005	1,000		
7/12/2005	560	1,078	830	9/27/2005	420	254	490
7/12/2005	1,400			9/27/2005	280		
7/12/2005	1,600			9/27/2005	140		
7/19/2005	760	1,298	918				
7/19/2005	2,400						
7/19/2005	1,200						

Table C-2. Main Rouge at Maple Road (G45) MDEQ 2005 *E. coli* Monitoring Data (cfu/100 ml).

Main Rouge at Maple Road (G45)							
Collection Date	Result	Daily Maximum	30-Day Rolling Geomean	Collection Date	Result	Daily Maximum	30-Day Rolling Geomean
5/10/2005	260	252	---	7/26/2005	3,800	3,449	1,184
5/10/2005	340			7/26/2005	3,600		
5/10/2005	180			7/26/2005	3,000		
5/17/2005	1,220	1,049	---	8/2/2005	320	645	1,068
5/17/2005	860			8/2/2005	600		
5/17/2005	1,100			8/2/2005	1,400		
5/24/2005	320	326	---	8/9/2005	800	850	1,014
5/24/2005	360			8/9/2005	640		
5/24/2005	300			8/9/2005	1,200		
5/31/2005	1,200	727	---	8/16/2005	800	1,048	1,131
5/31/2005	800			8/16/2005	1,200		
5/31/2005	400			8/16/2005	1,200		
6/7/2005	1,520	1,670	636	8/23/2005	1,220	599	1,035
6/7/2005	1,780			8/23/2005	420		
6/7/2005	1,720			8/23/2005	420		
6/16/2005	540	1,820	945	8/30/2005	600	509	706
6/16/2005	6,200			8/30/2005	220		
6/16/2005	1,800			8/30/2005	1,000		
6/21/2005	2,800	2,310	1,107	9/6/2005	480	521	676
6/21/2005	2,200			9/6/2005	460		
6/21/2005	2,000			9/6/2005	640		
6/28/2005	440	1,082	1,407	9/13/2005	1,600	1,887	793
6/28/2005	2,400			9/13/2005	3,000		
6/28/2005	1,200			9/13/2005	1,400		
7/5/2005	600	1,104	1,530	9/20/2005	480	456	672
7/5/2005	1,600			9/20/2005	300		
7/5/2005	1,400			9/20/2005	660		
7/12/2005	600	606	1,249	9/27/2005	1,000	153	511
7/12/2005	800			9/27/2005	60		
7/12/2005	464			9/27/2005	60		
7/19/2005	1,000	933	1,093				
7/19/2005	580						
7/19/2005	1,400						

Table C-3. Main Rouge at Riverside Drive (G58) MDEQ 2005 *E. coli* Monitoring Data (cfu/100 ml).

Main Rouge at Riverside Drive (G58)							
Collection Date	Result	Daily Maximum	30-Day Rolling Geomean	Collection Date	Result	Daily Maximum	30-Day Rolling Geomean
5/10/2005	20	49	---	7/26/2005	2,400	2,678	1,782
5/10/2005	20			7/26/2005	4,000		
5/10/2005	300			7/26/2005	2,000		
5/17/2005	800	395	---	8/2/2005	1,400	732	1,621
5/17/2005	240			8/2/2005	1,400		
5/17/2005	320			8/2/2005	200		
5/24/2005	280	300	---	8/9/2005	400	635	1,303
5/24/2005	600			8/9/2005	400		
5/24/2005	160			8/9/2005	1,600		
5/31/2005	220	128	---	8/16/2005	200	577	1,203
5/31/2005	80			8/16/2005	800		
5/31/2005	120			8/16/2005	1,200		
6/7/2005	660	945	234	8/23/2005	540	547	829
6/7/2005	780			8/23/2005	420		
6/7/2005	1,640			8/23/2005	720		
6/16/2005	600	363	349	8/30/2005	700	838	657
6/16/2005	400			8/30/2005	840		
6/16/2005	200			8/30/2005	1,000		
6/21/2005	620	645	385	9/6/2005	200	238	525
6/21/2005	800			9/6/2005	240		
6/21/2005	540			9/6/2005	280		
6/28/2005	2,800	1,175	507	9/13/2005	1,400	765	545
6/28/2005	1,000			9/13/2005	400		
6/28/2005	580			9/13/2005	800		
7/5/2005	3,000	1,887	867	9/20/2005	340	408	509
7/5/2005	1,600			9/20/2005	1,000		
7/5/2005	1,400			9/20/2005	200		
7/12/2005	800	862	852	9/27/2005	600	458	491
7/12/2005	1,000			9/27/2005	400		
7/12/2005	800			9/27/2005	400		
7/19/2005	1,800	3,509	1,340				
7/19/2005	4,000						
7/19/2005	6,000						

Table C-4. Main Rouge at Lahser Road (M03) MDEQ 2005 *E. coli* Monitoring Data (cfu/100 ml).

Main Rouge at Lahser Road (M03)							
Collection Date	Result	Daily Maximum	30-Day Rolling Geomean	Collection Date	Result	Daily Maximum	30-Day Rolling Geomean
5/10/2005	100	49	---	7/26/2005	1,200	1,154	986
5/10/2005	60			7/26/2005	1,600		
5/10/2005	<20			7/26/2005	800		
5/17/2005	100	166	---	8/2/2005	320	278	820
5/17/2005	380			8/2/2005	240		
5/17/2005	120			8/2/2005	280		
5/24/2005	340	299	---	8/9/2005	280	256	456
5/24/2005	280			8/9/2005	120		
5/24/2005	280			8/9/2005	500		
5/31/2005	100	199	---	8/16/2005	800	1,154	564
5/31/2005	280			8/16/2005	1,600		
5/31/2005	280			8/16/2005	1,200		
6/7/2005	340	485	221	8/23/2005	660	690	580
6/7/2005	600			8/23/2005	920		
6/7/2005	560			8/23/2005	540		
6/16/2005	240	276	266	8/30/2005	600	565	502
6/16/2005	220			8/30/2005	500		
6/16/2005	400			8/30/2005	600		
6/21/2005	360	301	299	9/6/2005	160	249	491
6/21/2005	380			9/6/2005	240		
6/21/2005	200			9/6/2005	400		
6/28/2005	560	698	355	9/13/2005	800	1,129	661
6/28/2005	380			9/13/2005	1,000		
6/28/2005	1,600			9/13/2005	1,800		
7/5/2005	6,800	4,837	671	9/20/2005	1,000	268	493
7/5/2005	3,200			9/20/2005	40		
7/5/2005	5,200			9/20/2005	480		
7/12/2005	480	395	645	9/27/2005	520	596	479
7/12/2005	460			9/27/2005	600		
7/12/2005	280			9/27/2005	680		
7/19/2005	220	604	754				
7/19/2005	1,000						
7/19/2005	1,000						

Table C-5. Franklin Branch at Middlebelt between Walnut Lake and 15 Mile Road (G38) MDEQ 2005 *E. coli* Monitoring Data (cfu/100 ml).

Franklin Branch at Middlebelt between Walnut Lake and 15 Mile Road (G38)							
Collection Date	Result	Daily Maximum	30-Day Rolling Geomean	Collection Date	Result	Daily Maximum	30-Day Rolling Geomean
5/10/2005	20	36	---	7/26/2005	380	426	506
5/10/2005	60			7/26/2005	600		
5/10/2005	40			7/26/2005	340		
5/17/2005	20	29	---	8/2/2005	120	163	417
5/17/2005	60			8/2/2005	180		
5/17/2005	<20			8/2/2005	200		
5/24/2005	120	132	---	8/9/2005	120	76	263
5/24/2005	160			8/9/2005	60		
5/24/2005	120			8/9/2005	60		
5/31/2005	240	531	---	8/16/2005	60	100	192
5/31/2005	1,200			8/16/2005	140		
5/31/2005	520			8/16/2005	120		
6/7/2005	360	274	130	8/23/2005	80	58	125
6/7/2005	220			8/23/2005	60		
6/7/2005	260			8/23/2005	40		
6/16/2005	440	399	218	8/30/2005	160	244	112
6/16/2005	800			8/30/2005	240		
6/16/2005	180			8/30/2005	380		
6/21/2005	200	200	274	9/6/2005	40	50	88
6/21/2005	400			9/6/2005	40		
6/21/2005	100			9/6/2005	80		
6/28/2005	120	429	346	9/13/2005	20	81	90
6/28/2005	1,000			9/13/2005	220		
6/28/2005	660			9/13/2005	120		
7/5/2005	600	756	372	9/20/2005	60	58	80
7/5/2005	1,200			9/20/2005	80		
7/5/2005	600			9/20/2005	40		
7/12/2005	340	485	417	9/27/2005	600	363	116
7/12/2005	800			9/27/2005	400		
7/12/2005	420			9/27/2005	200		
7/19/2005	460	493	435				
7/19/2005	520						
7/19/2005	500						

Table C-6. Franklin Branch at Middlebelt between 14 Mile Road and 15 Mile Road (G39) MDEQ 2005 *E. coli* Monitoring Data (cfu/100 ml).

Franklin Branch at Middlebelt between 14 Mile Road and 15 Mile Road (G39)							
Collection Date	Result	Daily Maximum	30-Day Rolling Geomean	Collection Date	Result	Daily Maximum	30-Day Rolling Geomean
5/10/2005	700	482	---	7/26/2005	2,200	2,194	3,162
5/10/2005	500			7/26/2005	4,000		
5/10/2005	320			7/26/2005	1,200		
5/17/2005	420	312	---	8/2/2005	1,200	2,621	2,882
5/17/2005	400			8/2/2005	5,000		
5/17/2005	180			8/2/2005	3,000		
5/24/2005	1,400	876	---	8/9/2005	2,500	1,890	2,849
5/24/2005	600			8/9/2005	600		
5/24/2005	800			8/9/2005	4,500		
5/31/2005	280	224	---	8/16/2005	400	635	1,603
5/31/2005	40			8/16/2005	800		
5/31/2005	1,000			8/16/2005	800		
6/7/2005	2,600	1,596	542	8/23/2005	1,000	628	1,341
6/7/2005	460			8/23/2005	620		
6/7/2005	3,400			8/23/2005	400		
6/16/2005	1,600	1,636	693	8/30/2005	1,400	759	1,084
6/16/2005	1,800			8/30/2005	400		
6/16/2005	1,520			8/30/2005	780		
6/21/2005	200	619	795	9/6/2005	600	363	730
6/21/2005	1,600			9/6/2005	400		
6/21/2005	740			9/6/2005	200		
6/28/2005	9,400	4,164	1,085	9/13/2005	1,400	1,844	727
6/28/2005	2,400			9/13/2005	1,600		
6/28/2005	3,200			9/13/2005	2,800		
7/5/2005	2,800	2,005	1,683	9/20/2005	220	192	572
7/5/2005	1,600			9/20/2005	160		
7/5/2005	1,800			9/20/2005	200		
7/12/2005	14,000	11,261	2,487	9/27/2005	400	458	537
7/12/2005	17,000			9/27/2005	600		
7/12/2005	6,000			9/27/2005	400		
7/19/2005	3,000	1,533	2,455				
7/19/2005	500						
7/19/2005	2,400						

Table C-7. Franklin Branch at Franklin Road (G461) MDEQ 2005 *E. coli* Monitoring Data (cfu/100 ml).

Franklin Branch at Franklin Road (G461)							
Collection Date	Result	Daily Maximum	30-Day Rolling Geomean	Collection Date	Result	Daily Maximum	30-Day Rolling Geomean
5/10/2005	380	227	---	7/26/2005	1,200	1,293	433
5/10/2005	140			7/26/2005	1,000		
5/10/2005	220			7/26/2005	1,800		
5/17/2005	80	99	---	8/2/2005	200	317	535
5/17/2005	120			8/2/2005	400		
5/17/2005	100			8/2/2005	400		
5/24/2005	620	384	---	8/9/2005	240	304	435
5/24/2005	240			8/9/2005	420		
5/24/2005	380			8/9/2005	280		
5/31/2005	60	36	---	8/16/2005	400	315	476
5/31/2005	40			8/16/2005	300		
5/31/2005	20			8/16/2005	260		
6/7/2005	280	372	163	8/23/2005	300	175	370
6/7/2005	400			8/23/2005	100		
6/7/2005	460			8/23/2005	180		
6/16/2005	320	536	194	8/30/2005	740	758	332
6/16/2005	400			8/30/2005	1,400		
6/16/2005	1,200			8/30/2005	420		
6/21/2005	120	147	210	9/6/2005	740	587	376
6/21/2005	120			9/6/2005	720		
6/21/2005	220			9/6/2005	380		
6/28/2005	300	110	163	9/13/2005	640	1,308	503
6/28/2005	20			9/13/2005	3,500		
6/28/2005	220			9/13/2005	1,000		
7/5/2005	1,000	862	308	9/20/2005	600	577	568
7/5/2005	800			9/20/2005	400		
7/5/2005	800			9/20/2005	800		
7/12/2005	200	200	272	9/27/2005	520	602	726
7/12/2005	200			9/27/2005	1,000		
7/12/2005	200			9/27/2005	420		
7/19/2005	1,000	621	280				
7/19/2005	400						
7/19/2005	600						

Table C-8. Franklin Branch at 13 Mile Road (H60) MDEQ 2005 *E. coli* Monitoring Data (cfu/100 ml).

Franklin Branch at 13 Mile Road (H60)							
Collection Date	Result	Daily Maximum	30-Day Rolling Geomean	Collection Date	Result	Daily Maximum	30-Day Rolling Geomean
5/10/2005	80	50	---	7/26/2005	2,600	1,841	---
5/10/2005	40			7/26/2005	3,000		
5/10/2005	40			7/26/2005	800		
5/17/2005	240	137	---	8/2/2005	600	1,887	---
5/17/2005	60			8/2/2005	800		
5/17/2005	180			8/2/2005	14,000		
5/24/2005	400	425	---	8/9/2005	400	468	---
5/24/2005	400			8/9/2005	320		
5/24/2005	480			8/9/2005	800		
5/31/2005	80	127	---	8/16/2005	1,000	577	984
5/31/2005	320			8/16/2005	320		
5/31/2005	80			8/16/2005	600		
6/7/2005	180	271	159	8/23/2005	340	294	773
6/7/2005	220			8/23/2005	340		
6/7/2005	500			8/23/2005	220		
6/16/2005	400	262	221	8/30/2005	600	607	619
6/16/2005	280			8/30/2005	620		
6/16/2005	160			8/30/2005	600		
6/21/2005	220	189	235	9/6/2005	200	407	455
6/21/2005	220			9/6/2005	800		
6/21/2005	140			9/6/2005	420		
6/28/2005	600	687	259	9/13/2005	1,600	990	529
6/28/2005	540			9/13/2005	740		
6/28/2005	1,000			9/13/2005	820		
7/5/2005	600	1,390	418	9/20/2005	360	357	480
7/5/2005	3,200			9/20/2005	300		
7/5/2005	1,400			9/20/2005	420		
7/12/2005	1,600	964	539	9/27/2005	400	397	510
7/12/2005	1,400			9/27/2005	600		
7/12/2005	400			9/27/2005	260		
7/19/2005	NC		---				
7/19/2005	NC						
7/19/2005	NC						

Table C-9. Franklin Branch at 12 Mile Road (G46) MDEQ 2005 *E. coli* Monitoring Data (cfu/100 ml).

Franklin Branch at 12 Mile Road (G46)							
Collection Date	Result	Daily Maximum	30-Day Rolling Geomean	Collection Date	Result	Daily Maximum	30-Day Rolling Geomean
5/10/2005	80	68	---	7/26/2005	2,000	3,326	1,252
5/10/2005	100			7/26/2005	4,600		
5/10/2005	40			7/26/2005	4,000		
5/17/2005	100	106	---	8/2/2005	600	577	1,286
5/17/2005	100			8/2/2005	800		
5/17/2005	120			8/2/2005	400		
5/24/2005	380	391	---	8/9/2005	280	364	861
5/24/2005	560			8/9/2005	540		
5/24/2005	280			8/9/2005	320		
5/31/2005	800	213	---	8/16/2005	800	601	839
5/31/2005	120			8/16/2005	800		
5/31/2005	100			8/16/2005	340		
6/7/2005	500	458	194	8/23/2005	380	422	708
6/7/2005	320			8/23/2005	340		
6/7/2005	600			8/23/2005	580		
6/16/2005	160	765	315	8/30/2005	400	431	470
6/16/2005	2,800			8/30/2005	200		
6/16/2005	1,000			8/30/2005	1,000		
6/21/2005	140	318	392	9/6/2005	400	621	477
6/21/2005	500			9/6/2005	1,000		
6/21/2005	460			9/6/2005	600		
6/28/2005	600	506	413	9/13/2005	640	743	550
6/28/2005	600			9/13/2005	640		
6/28/2005	360			9/13/2005	1,000		
7/5/2005	3,200	2,713	687	9/20/2005	3,800	3,768	794
7/5/2005	2,400			9/20/2005	3,200		
7/5/2005	2,600			9/20/2005	4,400		
7/12/2005	1,000	684	744	9/27/2005	300	381	778
7/12/2005	800			9/27/2005	400		
7/12/2005	400			9/27/2005	460		
7/19/2005	1,000	986	783				
7/19/2005	800						
7/19/2005	1,200						

Table C-10. Main Rouge at 10 Mile Road west of Telegraph Road (G59) MDEQ 2005 *E. coli* Monitoring Data (cfu/100 ml).

Main Rouge at 10 Mile Road west of Telegraph Road (G59)							
Collection Date	Result	Daily Maximum	30-Day Rolling Geomean	Collection Date	Result	Daily Maximum	30-Day Rolling Geomean
5/10/2005	460	461	---	7/26/2005	5,200	5,025	2,105
5/10/2005	820			7/26/2005	12,200		
5/10/2005	260			7/26/2005	2,000		
5/17/2005	140	77	---	8/2/2005	36,000	13,949	3,729
5/17/2005	80			8/2/2005	13,000		
5/17/2005	40			8/2/2005	5,800		
5/24/2005	160	772	---	8/9/2005	2,000	585	2,579
5/24/2005	800			8/9/2005	200		
5/24/2005	3,600			8/9/2005	500		
5/31/2005	120	136	---	8/16/2005	200	400	2,047
5/31/2005	80			8/16/2005	400		
5/31/2005	260			8/16/2005	800		
6/7/2005	2,200	1,493	353	8/23/2005	260	297	1,373
6/7/2005	1,800			8/23/2005	240		
6/7/2005	840			8/23/2005	420		
6/16/2005	3,200	2,907	511	8/30/2005	1,000	946	983
6/16/2005	3,200			8/30/2005	920		
6/16/2005	2,400			8/30/2005	920		
6/21/2005	120	362	697	9/6/2005	420	600	524
6/21/2005	660			9/6/2005	920		
6/21/2005	600			9/6/2005	560		
6/28/2005	800	800	702	9/13/2005	500	328	467
6/28/2005	800			9/13/2005	220		
6/28/2005	800			9/13/2005	320		
7/5/2005	6,200	3,699	1,360	9/20/2005	600	1,026	563
7/5/2005	2,400			9/20/2005	1,200		
7/5/2005	3,400			9/20/2005	1,500		
7/12/2005	3,400	1,268	1,316	9/27/2005	2,200	2,230	843
7/12/2005	600			9/27/2005	8,400		
7/12/2005	1,000			9/27/2005	600		
7/19/2005	2,000	2,194	1,244				
7/19/2005	2,400						
7/19/2005	2,200						

Table C-11. Pebble Creek, west of Middlebelt and south of 13 Mile Road (H47) MDEQ 2005 *E. coli* Monitoring Data (cfu/100 ml).

Pebble Creek, west of Middlebelt and south of 13 Mile Road (H47)							
Collection Date	Result	Daily Maximum	30-Day Rolling Geomean	Collection Date	Result	Daily Maximum	30-Day Rolling Geomean
5/10/2005	<20	216	---	7/26/2005	5,800	3,175	1,090
5/10/2005	660			7/26/2005	4,600		
5/10/2005	760			7/26/2005	1,200		
5/17/2005	80	50	---	8/2/2005	800	1,498	1,302
5/17/2005	<20			8/2/2005	4,200		
5/17/2005	80			8/2/2005	1,000		
5/24/2005	1,320	983	---	8/9/2005	200	252	778
5/24/2005	900			8/9/2005	400		
5/24/2005	800			8/9/2005	200		
5/31/2005	300	313	---	8/16/2005	600	416	728
5/31/2005	340			8/16/2005	600		
5/31/2005	300			8/16/2005	200		
6/7/2005	700	1,455	534	8/23/2005	280	372	714
6/7/2005	2,000			8/23/2005	460		
6/7/2005	2,200			8/23/2005	400		
6/16/2005	300	363	472	8/30/2005	1,400	617	515
6/16/2005	100			8/30/2005	420		
6/16/2005	1,600			8/30/2005	400		
6/21/2005	800	648	638	9/6/2005	1,500	1,442	511
6/21/2005	1,000			9/6/2005	1,000		
6/21/2005	340			9/6/2005	2,000		
6/28/2005	220	615	580	9/13/2005	600	928	663
6/28/2005	480			9/13/2005	740		
6/28/2005	2,200			9/13/2005	1,800		
7/5/2005	4,600	3,315	931	9/20/2005	400	252	600
7/5/2005	2,200			9/20/2005	200		
7/5/2005	3,600			9/20/2005	200		
7/12/2005	320	577	773	9/27/2005	400	504	637
7/12/2005	1,000			9/27/2005	400		
7/12/2005	600			9/27/2005	800		
7/19/2005	400	411	793				
7/19/2005	580						
7/19/2005	300						

Table C-12. Pebble Creek at 11 Mile Road (G60) MDEQ 2005 *E. coli* Monitoring Data (cfu/100 ml).

Pebble Creek at 11 Mile Road (G60)							
Collection Date	Result	Daily Maximum	30-Day Rolling Geomean	Collection Date	Result	Daily Maximum	30-Day Rolling Geomean
5/10/2005	120	133	---	7/26/2005	4,000	3,227	1,531
5/10/2005	140			7/26/2005	2,800		
5/10/2005	140			7/26/2005	3,000		
5/17/2005	820	550	---	8/2/2005	400	363	1,333
5/17/2005	260			8/2/2005	200		
5/17/2005	780			8/2/2005	600		
5/24/2005	2,600	1,808	---	8/9/2005	1,800	1,731	1,155
5/24/2005	1,420			8/9/2005	2,400		
5/24/2005	1,600			8/9/2005	1,200		
5/31/2005	220	183	---	8/16/2005	260	500	1,063
5/31/2005	200			8/16/2005	800		
5/31/2005	140			8/16/2005	600		
6/7/2005	800	928	468	8/23/2005	200	243	756
6/7/2005	1,000			8/23/2005	180		
6/7/2005	1,000			8/23/2005	400		
6/16/2005	340	397	583	8/30/2005	400	639	547
6/16/2005	400			8/30/2005	740		
6/16/2005	460			8/30/2005	880		
6/21/2005	260	238	493	9/6/2005	1,200	1,048	676
6/21/2005	260			9/6/2005	1,600		
6/21/2005	200			9/6/2005	600		
6/28/2005	660	726	411	9/13/2005	480	439	514
6/28/2005	1,000			9/13/2005	440		
6/28/2005	580			9/13/2005	400		
7/5/2005	6,400	3,545	743	9/20/2005	220	155	406
7/5/2005	1,200			9/20/2005	140		
7/5/2005	5,800			9/20/2005	120		
7/12/2005	600	756	713	9/27/2005	220	214	396
7/12/2005	1,800			9/27/2005	140		
7/12/2005	400			9/27/2005	320		
7/19/2005	2,000	1,339	909				
7/19/2005	1,200						
7/19/2005	1,000						

Table C-13. Pebble Creek at Franklin Road (G61) MDEQ 2005 *E. coli* Monitoring Data (cfu/100 ml).

Pebble Creek at Franklin Road (G61)							
Collection Date	Result	Daily Maximum	30-Day Rolling Geomean	Collection Date	Result	Daily Maximum	30-Day Rolling Geomean
5/10/2005	120	106	---	7/26/2005	2,000	2,759	1,996
5/10/2005	100			7/26/2005	3,500		
5/10/2005	100			7/26/2005	3,000		
5/17/2005	500	480	---	8/2/2005	600	577	1,724
5/17/2005	460			8/2/2005	400		
5/17/2005	480			8/2/2005	800		
5/24/2005	4,600	3,760	---	8/9/2005	1,400	1,715	1,516
5/24/2005	3,400			8/9/2005	2,000		
5/24/2005	3,400			8/9/2005	1,800		
5/31/2005	1,400	876	---	8/16/2005	620	414	1,199
5/31/2005	600			8/16/2005	220		
5/31/2005	800			8/16/2005	520		
6/7/2005	800	862	679	8/23/2005	840	870	997
6/7/2005	800			8/23/2005	560		
6/7/2005	1,000			8/23/2005	1,400		
6/16/2005	340	820	1,022	8/30/2005	1,200	727	763
6/16/2005	3,000			8/30/2005	400		
6/16/2005	540			8/30/2005	800		
6/21/2005	240	263	907	9/6/2005	380	455	728
6/21/2005	380			9/6/2005	620		
6/21/2005	200			9/6/2005	400		
6/28/2005	1,200	1,200	721	9/13/2005	4,200	4,149	869
6/28/2005	1,200			9/13/2005	3,400		
6/28/2005	1,200			9/13/2005	5,000		
7/5/2005	3,000	3,257	938	9/20/2005	240	157	715
7/5/2005	2,400			9/20/2005	100		
7/5/2005	4,800			9/20/2005	160		
7/12/2005	1,600	1,339	1,025	9/27/2005	400	232	549
7/12/2005	1,000			9/27/2005	260		
7/12/2005	1,500			9/27/2005	120		
7/19/2005	1,600	2,194	1,248				
7/19/2005	2,200						
7/19/2005	3,000						

Table C-14. Pebble Creek at 10 Mile Road (G47) MDEQ 2005 *E. coli* Monitoring Data (cfu/100 ml).

Pebble Creek at 10 Mile Road (G47)							
Collection Date	Result	Daily Maximum	30-Day Rolling Geomean	Collection Date	Result	Daily Maximum	30-Day Rolling Geomean
5/10/2005	40	78	---	7/26/2005	3,000	2,289	1,471
5/10/2005	100			7/26/2005	2,000		
5/10/2005	120			7/26/2005	2,000		
5/17/2005	100	137	---	8/2/2005	6,600	1,018	1,722
5/17/2005	160			8/2/2005	400		
5/17/2005	160			8/2/2005	400		
5/24/2005	200	830	---	8/9/2005	4,200	2,932	1,593
5/24/2005	2,200			8/9/2005	2,000		
5/24/2005	1,300			8/9/2005	3,000		
5/31/2005	40	61	---	8/16/2005	1,200	1,090	1,761
5/31/2005	140			8/16/2005	600		
5/31/2005	40			8/16/2005	1,800		
6/7/2005	820	831	214	8/23/2005	280	248	1,131
6/7/2005	1,060			8/23/2005	160		
6/7/2005	660			8/23/2005	340		
6/16/2005	3,200	4,026	471	8/30/2005	800	928	944
6/16/2005	6,000			8/30/2005	1,000		
6/16/2005	3,400			8/30/2005	1,000		
6/21/2005	2,200	619	636	9/6/2005	2,200	808	901
6/21/2005	180			9/6/2005	300		
6/21/2005	600			9/6/2005	800		
6/28/2005	800	464	567	9/13/2005	420	679	673
6/28/2005	260			9/13/2005	1,200		
6/28/2005	480			9/13/2005	620		
7/5/2005	4,000	4,320	1,329	9/20/2005	200	504	576
7/5/2005	4,800			9/20/2005	1,600		
7/5/2005	4,200			9/20/2005	400		
7/12/2005	400	660	1,270	9/27/2005	380	526	670
7/12/2005	1,200			9/27/2005	480		
7/12/2005	600			9/27/2005	800		
7/19/2005	4,000	2,275	1,133				
7/19/2005	4,600						
7/19/2005	640						

Table C-15. Main Rouge at Beech Road (US5) MDEQ 2005 *E. coli* Monitoring Data (cfu/100 ml).

Main Rouge at Beech Road (US5)							
Collection Date	Result	Daily Maximum	30-Day Rolling Geomean	Collection Date	Result	Daily Maximum	30-Day Rolling Geomean
5/10/2005	820	262	---	7/26/2005	5,400	4,800	2,302
5/10/2005	220			7/26/2005	6,400		
5/10/2005	100			7/26/2005	3,200		
5/17/2005	180	137	---	8/2/2005	33,500	3,892	2,983
5/17/2005	120			8/2/2005	4,400		
5/17/2005	120			8/2/2005	400		
5/24/2005	1,400	1,822	---	8/9/2005	2,500	2,359	2,605
5/24/2005	1,800			8/9/2005	3,500		
5/24/2005	2,400			8/9/2005	1,500		
5/31/2005	140	183	---	8/16/2005	600	524	2,530
5/31/2005	220			8/16/2005	1,200		
5/31/2005	200			8/16/2005	200		
6/7/2005	600	832	398	8/23/2005	200	357	1,525
6/7/2005	800			8/23/2005	300		
6/7/2005	1,200			8/23/2005	760		
6/16/2005	1,120	1,078	528	8/30/2005	740	939	1,101
6/16/2005	1,600			8/30/2005	1,400		
6/16/2005	700			8/30/2005	800		
6/21/2005	600	552	698	9/6/2005	1,000	1,538	914
6/21/2005	700			9/6/2005	2,600		
6/21/2005	400			9/6/2005	1,400		
6/28/2005	800	1,064	627	9/13/2005	600	524	677
6/28/2005	940			9/13/2005	480		
6/28/2005	1,600			9/13/2005	500		
7/5/2005	4,600	4,649	1,196	9/20/2005	1,200	584	692
7/5/2005	5,200			9/20/2005	520		
7/5/2005	4,200			9/20/2005	320		
7/12/2005	600	607	1,123	9/27/2005	540	730	798
7/12/2005	600			9/27/2005	600		
7/12/2005	620			9/27/2005	1,200		
7/19/2005	5,200	4,486	1,493				
7/19/2005	2,800						
7/19/2005	6,200						

Table C-16. Evans Ditch at Tamarack off 10 Mile Road (H44) MDEQ 2005 *E. coli* Monitoring Data (cfu/100 ml).

Evans Ditch at Tamarack off 10 Mile Road (H44)							
Collection Date	Result	Daily Maximum	30-Day Rolling Geomean	Collection Date	Result	Daily Maximum	30-Day Rolling Geomean
5/10/2005	400	157	---	7/26/2005	13,000	15,832	5,304
5/10/2005	80			7/26/2005	18,500		
5/10/2005	120			7/26/2005	16,500		
5/17/2005	40	86	---	8/2/2005	7,500	7,211	8,170
5/17/2005	160			8/2/2005	1,000		
5/17/2005	100			8/2/2005	50,000		
5/24/2005	340	130	---	8/9/2005	1,000	794	5,491
5/24/2005	80			8/9/2005	500		
5/24/2005	80			8/9/2005	1,000		
5/31/2005	160	146	---	8/16/2005	3,000	2,080	4,782
5/31/2005	140			8/16/2005	2,000		
5/31/2005	140			8/16/2005	1,500		
6/7/2005	1,400	1,621	211	8/23/2005	1,600	800	2,727
6/7/2005	800			8/23/2005	400		
6/7/2005	3,800			8/23/2005	800		
6/16/2005	2,800	980	304	8/30/2005	400	1,063	1,589
6/16/2005	1,200			8/30/2005	3,000		
6/16/2005	280			8/30/2005	1,000		
6/21/2005	400	586	446	9/6/2005	34,000	37,084	2,204
6/21/2005	1,400			9/6/2005	40,000		
6/21/2005	360			9/6/2005	37,500		
6/28/2005	400	832	647	9/13/2005	5,500	1,301	2,433
6/28/2005	800			9/13/2005	1,000		
6/28/2005	1,800			9/13/2005	400		
7/5/2005	5,600	5,784	1,350	9/20/2005	200	431	1,776
7/5/2005	5,400			9/20/2005	1,000		
7/5/2005	6,400			9/20/2005	400		
7/12/2005	2,600	4,156	1,630	9/27/2005	600	695	1,727
7/12/2005	4,600			9/27/2005	400		
7/12/2005	6,000			9/27/2005	1,400		
7/19/2005	6,500	13,261	2,744				
7/19/2005	20,500						
7/19/2005	17,500						

Table C-17. Evans Ditch at 9 Mile Road (US6) MDEQ 2005 *E. coli* Monitoring Data (cfu/100 ml).

Evans Ditch at 9 Mile Road (US6)							
Collection Date	Result	Daily Maximum	30-Day Rolling Geomean	Collection Date	Result	Daily Maximum	30-Day Rolling Geomean
5/10/2005	380	299	---	7/26/2005	7,000	8,819	5,295
5/10/2005	220			7/26/2005	7,000		
5/10/2005	320			7/26/2005	14,000		
5/17/2005	140	266	---	8/2/2005	1,500	3,455	6,230
5/17/2005	480			8/2/2005	5,500		
5/17/2005	280			8/2/2005	5,000		
5/24/2005	800	790	---	8/9/2005	500	1,931	4,531
5/24/2005	440			8/9/2005	2,400		
5/24/2005	1,400			8/9/2005	6,000		
5/31/2005	120	145	---	8/16/2005	1,000	1,442	4,338
5/31/2005	140			8/16/2005	3,000		
5/31/2005	180			8/16/2005	1,000		
6/7/2005	240	397	325	8/23/2005	400	765	2,304
6/7/2005	1,000			8/23/2005	1,400		
6/7/2005	260			8/23/2005	800		
6/16/2005	100	458	353	8/30/2005	4,000	1,857	1,687
6/16/2005	800			8/30/2005	2,000		
6/16/2005	1,200			8/30/2005	800		
6/21/2005	3,000	1,348	489	9/6/2005	200	1,521	1,432
6/21/2005	340			9/6/2005	11,000		
6/21/2005	2,400			9/6/2005	1,600		
6/28/2005	1,000	1,533	558	9/13/2005	360	355	1,021
6/28/2005	3,000			9/13/2005	520		
6/28/2005	1,200			9/13/2005	240		
7/5/2005	17,600	9,493	1,289	9/20/2005	800	458	811
7/5/2005	9,000			9/20/2005	1,200		
7/5/2005	5,400			9/20/2005	100		
7/12/2005	1,800	1,793	1,743	9/27/2005	600	952	848
7/12/2005	2,000			9/27/2005	1,200		
7/12/2005	1,600			9/27/2005	1,200		
7/19/2005	17,000	18,099	3,637				
7/19/2005	15,500						
7/19/2005	22,500						

Table C-18. Evans Ditch at Berg Road (M05) MDEQ 2005 *E. coli* Monitoring Data (cfu/100 ml).

Evans Ditch at Berg Road (M05)							
Collection Date	Result	Daily Maximum	30-Day Rolling Geomean	Collection Date	Result	Daily Maximum	30-Day Rolling Geomean
5/10/2005	340	332	---	7/26/2005	2,000	1,260	2,344
5/10/2005	360			7/26/2005	1,000		
5/10/2005	300			7/26/2005	1,000		
5/17/2005	80	109	---	8/2/2005	97,000	89,193	5,414
5/17/2005	160			8/2/2005	95,000		
5/17/2005	100			8/2/2005	77,000		
5/24/2005	420	369	---	8/9/2005	1,000	3,148	4,606
5/24/2005	120			8/9/2005	1,200		
5/24/2005	1,000			8/9/2005	26,000		
5/31/2005	160	252	---	8/16/2005	500	737	4,186
5/31/2005	500			8/16/2005	1,000		
5/31/2005	200			8/16/2005	800		
6/7/2005	740	376	263	8/23/2005	2,500	794	2,905
6/7/2005	400			8/23/2005	200		
6/7/2005	180			8/23/2005	1,000		
6/16/2005	2,200	726	308	8/30/2005	200	363	2,265
6/16/2005	280			8/30/2005	600		
6/16/2005	620			8/30/2005	400		
6/21/2005	240	306	379	9/6/2005	200	363	754
6/21/2005	460			9/6/2005	200		
6/21/2005	260			9/6/2005	1,200		
6/28/2005	1,160	1,358	491	9/13/2005	7,200	2,052	692
6/28/2005	1,800			9/13/2005	1,000		
6/28/2005	1,200			9/13/2005	1,200		
7/5/2005	15,400	7,063	957	9/20/2005	600	493	638
7/5/2005	10,400			9/20/2005	1,000		
7/5/2005	2,200			9/20/2005	200		
7/12/2005	1,000	1,189	1,204	9/27/2005	600	944	661
7/12/2005	600			9/27/2005	1,400		
7/12/2005	2,800			9/27/2005	1,000		
7/19/2005	1,800	4,928	1,767				
7/19/2005	9,500						
7/19/2005	7,000						

Table C-19. Main Rouge north of 7 Mile Road at Bonnie Brook Golf Course (M15) MDEQ 2005 *E. coli* Monitoring Data (cfu/100 ml).

Main Rouge, north of 7 Mile Road at Bonnie Brook Golf Course (M15)							
Collection Date	Result	Daily Maximum	30-Day Rolling Geomean	Collection Date	Result	Daily Maximum	30-Day Rolling Geomean
5/10/2005	240	287	---	7/26/2005	9,000	4,160	3,250
5/10/2005	260			7/26/2005	2,000		
5/10/2005	380			7/26/2005	4,000		
5/17/2005	220	102	---	8/2/2005	1,000	3,158	4,269
5/17/2005	80			8/2/2005	7,000		
5/17/2005	60			8/2/2005	4,500		
5/24/2005	2,400	2,292	---	8/9/2005	500	292	2,051
5/24/2005	760			8/9/2005	100		
5/24/2005	6,600			8/9/2005	500		
5/31/2005	160	179	---	8/16/2005	500	855	1,978
5/31/2005	180			8/16/2005	2,500		
5/31/2005	200			8/16/2005	500		
6/7/2005	420	764	391	8/23/2005	400	577	1,136
6/7/2005	1,000			8/23/2005	400		
6/7/2005	1,060			8/23/2005	1,200		
6/16/2005	800	1,454	541	8/30/2005	760	1,316	903
6/16/2005	3,200			8/30/2005	2,500		
6/16/2005	1,200			8/30/2005	1,200		
6/21/2005	1,800	1,864	968	9/6/2005	1,000	1,339	760
6/21/2005	1,800			9/6/2005	2,000		
6/21/2005	2,000			9/6/2005	1,200		
6/28/2005	400	807	786	9/13/2005	3,800	5,259	1,355
6/28/2005	940			9/13/2005	5,800		
6/28/2005	1,400			9/13/2005	6,600		
7/5/2005	11,400	11,418	1,803	9/20/2005	600	363	1,142
7/5/2005	12,800			9/20/2005	400		
7/5/2005	10,200			9/20/2005	200		
7/12/2005	500	1,026	1,913	9/27/2005	800	529	1,122
7/12/2005	1,800			9/27/2005	420		
7/12/2005	1,200			9/27/2005	440		
7/19/2005	18,000	9,217	2,768				
7/19/2005	3,000						
7/19/2005	14,500						

Table C-20. Main Rouge at Fenkell Road (G43) MDEQ 2005 *E. coli* Monitoring Data (cfu/100 ml).

Main Rouge at Fenkell Road (G43)							
Collection Date	Result	Daily Maximum	30-Day Rolling Geomean	Collection Date	Result	Daily Maximum	30-Day Rolling Geomean
5/10/2005	160	198	---	7/26/2005	2,500	1,554	2,912
5/10/2005	220			7/26/2005	1,500		
5/10/2005	220			7/26/2005	1,000		
5/17/2005	160	157	---	8/2/2005	10,500	4,034	3,617
5/17/2005	240			8/2/2005	500		
5/17/2005	100			8/2/2005	12,500		
5/24/2005	1,820	835	---	8/9/2005	800	783	2,265
5/24/2005	800			8/9/2005	1,500		
5/24/2005	400			8/9/2005	400		
5/31/2005	420	343	---	8/16/2005	600	925	2,073
5/31/2005	480			8/16/2005	2,200		
5/31/2005	200			8/16/2005	600		
6/7/2005	1,600	955	385	8/23/2005	1,000	843	1,308
6/7/2005	680			8/23/2005	1,000		
6/7/2005	800			8/23/2005	600		
6/16/2005	3,000	2,080	617	8/30/2005	800	1,308	1,264
6/16/2005	3,000			8/30/2005	1,400		
6/16/2005	1,000			8/30/2005	2,000		
6/21/2005	800	884	872	9/6/2005	600	458	818
6/21/2005	1,800			9/6/2005	400		
6/21/2005	480			9/6/2005	400		
6/28/2005	1,240	1,365	962	9/13/2005	2,600	2,655	1,044
6/28/2005	1,800			9/13/2005	3,000		
6/28/2005	1,140			9/13/2005	2,400		
7/5/2005	6,800	8,128	1,811	9/20/2005	600	711	991
7/5/2005	9,400			9/20/2005	1,000		
7/5/2005	8,400			9/20/2005	600		
7/12/2005	600	1,442	1,967	9/27/2005	3,000	2,896	1,268
7/12/2005	2,500			9/27/2005	4,500		
7/12/2005	2,000			9/27/2005	1,800		
7/19/2005	3,000	8,427	2,602				
7/19/2005	28,500						
7/19/2005	7,000						

Table C-21. Main Rouge at Plymouth Road (US7) MDEQ 2005 *E. coli* Monitoring Data (cfu/100 ml).

Main Rouge at Plymouth Road (US7)							
Collection Date	Result	Daily Maximum	30-Day Rolling Geomean	Collection Date	Result	Daily Maximum	30-Day Rolling Geomean
5/10/2005	140	125	---	7/26/2005	8,000	3,420	2,170
5/10/2005	100			7/26/2005	2,500		
5/10/2005	140			7/26/2005	2,000		
5/17/2005	1,000	711	---	8/2/2005	2,500	1,357	2,349
5/17/2005	600			8/2/2005	500		
5/17/2005	600			8/2/2005	2,000		
5/24/2005	260	1,259	---	8/9/2005	2,800	2,077	2,654
5/24/2005	4,800			8/9/2005	3,200		
5/24/2005	1,600			8/9/2005	1,000		
5/31/2005	1,600	1,226	---	8/16/2005	1,400	4,718	3,716
5/31/2005	4,800			8/16/2005	15,000		
5/31/2005	240			8/16/2005	5,000		
6/7/2005	4,600	4,562	911	8/23/2005	1,500	1,480	2,321
6/7/2005	8,600			8/23/2005	1,800		
6/7/2005	2,400			8/23/2005	1,200		
6/16/2005	200	473	1,188	8/30/2005	2,500	1,913	2,066
6/16/2005	240			8/30/2005	2,000		
6/16/2005	2,200			8/30/2005	1,400		
6/21/2005	100	476	1,097	9/6/2005	2,200	1,639	2,145
6/21/2005	1,800			9/6/2005	2,000		
6/21/2005	600			9/6/2005	1,000		
6/28/2005	720	913	1,028	9/13/2005	3,000	3,533	2,386
6/28/2005	660			9/13/2005	4,200		
6/28/2005	1,600			9/13/2005	3,500		
7/5/2005	1,000	1,129	1,011	9/20/2005	3,200	2,486	2,099
7/5/2005	800			9/20/2005	6,000		
7/5/2005	1,800			9/20/2005	800		
7/12/2005	1,400	876	727	9/27/2005	4,500	2,008	2,231
7/12/2005	600			9/27/2005	1,800		
7/12/2005	800			9/27/2005	1,000		
7/19/2005	19,500	15,590	1,463				
7/19/2005	33,500						
7/19/2005	5,800						

Table C-22. Main Rouge at Ann Arbor Trail (G42) MDEQ 2005 *E. coli* Monitoring Data (cfu/100 ml).

Main Rouge at Ann Arbor Trail (G42)							
Collection Date	Result	Daily Maximum	30-Day Rolling Geomean	Collection Date	Result	Daily Maximum	30-Day Rolling Geomean
5/10/2005	80	137	---	7/26/2005	48,000	49,612	5,633
5/10/2005	100			7/26/2005	53,000		
5/10/2005	320			7/26/2005	48,000		
5/17/2005	1,340	916	---	8/2/2005	67,000	67,782	16,268
5/17/2005	820			8/2/2005	56,000		
5/17/2005	700			8/2/2005	83,000		
5/24/2005	1,800	1,864	---	8/9/2005	6,000	4,932	12,108
5/24/2005	1,000			8/9/2005	4,000		
5/24/2005	3,600			8/9/2005	5,000		
5/31/2005	240	249	---	8/16/2005	2,200	1,283	13,203
5/31/2005	200			8/16/2005	1,200		
5/31/2005	320			8/16/2005	800		
6/7/2005	1,060	1,140	581	8/23/2005	500	368	6,010
6/7/2005	1,320			8/23/2005	200		
6/7/2005	1,060			8/23/2005	500		
6/16/2005	1,160	1,135	887	8/30/2005	1,500	1,480	2,977
6/16/2005	1,260			8/30/2005	1,800		
6/16/2005	1,000			8/30/2005	1,200		
6/21/2005	400	764	856	9/6/2005	260	269	985
6/21/2005	620			9/6/2005	340		
6/21/2005	1,800			9/6/2005	220		
6/28/2005	400	337	608	9/13/2005	1,900	913	703
6/28/2005	400			9/13/2005	400		
6/28/2005	240			9/13/2005	1,000		
7/5/2005	24,600	21,595	1,484	9/20/2005	800	684	620
7/5/2005	17,200			9/20/2005	400		
7/5/2005	23,800			9/20/2005	1,000		
7/12/2005	1,800	832	1,394	9/27/2005	2,400	3,663	981
7/12/2005	400			9/27/2005	3,200		
7/12/2005	800			9/27/2005	6,400		
7/19/2005	16,500	18,855	2,445				
7/19/2005	12,500						
7/19/2005	32,500						

Table C-23. Main Rouge at Ford Mansion (M10) MDEQ 2005 *E. coli* Monitoring Data (cfu/100 ml).

Main Rouge at Ford Mansion (M10)							
Collection Date	Result	Daily Maximum	30-Day Rolling Geomean	Collection Date	Result	Daily Maximum	30-Day Rolling Geomean
5/10/2005	NC		---	7/26/2005	10,000	32,992	6,738
5/10/2005	NC			7/26/2005	66,500		
5/10/2005	NC			7/26/2005	54,000		
5/17/2005	NC		---	8/2/2005	6,000	4,481	8,407
5/17/2005	NC			8/2/2005	2,500		
5/17/2005	NC			8/2/2005	6,000		
5/24/2005	NC		---	8/9/2005	2,400	1,687	5,172
5/24/2005	NC			8/9/2005	1,000		
5/24/2005	NC			8/9/2005	2,000		
5/31/2005	80	83	---	8/16/2005	400	824	5,250
5/31/2005	60			8/16/2005	1,400		
5/31/2005	120			8/16/2005	1,000		
6/7/2005	400	436	---	8/23/2005	400	252	2,202
6/7/2005	280			8/23/2005	200		
6/7/2005	740			8/23/2005	200		
6/16/2005	NC	693	---	8/30/2005	2,000	1,293	1,152
6/16/2005	600			8/30/2005	1,080		
6/16/2005	800			8/30/2005	1,000		
6/21/2005	220	223	---	9/6/2005	600	487	739
6/21/2005	180			9/6/2005	320		
6/21/2005	280			9/6/2005	600		
6/28/2005	1,520	1,482	368	9/13/2005	200	200	482
6/28/2005	1,700			9/13/2005	200		
6/28/2005	1,260			9/13/2005	200		
7/5/2005	19,200	19,137	1,179	9/20/2005	200	543	444
7/5/2005	23,400			9/20/2005	1,000		
7/5/2005	15,600			9/20/2005	800		
7/12/2005	1,400	765	1,330	9/27/2005	2,000	2,125	680
7/12/2005	400			9/27/2005	600		
7/12/2005	800			9/27/2005	8,000		
7/19/2005	29,000	19,399	2,480				
7/19/2005	9,500						
7/19/2005	26,500						

Table C-24. Main Rouge at Rotunda Drive (US8) MDEQ 2005 *E. coli* Monitoring Data (cfu/100 ml).

Main Rouge at Rotunda Drive (US8)							
Collection Date	Result	Daily Maximum	30-Day Rolling Geomean	Collection Date	Result	Daily Maximum	30-Day Rolling Geomean
5/10/2005	120	151	---	7/26/2005	6,800	5,641	4,382
5/10/2005	120			7/26/2005	4,000		
5/10/2005	240			7/26/2005	6,600		
5/17/2005	780	831	---	8/2/2005	3,800	3,100	6,092
5/17/2005	920			8/2/2005	2,800		
5/17/2005	800			8/2/2005	2,800		
5/24/2005	1,600	1,964	---	8/9/2005	1,000	1,587	3,925
5/24/2005	1,820			8/9/2005	1,600		
5/24/2005	2,600			8/9/2005	2,500		
5/31/2005	200	164	---	8/16/2005	2,000	1,864	3,728
5/31/2005	100			8/16/2005	1,800		
5/31/2005	220			8/16/2005	1,800		
6/7/2005	520	1,130	539	8/23/2005	1,060	1,019	2,210
6/7/2005	1,540			8/23/2005	980		
6/7/2005	1,800			8/23/2005	1,020		
6/16/2005	2,000	1,356	837	8/30/2005	200	635	1,428
6/16/2005	1,560			8/30/2005	3,200		
6/16/2005	800			8/30/2005	400		
6/21/2005	160	276	671	9/6/2005	1,200	832	1,098
6/21/2005	220			9/6/2005	800		
6/21/2005	600			9/6/2005	600		
6/28/2005	740	597	529	9/13/2005	1,800	968	994
6/28/2005	600			9/13/2005	1,200		
6/28/2005	480			9/13/2005	420		
7/5/2005	9,400	14,300	1,293	9/20/2005	800	800	840
7/5/2005	15,400			9/20/2005	800		
7/5/2005	20,200			9/20/2005	800		
7/12/2005	1,000	2,410	1,505	9/27/2005	4,800	2,566	1,010
7/12/2005	2,000			9/27/2005	2,200		
7/12/2005	7,000			9/27/2005	1,600		
7/19/2005	14,500	13,920	2,397				
7/19/2005	12,000						
7/19/2005	15,500						

Table C-25. Main Rouge at Greenfield Road (M12) MDEQ 2005 *E. coli* Monitoring Data (cfu/100 ml).

Main Rouge at Greenfield Road (M12)							
Collection Date	Result	Daily Maximum	30-Day Rolling Geomean	Collection Date	Result	Daily Maximum	30-Day Rolling Geomean
5/10/2005	300	272	---	7/26/2005	2,600	3,465	2,784
5/10/2005	240			7/26/2005	3,200		
5/10/2005	280			7/26/2005	5,000		
5/17/2005	40	98	---	8/2/2005	2,400	2,265	4,309
5/17/2005	580			8/2/2005	2,200		
5/17/2005	40			8/2/2005	2,200		
5/24/2005	1,740	2,291	---	8/9/2005	600	952	2,400
5/24/2005	1,920			8/9/2005	1,800		
5/24/2005	3,600			8/9/2005	800		
5/31/2005	100	167	---	8/16/2005	400	400	2,267
5/31/2005	180			8/16/2005	400		
5/31/2005	260			8/16/2005	400		
6/7/2005	800	784	380	8/23/2005	120	154	856
6/7/2005	700			8/23/2005	380		
6/7/2005	860			8/23/2005	80		
6/16/2005	1,600	1,512	536	8/30/2005	520	1,356	710
6/16/2005	600			8/30/2005	3,000		
6/16/2005	3,600			8/30/2005	1,600		
6/21/2005	320	268	656	9/6/2005	400	425	508
6/21/2005	300			9/6/2005	320		
6/21/2005	200			9/6/2005	600		
6/28/2005	400	255	423	9/13/2005	160	217	378
6/28/2005	160			9/13/2005	400		
6/28/2005	260			9/13/2005	160		
7/5/2005	18,400	17,768	1,076	9/20/2005	800	1,423	487
7/5/2005	20,600			9/20/2005	2,000		
7/5/2005	14,800			9/20/2005	1,800		
7/12/2005	100	531	995	9/27/2005	1,600	1,832	799
7/12/2005	1,500			9/27/2005	1,200		
7/12/2005	1,000			9/27/2005	3,200		
7/19/2005	13,500	20,041	1,669				
7/19/2005	22,500						
7/19/2005	26,500						

APPENDIX D

UPPER ROUGE RIVER
MDEQ 2005 *E. coli* MONITORING DATA

SAMPLING LOCATIONS,
SAMPLING DATES,
E. COLI RESULTS,
DAILY MAXIMUMS, AND
30-DAY ROLLING GEOMETRIC MEANS

Table D-1. Upper Rouge at Powers Road (U01) MDEQ 2005 *E. coli* Monitoring Data (cfu/100 ml).

Upper Rouge at Powers Road (U01)							
Collection Date	Result	Daily Maximum	30-Day Rolling Geomean	Collection Date	Result	Daily Maximum	30-Day Rolling Geomean
5/12/2005	40	179	---	7/29/2005	2,500	1,442	2,144
5/12/2005	360			7/29/2005	1,200		
5/12/2005	400			7/29/2005	1,000		
5/19/2005	480	390	---	8/5/2005	2,500	2,321	1,478
5/19/2005	440			8/5/2005	2,500		
5/19/2005	280			8/5/2005	2,000		
5/26/2005	120	250	---	8/12/2005	2,400	3,115	1,737
5/26/2005	540			8/12/2005	4,500		
5/26/2005	240			8/12/2005	2,800		
6/2/2005	1,200	993	---	8/19/2005	400	783	1,482
6/2/2005	1,200			8/19/2005	2,000		
6/2/2005	680			8/19/2005	600		
6/9/2005	1,000	965	441	8/26/2005	4,000	3,774	1,985
6/9/2005	880			8/26/2005	2,800		
6/9/2005	1,020			8/26/2005	4,800		
6/14/2005	800	916	611	9/2/2005	1,000	783	1,757
6/14/2005	600			9/2/2005	800		
6/14/2005	1,600			9/2/2005	600		
6/24/2005	300	682	684	9/9/2005	6,000	3,780	1,937
6/24/2005	880			9/9/2005	4,500		
6/24/2005	1,200			9/9/2005	2,000		
6/30/2005	15,800	14,895	1,549	9/16/2005	2,000	4,672	2,100
6/30/2005	12,600			9/16/2005	6,000		
6/30/2005	16,600			9/16/2005	8,500		
7/8/2005	1,600	1,390	1,656	9/26/2005	4,200	3,540	2,840
7/8/2005	1,400			9/26/2005	2,400		
7/8/2005	1,200			9/26/2005	4,400		
7/15/2005	1,200	1,731	1,862	9/30/2005	200	252	1,653
7/15/2005	2,400			9/30/2005	400		
7/15/2005	1,800			9/30/2005	200		
7/22/2005	1,400	876	1,845				
7/22/2005	1,200						
7/22/2005	400						

Table D-2. Upper Rouge at Tuck Road (G72) MDEQ 2005 *E. coli* Monitoring Data (cfu/100 ml).

Upper Rouge at Tuck Road (G72)							
Collection Date	Result	Daily Maximum	30-Day Rolling Geomean	Collection Date	Result	Daily Maximum	30-Day Rolling Geomean
5/12/2005	120	145	---	7/29/2005	4,400	4,373	1,774
5/12/2005	160			7/29/2005	5,000		
5/12/2005	160			7/29/2005	3,800		
5/19/2005	340	943	---	8/5/2005	600	1,129	1,570
5/19/2005	1,540			8/5/2005	1,200		
5/19/2005	1,600			8/5/2005	2,000		
5/26/2005	300	307	---	8/12/2005	2,000	2,289	1,653
5/26/2005	160			8/12/2005	2,000		
5/26/2005	600			8/12/2005	3,000		
6/2/2005	520	479	---	8/19/2005	1,000	783	1,463
6/2/2005	460			8/19/2005	600		
6/2/2005	460			8/19/2005	800		
6/9/2005	1,000	1,086	465	8/26/2005	13,600	8,452	2,370
6/9/2005	800			8/26/2005	7,400		
6/9/2005	1,600			8/26/2005	6,000		
6/14/2005	1,800	1,864	775	9/2/2005	400	684	1,636
6/14/2005	2,000			9/2/2005	1,000		
6/14/2005	1,800			9/2/2005	800		
6/24/2005	3,600	3,302	996	9/9/2005	6,500	4,302	2,137
6/24/2005	2,000			9/9/2005	3,500		
6/24/2005	5,000			9/9/2005	3,500		
6/30/2005	800	2,082	1,462	9/16/2005	9,500	6,193	2,608
6/30/2005	9,400			9/16/2005	5,000		
6/30/2005	1,200			9/16/2005	5,000		
7/8/2005	600	1,772	1,899	9/26/2005	3,500	4,138	3,638
7/8/2005	1,600			9/26/2005	4,600		
7/8/2005	5,800			9/26/2005	4,400		
7/15/2005	1,500	1,442	2,009	9/30/2005	1,000	493	2,061
7/15/2005	1,000			9/30/2005	200		
7/15/2005	2,000			9/30/2005	600		
7/22/2005	1,200	756	1,678				
7/22/2005	600						
7/22/2005	600						

Table D-3. Upper Rouge at Inkster Road (G71) MDEQ 2005 *E. coli* Monitoring Data (cfu/100 ml).

Upper Rouge Inkster Road (G71)							
Collection Date	Result	Daily Maximum	30-Day Rolling Geomean	Collection Date	Result	Daily Maximum	30-Day Rolling Geomean
5/12/2005	1,060	1,210	---	7/29/2005	1,000	1,301	4,590
5/12/2005	2,200			7/29/2005	1,000		
5/12/2005	760			7/29/2005	2,200		
5/19/2005	1,060	716	---	8/5/2005	200	727	2,682
5/19/2005	540			8/5/2005	800		
5/19/2005	640			8/5/2005	2,400		
5/26/2005	320	342	---	8/12/2005	41,500	18,334	3,393
5/26/2005	260			8/12/2005	13,500		
5/26/2005	480			8/12/2005	11,000		
6/2/2005	200	660	---	8/19/2005	2,500	1,339	2,154
6/2/2005	1,800			8/19/2005	800		
6/2/2005	800			8/19/2005	1,200		
6/9/2005	1,800	1,361	767	8/26/2005	2,000	1,833	2,117
6/9/2005	1,000			8/26/2005	1,400		
6/9/2005	1,400			8/26/2005	2,200		
6/14/2005	2,100	2,066	854	9/2/2005	1,600	1,215	2,088
6/14/2005	3,000			9/2/2005	1,400		
6/14/2005	1,400			9/2/2005	800		
6/24/2005	200	1,702	1,016	9/9/2005	8,500	13,133	3,726
6/24/2005	8,800			9/9/2005	13,000		
6/24/2005	2,800			9/9/2005	20,500		
6/30/2005	17,400	10,659	2,021	9/16/2005	1,500	5,168	2,892
6/30/2005	14,500			9/16/2005	8,000		
6/30/2005	4,800			9/16/2005	11,500		
7/8/2005	2,200	5,662	3,105	9/26/2005	2,000	2,499	3,276
7/8/2005	5,500			9/26/2005	3,000		
7/8/2005	15,000			9/26/2005	2,600		
7/15/2005	26,000	12,974	4,875	9/30/2005	600	476	2,502
7/15/2005	7,000			9/30/2005	180		
7/15/2005	12,000			9/30/2005	1,000		
7/22/2005	2,000	2,000	4,843				
7/22/2005	2,000						
7/22/2005	2,000						

Table D-4. Upper Rouge at Graham Road (U02) MDEQ 2005 *E. coli* Monitoring Data (cfu/100 ml).

Upper Rouge Graham Road (U02)							
Collection Date	Result	Daily Maximum	30-Day Rolling Geomean	Collection Date	Result	Daily Maximum	30-Day Rolling Geomean
5/12/2005	1,120	1,026	---	7/29/2005	2,500	2,726	3,902
5/12/2005	860			7/29/2005	1,800		
5/12/2005	1,120			7/29/2005	4,500		
5/19/2005	920	619	---	8/5/2005	400	577	2,446
5/19/2005	340			8/5/2005	600		
5/19/2005	760			8/5/2005	800		
5/26/2005	340	245	---	8/12/2005	1,600	1,308	1,856
5/26/2005	120			8/12/2005	1,000		
5/26/2005	360			8/12/2005	1,400		
6/2/2005	1,200	1,021	---	8/19/2005	1,200	896	1,356
6/2/2005	1,200			8/19/2005	600		
6/2/2005	740			8/19/2005	1,000		
6/9/2005	3,200	2,493	831	8/26/2005	800	862	1,097
6/9/2005	2,200			8/26/2005	1,000		
6/9/2005	2,200			8/26/2005	800		
6/14/2005	3,400	5,572	1,166	9/2/2005	3,000	2,052	1,037
6/14/2005	10,600			9/2/2005	2,400		
6/14/2005	4,800			9/2/2005	1,200		
6/24/2005	2,400	3,504	1,648	9/9/2005	1,000	3,780	1,510
6/24/2005	3,200			9/9/2005	6,000		
6/24/2005	5,600			9/9/2005	9,000		
6/30/2005	4,800	5,955	3,121	9/16/2005	2,000	7,905	2,163
6/30/2005	4,400			9/16/2005	19,000		
6/30/2005	10,000			9/16/2005	13,000		
7/8/2005	8,000	5,202	4,322	9/26/2005	4,200	2,932	2,742
7/8/2005	4,400			9/26/2005	4,000		
7/8/2005	4,000			9/26/2005	1,500		
7/15/2005	6,000	4,305	4,821	9/30/2005	1,400	964	2,804
7/15/2005	3,500			9/30/2005	800		
7/15/2005	3,800			9/30/2005	800		
7/22/2005	3,500	2,488	4,103				
7/22/2005	2,000						
7/22/2005	2,200						

Table D-5. Bell Branch at Riverside Street (U14) MDEQ 2005 *E. coli* Monitoring Data (cfu/100 ml).

Bell Branch at Riverside Street (U14)							
Collection Date	Result	Daily Maximum	30-Day Rolling Geomean	Collection Date	Result	Daily Maximum	30-Day Rolling Geomean
5/12/2005	NC		---	7/29/2005	4,800	4,654	4,121
5/12/2005	NC			7/29/2005	7,000		
5/12/2005	NC			7/29/2005	3,000		
5/19/2005	NC		---	8/5/2005	2,200	890	2,580
5/19/2005	NC			8/5/2005	800		
5/19/2005	NC			8/5/2005	400		
5/26/2005	NC		---	8/12/2005	7,000	7,151	2,824
5/26/2005	NC			8/12/2005	9,500		
5/26/2005	NC			8/12/2005	5,500		
6/2/2005	400	868	---	8/19/2005	2,600	2,153	2,686
6/2/2005	1,540			8/19/2005	2,400		
6/2/2005	1,060			8/19/2005	1,600		
6/9/2005	12,200	3,133	---	8/26/2005	1,400	1,104	2,341
6/9/2005	1,400			8/26/2005	1,200		
6/9/2005	1,800			8/26/2005	800		
6/14/2005	2,200	2,978	---	9/2/2005	4,000	3,297	2,185
6/14/2005	2,000			9/2/2005	3,200		
6/14/2005	6,000			9/2/2005	2,800		
6/24/2005	800	1,185	---	9/9/2005	2,000	2,943	2,776
6/24/2005	2,600			9/9/2005	1,500		
6/24/2005	800			9/9/2005	8,500		
6/30/2005	11,500	9,247	2,452	9/16/2005	7,000	6,316	2,708
6/30/2005	5,500			9/16/2005	3,000		
6/30/2005	12,500			9/16/2005	12,000		
7/8/2005	1,800	4,555	3,417	9/26/2005	5,500	4,041	3,071
7/8/2005	7,000			9/26/2005	3,000		
7/8/2005	7,500			9/26/2005	4,000		
7/15/2005	2,400	2,764	3,332	9/30/2005	2,500	669	2,779
7/15/2005	1,600			9/30/2005	600		
7/15/2005	5,500			9/30/2005	200		
7/22/2005	1,600	2,194	3,135				
7/22/2005	2,200						
7/22/2005	3,000						

Table D-6. Bell Branch at 6 Mile Road, west of Farmington (U15) MDEQ 2005 *E. coli* Monitoring Data (cfu/100 ml).

Bell Branch at 6 Mile Road, west of Farmington (U15)							
Collection Date	Result	Daily Maximum	30-Day Rolling Geomean	Collection Date	Result	Daily Maximum	30-Day Rolling Geomean
5/12/2005	360	557	---	7/29/2005	4,000	2,125	3,006
5/12/2005	600			7/29/2005	2,000		
5/12/2005	800			7/29/2005	1,200		
5/19/2005	220	338	---	8/5/2005	3,000	1,026	2,300
5/19/2005	380			8/5/2005	600		
5/19/2005	460			8/5/2005	600		
5/26/2005	580	197	---	8/12/2005	22,500	15,654	2,958
5/26/2005	20			8/12/2005	11,000		
5/26/2005	660			8/12/2005	15,500		
6/2/2005	640	755	---	8/19/2005	600	1,480	2,846
6/2/2005	700			8/19/2005	4,500		
6/2/2005	960			8/19/2005	1,200		
6/9/2005	1,400	2,033	564	8/26/2005	800	783	2,087
6/9/2005	2,000			8/26/2005	600		
6/9/2005	3,000			8/26/2005	1,000		
6/14/2005	3,500	3,865	830	9/2/2005	600	916	1,763
6/14/2005	3,000			9/2/2005	1,600		
6/14/2005	5,500			9/2/2005	800		
6/24/2005	6,400	7,230	1,532	9/9/2005	17,000	14,272	2,985
6/24/2005	8,200			9/9/2005	9,000		
6/24/2005	7,200			9/9/2005	19,000		
6/30/2005	5,000	3,915	2,786	9/16/2005	10,500	5,489	2,421
6/30/2005	3,000			9/16/2005	4,500		
6/30/2005	4,000			9/16/2005	3,500		
7/8/2005	5,000	4,448	3,972	9/26/2005	2,800	2,527	2,694
7/8/2005	3,200			9/26/2005	2,400		
7/8/2005	5,500			9/26/2005	2,400		
7/15/2005	1,800	1,793	3,874	9/30/2005	1,000	1,000	2,829
7/15/2005	2,000			9/30/2005	1,000		
7/15/2005	1,600			9/30/2005	1,000		
7/22/2005	2,500	3,699	3,840				
7/22/2005	4,500						
7/22/2005	4,500						

Table D-7. Tarabusi Creek at 7 Mile Road between Farmington Road and Merriman Road (U17) MDEQ 2005 *E. coli* Monitoring Data (cfu/100 ml).

Tarabusi Creek at 7 Mile Road between Farmington Road and Merriman Road (U17)							
Collection Date	Result	Daily Maximum	30-Day Rolling Geomean	Collection Date	Result	Daily Maximum	30-Day Rolling Geomean
5/12/2005	760	2,133	---	7/29/2005	2,500	2,972	2,788
5/12/2005	11,400			7/29/2005	3,000		
5/12/2005	1,120			7/29/2005	3,500		
5/19/2005	600	690	---	8/5/2005	2,400	1,887	2,586
5/19/2005	740			8/5/2005	1,000		
5/19/2005	740			8/5/2005	2,800		
5/26/2005	1,320	1,340	---	8/12/2005	1,000	1,474	2,248
5/26/2005	1,200			8/12/2005	2,000		
5/26/2005	1,520			8/12/2005	1,600		
6/2/2005	120	589	---	8/19/2005	800	928	1,723
6/2/2005	1,420			8/19/2005	1,000		
6/2/2005	1,200			8/19/2005	1,000		
6/9/2005	1,800	1,129	1,056	8/26/2005	2,600	3,298	1,908
6/9/2005	1,000			8/26/2005	4,600		
6/9/2005	800			8/26/2005	3,000		
6/14/2005	1,200	1,512	986	9/2/2005	800	660	1,413
6/14/2005	1,200			9/2/2005	600		
6/14/2005	2,400			9/2/2005	600		
6/24/2005	5,200	4,273	1,419	9/9/2005	12,000	9,524	1,953
6/24/2005	3,000			9/9/2005	9,000		
6/24/2005	5,000			9/9/2005	8,000		
6/30/2005	7,400	2,747	1,638	9/16/2005	1,000	5,446	2,536
6/30/2005	1,000			9/16/2005	17,000		
6/30/2005	2,800			9/16/2005	9,500		
7/8/2005	3,000	2,972	2,264	9/26/2005	8,000	5,646	3,639
7/8/2005	3,500			9/26/2005	4,500		
7/8/2005	2,500			9/26/2005	5,000		
7/15/2005	4,000	3,509	2,841	9/30/2005	2,500	1,554	3,130
7/15/2005	4,500			9/30/2005	1,500		
7/15/2005	2,400			9/30/2005	1,000		
7/22/2005	1,600	1,978	2,998				
7/22/2005	2,200						
7/22/2005	2,200						

Table D-8. Tributary to Tarabusi Creek at 8 Mile Road and Purlingbrook, east of Orchard Lake Road (G19) MDEQ 2005 *E. coli* Monitoring Data (cfu/100 ml).

Tributary to Tarabusi Creek at 8 Mile Road and Purlingbrook, east of Orchard Lake Road (G19)							
Collection Date	Result	Daily Maximum	30-Day Rolling Geomean	Collection Date	Result	Daily Maximum	30-Day Rolling Geomean
5/12/2005	1,540	1,762	---	7/29/2005	2,000	2,000	3,879
5/12/2005	2,140			7/29/2005	2,500		
5/12/2005	1,660			7/29/2005	1,600		
5/19/2005	1,400	1,192	---	8/5/2005	1,500	1,026	2,248
5/19/2005	1,140			8/5/2005	600		
5/19/2005	1,060			8/5/2005	1,200		
5/26/2005	1,600	2,314	---	8/12/2005	22,000	3,208	2,452
5/26/2005	4,400			8/12/2005	500		
5/26/2005	1,760			8/12/2005	3,000		
6/2/2005	1,000	1,461	---	8/19/2005	1,600	1,308	2,022
6/2/2005	2,600			8/19/2005	1,400		
6/2/2005	1,200			8/19/2005	1,000		
6/9/2005	4,600	5,748	2,100	8/26/2005	1,600	400	1,281
6/9/2005	4,800			8/26/2005	200		
6/9/2005	8,600			8/26/2005	200		
6/14/2005	4,800	3,483	2,406	9/2/2005	200	193	802
6/14/2005	4,000			9/2/2005	60		
6/14/2005	2,200			9/2/2005	600		
6/24/2005	5,400	3,324	2,954	9/9/2005	9,000	9,475	1,252
6/24/2005	3,400			9/9/2005	10,500		
6/24/2005	2,000			9/9/2005	9,000		
6/30/2005	19,000	15,714	4,333	9/16/2005	3,000	10,284	1,580
6/30/2005	9,200			9/16/2005	14,500		
6/30/2005	22,200			9/16/2005	25,000		
7/8/2005	1,600	2,077	4,649	9/26/2005	9,500	8,472	2,296
7/8/2005	3,500			9/26/2005	8,000		
7/8/2005	1,600			9/26/2005	8,000		
7/15/2005	2,800	3,429	4,193	9/30/2005	800	862	2,677
7/15/2005	3,200			9/30/2005	800		
7/15/2005	4,500			9/30/2005	1,000		
7/22/2005	4,000	3,925	4,294				
7/22/2005	4,200						
7/22/2005	3,600						

Table D-9. Bell Branch at Inkster Road between 5 Mile Road and 6 Mile Road (U03) MDEQ 2005 *E. coli* Monitoring Data (cfu/100 ml).

Bell Branch at Inkster Road between 5 Mile Road and 6 Mile Road (U03)							
Collection Date	Result	Daily Maximum	30-Day Rolling Geomean	Collection Date	Result	Daily Maximum	30-Day Rolling Geomean
5/12/2005	740	2,391	---	7/29/2005	4,000	4,129	3,831
5/12/2005	4,400			7/29/2005	4,400		
5/12/2005	4,200			7/29/2005	4,000		
5/19/2005	1,000	367	---	8/5/2005	1,800	1,793	2,925
5/19/2005	80			8/5/2005	2,000		
5/19/2005	620			8/5/2005	1,600		
5/26/2005	940	794	---	8/12/2005	7,000	3,037	2,868
5/26/2005	620			8/12/2005	1,000		
5/26/2005	860			8/12/2005	4,000		
6/2/2005	1,000	711	---	8/19/2005	1,600	1,724	2,595
6/2/2005	600			8/19/2005	2,000		
6/2/2005	600			8/19/2005	1,600		
6/9/2005	4,600	13,836	1,470	8/26/2005	1,600	1,086	2,112
6/9/2005	24,400			8/26/2005	1,000		
6/9/2005	23,600			8/26/2005	800		
6/14/2005	3,400	5,870	1,760	9/2/2005	1,800	1,480	1,720
6/14/2005	8,500			9/2/2005	1,200		
6/14/2005	7,000			9/2/2005	1,500		
6/24/2005	5,800	4,168	2,860	9/9/2005	1,500	3,832	2,003
6/24/2005	4,800			9/9/2005	2,500		
6/24/2005	2,600			9/9/2005	15,000		
6/30/2005	3,500	6,916	4,409	9/16/2005	15,000	12,698	2,666
6/30/2005	9,000			9/16/2005	10,500		
6/30/2005	10,500			9/16/2005	13,000		
7/8/2005	3,000	3,345	6,009	9/26/2005	5,600	3,694	3,105
7/8/2005	4,800			9/26/2005	6,000		
7/8/2005	2,600			9/26/2005	1,500		
7/15/2005	3,200	2,846	4,379	9/30/2005	1,800	1,890	3,469
7/15/2005	4,500			9/30/2005	2,500		
7/15/2005	1,600			9/30/2005	1,500		
7/22/2005	4,000	3,037	3,838				
7/22/2005	3,500						
7/22/2005	2,000						

Table D-10. Bell Branch at Beech Daly Road south of 5 Mile Road (U04) MDEQ 2005 *E. coli* Monitoring Data (cfu/100 ml).

Bell Branch at Beech Daly Road south of 5 Mile Road (U04)							
Collection Date	Result	Daily Maximum	30-Day Rolling Geomean	Collection Date	Result	Daily Maximum	30-Day Rolling Geomean
5/12/2005	3,400	1,951	---	7/29/2005	2,500	3,240	5,011
5/12/2005	520			7/29/2005	1,600		
5/12/2005	4,200			7/29/2005	8,500		
5/19/2005	160	472	---	8/5/2005	2,000	1,687	3,622
5/19/2005	820			8/5/2005	1,600		
5/19/2005	800			8/5/2005	1,500		
5/26/2005	120	600	---	8/12/2005	500	630	2,202
5/26/2005	2,000			8/12/2005	1,000		
5/26/2005	900			8/12/2005	500		
6/2/2005	1,000	660	---	8/19/2005	1,500	1,243	1,652
6/2/2005	600			8/19/2005	1,600		
6/2/2005	480			8/19/2005	800		
6/9/2005	1,800	4,081	1,083	8/26/2005	1,000	986	1,334
6/9/2005	3,200			8/26/2005	800		
6/9/2005	11,800			8/26/2005	1,200		
6/14/2005	6,600	3,588	1,223	9/2/2005	1,200	832	1,016
6/14/2005	2,500			9/2/2005	600		
6/14/2005	2,800			9/2/2005	800		
6/24/2005	3,500	1,409	1,522	9/9/2005	7,000	7,383	1,365
6/24/2005	800			9/9/2005	11,500		
6/24/2005	1,000			9/9/2005	5,000		
6/30/2005	12,400	8,545	2,590	9/16/2005	14,000	12,440	2,479
6/30/2005	3,400			9/16/2005	11,000		
6/30/2005	14,800			9/16/2005	12,500		
7/8/2005	5,500	7,580	4,219	9/26/2005	4,500	4,327	3,182
7/8/2005	4,800			9/26/2005	6,000		
7/8/2005	16,500			9/26/2005	3,000		
7/15/2005	2,600	5,232	4,434	9/30/2005	1,000	1,613	3,511
7/15/2005	9,500			9/30/2005	2,800		
7/15/2005	5,800			9/30/2005	1,500		
7/22/2005	2,500	2,876	4,242				
7/22/2005	3,400						
7/22/2005	2,800						

Table D-11. Upper Rouge at Telegraph Road (U05) MDEQ 2005 *E. coli* Monitoring Data (cfu/100 ml).

Upper Rouge at Telegraph Road (U05)							
Collection Date	Result	Daily Maximum	30-Day Rolling Geomean	Collection Date	Result	Daily Maximum	30-Day Rolling Geomean
5/12/2005	10,600	7,119	---	7/29/2005	3,800	3,476	5,917
5/12/2005	4,600			7/29/2005	6,500		
5/12/2005	7,400			7/29/2005	1,700		
5/19/2005	700	440	---	8/5/2005	4,400	2,635	5,043
5/19/2005	320			8/5/2005	1,600		
5/19/2005	380			8/5/2005	2,600		
5/26/2005	160	259	---	8/12/2005	5,000	5,593	4,352
5/26/2005	180			8/12/2005	5,000		
5/26/2005	600			8/12/2005	7,000		
6/2/2005	580	551	---	8/19/2005	3,400	2,592	3,349
6/2/2005	600			8/19/2005	1,600		
6/2/2005	480			8/19/2005	3,200		
6/9/2005	5,800	3,845	1,114	8/26/2005	400	1,382	2,836
6/9/2005	1,400			8/26/2005	6,600		
6/9/2005	7,000			8/26/2005	1,000		
6/14/2005	3,800	4,599	1,021	9/2/2005	400	1,243	2,309
6/14/2005	4,000			9/2/2005	1,600		
6/14/2005	6,400			9/2/2005	3,000		
6/24/2005	4,200	3,127	1,511	9/9/2005	14,500	6,270	2,746
6/24/2005	2,800			9/9/2005	8,500		
6/24/2005	2,600			9/9/2005	2,000		
6/30/2005	4,600	5,858	2,820	9/16/2005	13,000	9,306	3,040
6/30/2005	4,600			9/16/2005	15,500		
6/30/2005	9,500			9/16/2005	4,000		
7/8/2005	10,000	11,686	5,195	9/26/2005	2,000	1,207	2,610
7/8/2005	8,400			9/26/2005	400		
7/8/2005	19,000			9/26/2005	2,200		
7/15/2005	6,500	9,597	6,238	9/30/2005	1,000	1,216	2,544
7/15/2005	8,500			9/30/2005	1,800		
7/15/2005	16,000			9/30/2005	1,000		
7/22/2005	3,200	3,175	5,793				
7/22/2005	4,000						
7/22/2005	2,500						

APPENDIX E

MIDDLE ROUGE RIVER
MDEQ 2005 *E. coli* MONITORING DATA

SAMPLING LOCATIONS,
SAMPLING DATES,
E. COLI RESULTS,
DAILY MAXIMUMS, AND
30-DAY ROLLING GEOMETRIC MEANS

Table E-1. Middle Rouge at Old Novi Road/Baseline Road (G03) MDEQ 2005 *E. coli* Monitoring Data (cfu/100 ml).

Middle Rouge at Old Novi Road/Baseline Road (G03)							
Collection Date	Result	Daily Maximum	30-Day Rolling Geomean	Collection Date	Result	Daily Maximum	30-Day Rolling Geomean
5/11/2005	120	73	---	8/3/2005	2,000	1,732	1,742
5/11/2005	80			8/3/2005	500		
5/11/2005	40			8/3/2005	5,200		
5/18/2005	160	172	---	8/10/2005	200	363	1,240
5/18/2005	160			8/10/2005	400		
5/18/2005	200			8/10/2005	600		
5/25/2005	200	169	---	8/17/2005	400	317	682
5/25/2005	40			8/17/2005	400		
5/25/2005	600			8/17/2005	200		
6/1/2005	300	330	---	8/24/2005	400	458	674
6/1/2005	600			8/24/2005	400		
6/1/2005	200			8/24/2005	600		
6/8/2005	3,000	1,754	262	8/31/2005	500	669	572
6/8/2005	1,000			8/31/2005	1,000		
6/8/2005	1,800			8/31/2005	600		
6/15/2005	2,600	1,929	504	9/7/2005	500	271	395
6/15/2005	600			9/7/2005	200		
6/15/2005	4,600			9/7/2005	200		
6/22/2005	1,800	2,052	827	9/14/2005	600	493	420
6/22/2005	2,400			9/14/2005	200		
6/22/2005	2,000			9/14/2005	1,000		
6/29/2005	7,800	7,733	1,777	9/21/2005	40	169	370
6/29/2005	7,800			9/21/2005	600		
6/29/2005	7,600			9/21/2005	200		
7/6/2005	1,400	1,987	2,545	9/28/2005	180	179	307
7/6/2005	2,800			9/28/2005	400		
7/6/2005	2,000			9/28/2005	80		
7/13/2005	6,600	6,311	3,287	10/5/2005	200	173	234
7/13/2005	6,800			10/5/2005	260		
7/13/2005	5,600			10/5/2005	100		
7/20/2005	500	485	2,494	10/12/2005	200	301	239
7/20/2005	440			10/12/2005	340		
7/20/2005	520			10/12/2005	400		
7/27/2005	800	1,521	2,349				
7/27/2005	2,200						
7/27/2005	2,000						

Table E-2. Johnson Creek at Sheldon Road (D03) MDEQ 2005 *E. coli* Monitoring Data (cfu/100 ml).

Johnson Creek at Sheldon Road (D03)							
Collection Date	Result	Daily Maximum	30-Day Rolling Geomean	Collection Date	Result	Daily Maximum	30-Day Rolling Geomean
5/11/2005	100	62	---	8/3/2005		349	1,003
5/11/2005	120			8/3/2005	380		
5/11/2005	20			8/3/2005	320		
5/18/2005	140	183	---	8/10/2005	300	221	679
5/18/2005	220			8/10/2005	180		
5/18/2005	200			8/10/2005	200		
5/25/2005	180	280	---	8/17/2005	1,600	1,235	544
5/25/2005	340			8/17/2005	4,200		
5/25/2005	360			8/17/2005	280		
6/1/2005	60	153	---	8/24/2005	140	262	534
6/1/2005	300			8/24/2005	400		
6/1/2005	200			8/24/2005	320		
6/8/2005	340	396	181	8/31/2005	240	201	346
6/8/2005	480			8/31/2005	120		
6/8/2005	380			8/31/2005	280		
6/15/2005	1,000	1,442	339	9/7/2005	260	155	295
6/15/2005	3,000			9/7/2005	60		
6/15/2005	1,000			9/7/2005	240		
6/22/2005	860	1,119	487	9/14/2005	20	115	259
6/22/2005	2,200			9/14/2005	350		
6/22/2005	740			9/14/2005	220		
6/29/2005	400	832	606	9/21/2005	80	141	168
6/29/2005	1,200			9/21/2005	160		
6/29/2005	1,200			9/21/2005	220		
7/6/2005	1,800	1,361	937	9/28/2005	20	93	136
7/6/2005	1,000			9/28/2005	200		
7/6/2005	1,400			9/28/2005	200		
7/13/2005	5,600	3,491	1,449	10/5/2005	100	113	122
7/13/2005	7,600			10/5/2005	120		
7/13/2005	1,000			10/5/2005	120		
7/20/2005	200	285	1,047	10/12/2005	80	121	116
7/20/2005	320			10/12/2005	140		
7/20/2005	360			10/12/2005	160		
7/27/2005	1,600	1,512	1,112				
7/27/2005	1,800						
7/27/2005	1,200						

Table E-3. Middle Rouge at King's Mill Farm, Park Bridge – Northville Area Drive (G04) MDEQ 2005 *E. coli* Monitoring Data (cfu/100 ml).

Middle Rouge at King's Mill Farm, Park Bridge - Northville Area Drive (G04)							
Collection Date	Result	Daily Maximum	30-Day Rolling Geomean	Collection Date	Result	Daily Maximum	30-Day Rolling Geomean
5/11/2005	80	131	---	8/3/2005	400	952	2,566
5/11/2005	100			8/3/2005	1,200		
5/11/2005	280			8/3/2005	1,800		
5/18/2005	800	477	---	8/10/2005	1,200	1,154	2,279
5/18/2005	400			8/10/2005	800		
5/18/2005	340			8/10/2005	1,600		
5/25/2005	200	150	---	8/17/2005	1,000	737	1,446
5/25/2005	140			8/17/2005	500		
5/25/2005	120			8/17/2005	800		
6/1/2005	200	189	---	8/24/2005	180	301	1,066
6/1/2005	280			8/24/2005	380		
6/1/2005	120			8/24/2005	400		
6/8/2005	280	303	222	8/31/2005	200	660	694
6/8/2005	160			8/31/2005	1,200		
6/8/2005	620			8/31/2005	1,200		
6/15/2005	1,800	1,572	364	9/7/2005	400	458	600
6/15/2005	1,200			9/7/2005	400		
6/15/2005	1,800			9/7/2005	600		
6/22/2005	1,200	2,252	497	9/14/2005	1,000	431	492
6/22/2005	2,800			9/14/2005	400		
6/22/2005	3,400			9/14/2005	200		
6/29/2005	8,000	9,001	1,127	9/21/2005	200	178	370
6/29/2005	8,600			9/21/2005	200		
6/29/2005	10,600			9/21/2005	140		
7/6/2005	1,800	2,086	1,823	9/28/2005	2,000	986	470
7/6/2005	1,800			9/28/2005	400		
7/6/2005	2,800			9/28/2005	1,200		
7/13/2005	6,600	7,176	3,433	10/5/2005	400	1,038	514
7/13/2005	8,000			10/5/2005	3,500		
7/13/2005	7,000			10/5/2005	800		
7/20/2005	1,200	1,382	3,346	10/12/2005	1,200	1,243	628
7/20/2005	1,000			10/12/2005	800		
7/20/2005	2,200			10/12/2005	2,000		
7/27/2005	6,000	5,646	4,021				
7/27/2005	5,000						
7/27/2005	6,000						

Table E-4. Middle Rouge at Gunsolly Drive northeast of Edward Hines and Plymouth Road (G05) MDEQ 2005 *E. coli* Monitoring Data (cfu/100 ml).

Middle Rouge at Gunsolly Drive northeast of Edward Hines and Plymouth Road (G05)							
Collection Date	Result	Daily Maximum	30-Day Rolling Geomean	Collection Date	Result	Daily Maximum	30-Day Rolling Geomean
5/11/2005	20	28	---	8/3/2005	40	77	1,045
5/11/2005				8/3/2005	20		
5/11/2005	40			8/3/2005	560		
5/18/2005	300	416	---	8/10/2005	600	142	504
5/18/2005	400			8/10/2005	60		
5/18/2005	600			8/10/2005	80		
5/25/2005	80	58	---	8/17/2005	2,800	272	251
5/25/2005	40			8/17/2005	120		
5/25/2005	60			8/17/2005	60		
6/1/2005	160	115	---	8/24/2005	120	76	198
6/1/2005	240			8/24/2005	180		
6/1/2005	40			8/24/2005	20		
6/8/2005	1,200	473	145	8/31/2005	480	307	147
6/8/2005	260			8/31/2005	300		
6/8/2005	340			8/31/2005	200		
6/15/2005	720	651	243	9/7/2005	80	104	156
6/15/2005	320			9/7/2005	100		
6/15/2005	1,200			9/7/2005	140		
6/22/2005	7,000	4,832	397	9/14/2005	140	119	151
6/22/2005	6,200			9/14/2005	100		
6/22/2005	2,600			9/14/2005	120		
6/29/2005	9,800	9,712	1,108	9/21/2005	120	99	123
6/29/2005	8,200			9/21/2005	40		
6/29/2005	11,400			9/21/2005	200		
7/6/2005	4,200	5,447	2,395	9/28/2005	340	477	178
7/6/2005	7,400			9/28/2005	1,000		
7/6/2005	5,200			9/28/2005	320		
7/13/2005	9,400	8,868	4,304	10/5/2005	380	317	179
7/13/2005	7,000			10/5/2005	420		
7/13/2005	10,600			10/5/2005	200		
7/20/2005	260	246	3,542	10/12/2005	320	447	240
7/20/2005	220			10/12/2005	1,000		
7/20/2005	260			10/12/2005	280		
7/27/2005	1,600	1,368	2,752				
7/27/2005	1,000						
7/27/2005	1,600						

Table E-5. Middle Rouge at Newburgh Lake inlet (in river near mouth) (D21) MDEQ 2005 *E. coli* Monitoring Data (cfu/100 ml).

Middle Rouge at Newburgh Lake Inlet (in river near mouth) (D21)							
Collection Date	Result	Daily Maximum	30-Day Rolling Geomean	Collection Date	Result	Daily Maximum	30-Day Rolling Geomean
5/11/2005	120	115	---	8/3/2005	160	105	1,480
5/11/2005	80			8/3/2005	120		
5/11/2005	160			8/3/2005	60		
5/18/2005	1,400	1,003	---	8/10/2005	600	337	877
5/18/2005	1,200			8/10/2005	400		
5/18/2005	600			8/10/2005	160		
5/25/2005	4,200	3,280	---	8/17/2005	380	913	671
5/25/2005	2,800			8/17/2005	500		
5/25/2005	3,000			8/17/2005	4,000		
6/1/2005	5,000	3,227	---	8/24/2005	120	201	429
6/1/2005	1,600			8/24/2005	340		
6/1/2005	4,200			8/24/2005	200		
6/8/2005	2,200	1,616	1,146	8/31/2005	60	148	249
6/8/2005	1,600			8/31/2005	340		
6/8/2005	1,200			8/31/2005	160		
6/15/2005	220	495	1,534	9/7/2005	240	425	330
6/15/2005	460			9/7/2005	800		
6/15/2005	1,200			9/7/2005	400		
6/22/2005	11,400	7,567	2,298	9/14/2005	100	253	311
6/22/2005	5,000			9/14/2005	620		
6/22/2005	7,600			9/14/2005	260		
6/29/2005	9,600	9,772	2,859	9/21/2005	180	259	242
6/29/2005	10,800			9/21/2005	240		
6/29/2005	9,000			9/21/2005	400		
7/6/2005	5,400	4,618	3,071	9/28/2005	1,000	1,160	343
7/6/2005	4,800			9/28/2005	2,600		
7/6/2005	3,800			9/28/2005	600		
7/13/2005	7,000	3,462	3,577	10/5/2005	600	465	432
7/13/2005	780			10/5/2005	280		
7/13/2005	7,600			10/5/2005	600		
7/20/2005	2,000	1,887	4,674	10/12/2005	380	421	431
7/20/2005	1,400			10/12/2005	140		
7/20/2005	2,400			10/12/2005	1,400		
7/27/2005	2,200	2,242	3,665				
7/27/2005	3,200						
7/27/2005	1,600						

Table E-6. Middle Rouge at Hines east of Wayne Road (upstream of Nankin Lake) (G13) MDEQ 2005 *E. coli* Monitoring Data (cfu/100 ml).

Middle Rouge at Hines east of Wayne Road (upstream of Nankin Lake) (G13)							
Collection Date	Result	Daily Maximum	30-Day Rolling Geomean	Collection Date	Result	Daily Maximum	30-Day Rolling Geomean
5/11/2005	20	40	---	8/3/2005	260	654	909
5/11/2005	40			8/3/2005	1,580		
5/11/2005	80			8/3/2005	680		
5/18/2005	40	117	---	8/10/2005	80	128	589
5/18/2005	200			8/10/2005	120		
5/18/2005	200			8/10/2005	220		
5/25/2005	100	78	---	8/17/2005	140	300	346
5/25/2005	80			8/17/2005	1,600		
5/25/2005	60			8/17/2005	120		
6/1/2005	300	203	---	8/24/2005	180	173	266
6/1/2005	200			8/24/2005	160		
6/1/2005	140			8/24/2005	180		
6/8/2005	360	429	126	8/31/2005	800	832	325
6/8/2005	220			8/31/2005	400		
6/8/2005	1,000			8/31/2005	1,800		
6/15/2005	600	386	199	9/7/2005	200	216	260
6/15/2005	400			9/7/2005	120		
6/15/2005	240			9/7/2005	420		
6/22/2005	1,200	645	279	9/14/2005	340	306	310
6/22/2005	800			9/14/2005	280		
6/22/2005	280			9/14/2005	300		
6/29/2005	1,800	952	461	9/21/2005	380	483	341
6/29/2005	800			9/21/2005	380		
6/29/2005	600			9/21/2005	780		
7/6/2005	2,200	1,121	648	9/28/2005	140	383	399
7/6/2005	800			9/28/2005	1,000		
7/6/2005	800			9/28/2005	400		
7/13/2005	9,400	4,310	1,028	10/5/2005	180	151	284
7/13/2005	14,200			10/5/2005	160		
7/13/2005	600			10/5/2005	120		
7/20/2005	1,600	645	1,139	10/12/2005	240	166	269
7/20/2005	600			10/12/2005	320		
7/20/2005	280			10/12/2005	60		
7/27/2005	400	304	980				
7/27/2005	320						
7/27/2005	220						

Table E-7. Middle Rouge at Hines/Nankin Lake (opposite canoe livery) (D33) MDEQ 2005 *E. coli* Monitoring Data (cfu/100 ml).

Middle Rouge at Hines/Nankin Lake (opposite canoe livery) (D33)							
Collection Date	Result	Daily Maximum	30-Day Rolling Geomean	Collection Date	Result	Daily Maximum	30-Day Rolling Geomean
6/8/2005	320	271	---	8/17/2005	200	284	537
6/8/2005	240			8/17/2005	140		
6/8/2005	260			8/17/2005	820		
6/15/2005	360	264	---	8/24/2005	440	381	449
6/15/2005	160			8/24/2005	700		
6/15/2005	320			8/24/2005	180		
6/22/2005	1,000	711	---	8/31/2005	200	577	461
6/22/2005	1,800			8/31/2005	600		
6/22/2005	200			8/31/2005	1,600		
6/29/2005	3,800	2,610	---	9/7/2005	780	500	447
6/29/2005	1,800			9/7/2005	400		
6/29/2005	2,600			9/7/2005	400		
7/6/2005	800	2,024	769	9/14/2005	1,000	1,189	518
7/6/2005	1,400			9/14/2005	1,400		
7/6/2005	7,400			9/14/2005	1,200		
7/13/2005	1,000	928	984	9/21/2005	380	426	561
7/13/2005	800			9/21/2005	600		
7/13/2005	1,000			9/21/2005	340		
7/20/2005	800	928	1,265	9/28/2005	280	285	530
7/20/2005	1,000			9/28/2005	180		
7/20/2005	1,000			9/28/2005	460		
7/27/2005	800	504	1,181	10/5/2005	160	264	453
7/27/2005	400			10/5/2005	360		
7/27/2005	400			10/5/2005	320		
8/3/2005	2,140	585	875	10/12/2005	600	1,081	529
8/3/2005	360			10/12/2005	620		
8/3/2005	260			10/12/2005	3,400		
8/10/2005	520	572	680				
8/10/2005	600						
8/10/2005	600						

Table E-8. Tonquish Creek at Joy Road, west of Lilley Road (D62) MDEQ 2005 *E. coli* Monitoring Data (cfu/100 ml).

Tonquish Creek at Joy Road, west of Lilley Road (D62)							
Collection Date	Result	Daily Maximum	30-Day Rolling Geomean	Collection Date	Result	Daily Maximum	30-Day Rolling Geomean
5/11/2005	20	193	---	8/3/2005	1,400	3,540	4,010
5/11/2005	1,000			8/3/2005	6,600		
5/11/2005	360			8/3/2005	4,800		
5/18/2005	2,600	2,060	---	8/10/2005	2,000	2,154	3,305
5/18/2005	1,400			8/10/2005	2,000		
5/18/2005	2,400			8/10/2005	2,500		
5/25/2005	1,000	1,243	---	8/17/2005	1,700	3,624	3,166
5/25/2005	800			8/17/2005	2,500		
5/25/2005	2,400			8/17/2005	11,200		
6/1/2005	3,400	2,529	---	8/24/2005	8,000	3,826	3,398
6/1/2005	3,400			8/24/2005	3,500		
6/1/2005	1,400			8/24/2005	2,000		
6/8/2005	2,000	2,125	1,216	8/31/2005	500	1,145	2,610
6/8/2005	3,000			8/31/2005	1,000		
6/8/2005	1,600			8/31/2005	3,000		
6/15/2005	2,200	1,917	1,924	9/7/2005	15,000	7,677	3,047
6/15/2005	800			9/7/2005	5,200		
6/15/2005	4,000			9/7/2005	5,800		
6/22/2005	21,200	18,259	2,977	9/14/2005	1,800	2,160	3,048
6/22/2005	19,400			9/14/2005	2,800		
6/22/2005	14,800			9/14/2005	2,000		
6/29/2005	9,500	11,686	4,660	9/21/2005	2,000	1,129	2,414
6/29/2005	10,500			9/21/2005	1,200		
6/29/2005	16,000			9/21/2005	600		
7/6/2005	4,600	5,661	5,475	9/28/2005	2,000	2,194	2,160
7/6/2005	6,800			9/28/2005	2,200		
7/6/2005	5,800			9/28/2005	2,400		
7/13/2005	5,500	4,494	6,360	10/5/2005	200	916	2,066
7/13/2005	5,500			10/5/2005	1,600		
7/13/2005	3,000			10/5/2005	2,400		
7/20/2005	3,600	2,689	6,805	10/12/2005	3,800	4,313	1,841
7/20/2005	1,800			10/12/2005	4,800		
7/20/2005	3,000			10/12/2005	4,400		
7/27/2005	3,400	4,282	5,092				
7/27/2005	4,200						
7/27/2005	5,500						

Table E-9. Tonquish Creek at Wayne Road (G84) MDEQ 2005 *E. coli* Monitoring Data (cfu/100 ml).

Tonquish Creek at Wayne Road (G84)							
Collection Date	Result	Daily Maximum	30-Day Rolling Geomean	Collection Date	Result	Daily Maximum	30-Day Rolling Geomean
5/11/2005	60	58	---	8/3/2005	600	934	2,945
5/11/2005	40			8/3/2005	400		
5/11/2005	80			8/3/2005	3,400		
5/18/2005	2,000	1,639	---	8/10/2005	1,000	843	2,029
5/18/2005	1,000			8/10/2005	1,000		
5/18/2005	2,200			8/10/2005	600		
5/25/2005	1,120	846	---	8/17/2005	2,000	2,289	1,339
5/25/2005	540			8/17/2005	3,000		
5/25/2005	1,000			8/17/2005	2,000		
6/1/2005	320	249	---	8/24/2005	2,000	1,687	1,515
6/1/2005	120			8/24/2005	800		
6/1/2005	400			8/24/2005	3,000		
6/8/2005	1,000	1,129	468	8/31/2005	1,200	1,616	1,375
6/8/2005	1,200			8/31/2005	2,200		
6/8/2005	1,200			8/31/2005	1,600		
6/15/2005	2,000	2,363	983	9/7/2005	600	416	1,170
6/15/2005	3,000			9/7/2005	200		
6/15/2005	2,200			9/7/2005	600		
6/22/2005	18,400	8,916	1,380	9/14/2005	1,200	1,200	1,255
6/22/2005	1,800			9/14/2005	1,200		
6/22/2005	21,400			9/14/2005	1,200		
6/29/2005	4,500	11,233	2,315	9/21/2005	1,600	1,008	1,065
6/29/2005	35,000			9/21/2005	800		
6/29/2005	9,000			9/21/2005	800		
7/6/2005	8,000	5,429	4,289	9/28/2005	1,500	1,174	991
7/6/2005	5,000			9/28/2005	1,800		
7/6/2005	4,000			9/28/2005	600		
7/13/2005	4,000	18,327	7,489	10/5/2005	600	896	881
7/13/2005	57,000			10/5/2005	1,000		
7/13/2005	27,000			10/5/2005	1,200		
7/20/2005	500	909	6,185	10/12/2005	400	1,018	1,053
7/20/2005	1,000			10/12/2005	1,200		
7/20/2005	1,500			10/12/2005	2,200		
7/27/2005	2,000	2,621	4,842				
7/27/2005	2,000						
7/27/2005	4,500						

Table E-10. Middle Rouge at Inkster Road (US2) MDEQ 2005 *E. coli* Monitoring Data (cfu/100 ml).

Middle Rouge at Inkster Road (US2)							
Collection Date	Result	Daily Maximum	30-Day Rolling Geomean	Collection Date	Result	Daily Maximum	30-Day Rolling Geomean
5/11/2005	100	219	---	8/3/2005	400	1,610	3,142
5/11/2005				8/3/2005	600		
5/11/2005	480			8/3/2005	17,400		
5/18/2005	800	560	---	8/10/2005	3,800	4,623	3,236
5/18/2005	1,100			8/10/2005	5,000		
5/18/2005	200			8/10/2005	5,200		
5/25/2005	600	1,293	---	8/17/2005	1,800	3,742	3,047
5/25/2005	3,000			8/17/2005	5,200		
5/25/2005	1,200			8/17/2005	5,600		
6/1/2005	1,000	317	---	8/24/2005	280	304	2,104
6/1/2005	400			8/24/2005	360		
6/1/2005	80			8/24/2005	280		
6/8/2005	1,060	840	566	8/31/2005	4,000	3,915	2,015
6/8/2005	1,000			8/31/2005	5,000		
6/8/2005	560			8/31/2005	3,000		
6/15/2005	4,400	3,255	912	9/7/2005	400	363	1,496
6/15/2005	2,800			9/7/2005	600		
6/15/2005	2,800			9/7/2005	200		
6/22/2005	12,600	5,922	1,461	9/14/2005	2,500	1,063	1,115
6/22/2005	20,600			9/14/2005	600		
6/22/2005	800			9/14/2005	800		
6/29/2005	6,600	5,540	1,954	9/21/2005	2,500	843	828
6/29/2005	18,400			9/21/2005	400		
6/29/2005	1,400			9/21/2005	600		
7/6/2005	3,000	4,026	3,248	9/28/2005	1,000	543	929
7/6/2005	6,400			9/28/2005	200		
7/6/2005	3,400			9/28/2005	800		
7/13/2005	4,500	4,953	4,631	10/5/2005	2,000	783	673
7/13/2005	3,000			10/5/2005	400		
7/13/2005	9,000			10/5/2005	600		
7/20/2005		1,549	4,271	10/12/2005	800	1,793	927
7/20/2005	800			10/12/2005	6,000		
7/20/2005	3,000			10/12/2005	1,200		
7/27/2005	1,500	4,859	4,094				
7/27/2005	8,500						
7/27/2005	9,000						

Table E-11. Middle Rouge at Hines/Ford Road (D06) MDEQ 2005 *E. coli* Monitoring Data (cfu/100 ml).

Middle Rouge at Hines/Ford Road (D06)							
Collection Date	Result	Daily Maximum	30-Day Rolling Geomean	Collection Date	Result	Daily Maximum	30-Day Rolling Geomean
5/11/2005	1,720	1,125	---	8/3/2005	1,000	2,095	2,290
5/11/2005	440			8/3/2005	1,000		
5/11/2005	1,880			8/3/2005	9,200		
5/18/2005	1,200	952	---	8/10/2005	7,000	3,552	2,323
5/18/2005	600			8/10/2005	1,600		
5/18/2005	1,200			8/10/2005	4,000		
5/25/2005	680	573	---	8/17/2005	6,500	2,962	2,737
5/25/2005	600			8/17/2005	2,000		
5/25/2005	460			8/17/2005	2,000		
6/1/2005	600	546	---	8/24/2005	600	965	2,718
6/1/2005	340			8/24/2005	1,500		
6/1/2005	800			8/24/2005	1,000		
6/8/2005	1,200	1,598	883	8/31/2005	3,000	2,795	2,264
6/8/2005	1,000			8/31/2005	2,800		
6/8/2005	3,400			8/31/2005	2,600		
6/15/2005	2,200	2,265	1,015	9/7/2005	400	832	1,882
6/15/2005	2,400			9/7/2005	1,800		
6/15/2005	2,200			9/7/2005	800		
6/22/2005	11,800	11,108	1,659	9/14/2005	1,800	896	1,429
6/22/2005	8,800			9/14/2005	400		
6/22/2005	13,200			9/14/2005	1,000		
6/29/2005	23,000	21,059	3,412	9/21/2005	1,600	832	1,109
6/29/2005	18,800			9/21/2005	600		
6/29/2005	21,600			9/21/2005	600		
7/6/2005		3,420	5,169	9/28/2005	600	577	1,000
7/6/2005	5,000			9/28/2005	400		
7/6/2005	3,200			9/28/2005	800		
7/13/2005		1,104	5,247	10/5/2005	500	493	707
7/13/2005	1,600			10/5/2005	200		
7/13/2005	600			10/5/2005	1,200		
7/20/2005	1,000	1,000	4,345	10/12/2005	2,200	1,741	819
7/20/2005	1,000			10/12/2005	2,000		
7/20/2005	1,000			10/12/2005	1,200		
7/27/2005	12,500	6,962	3,901				
7/27/2005	3,000						
7/27/2005	9,000						

APPENDIX F

LOWER ROUGE RIVER
MDEQ 2005 *E. COLI* MONITORING DATA

SAMPLING LOCATIONS,
SAMPLING DATES,
E. COLI RESULTS,
DAILY MAXIMUMS, AND
30-DAY ROLLING GEOMETRIC MEANS

Table F-1. Lower Rouge at Denton Road (G200) MDEQ 2005 *E. coli* Monitoring Data (cfu/100 ml).

Lower Rouge at Denton Road (G200)							
Collection Date	Result	Daily Maximum	30-Day Rolling Geomean	Collection Date	Result	Daily Maximum	30-Day Rolling Geomean
5/13/2005	120	219	---	8/4/2005	3,400	2,287	1,105
5/13/2005	200			8/4/2005	4,400		
5/13/2005	440			8/4/2005	800		
5/20/2005	40	140	---	8/11/2005	800	504	870
5/20/2005	340			8/11/2005	400		
5/20/2005	200			8/11/2005	400		
5/27/2005	1,200	1,918	---	8/18/2005	200	200	711
5/27/2005	4,200			8/18/2005	200		
5/27/2005	1,400			8/18/2005	200		
6/3/2005	520	641	---	8/25/2005	40	25	343
6/3/2005	940			8/25/2005	20		
6/3/2005	540			8/25/2005	20		
6/10/2005	60	263	397	9/1/2005	60	29	176
6/10/2005	3,800			9/1/2005	20		
6/10/2005	80			9/1/2005	20		
6/17/2005	1,800	1,135	552	9/8/2005	220	231	111
6/17/2005	1,400			9/8/2005	140		
6/17/2005	580			9/8/2005	400		
6/23/2005	80	234	612	9/15/2005	200	157	88
6/23/2005	1,000			9/15/2005	160		
6/23/2005	160			9/15/2005	120		
6/30/2005	11,400	2,220	630	9/22/2005	3,500	5,082	168
6/30/2005	600			9/22/2005	2,500		
6/30/2005	1,600			9/22/2005	15,000		
7/7/2005	1,600	1,664	763	9/29/2005	400	431	296
7/7/2005	3,600			9/29/2005	1,000		
7/7/2005	800			9/29/2005	200		
7/14/2005	400	550	884	10/6/2005	600	62	345
7/14/2005	800			10/6/2005	20		
7/14/2005	520			10/6/2005	20		
7/21/2005	1,400	968	856	10/13/2005	2,000	986	462
7/21/2005	1,200			10/13/2005	1,200		
7/21/2005	540			10/13/2005	400		
7/28/2005	680	814	1,099				
7/28/2005	880						
7/28/2005	900						

Table F-2. Lower Rouge at Beck Road (L01) MDEQ 2005 *E. coli* Monitoring Data (cfu/100 ml).

Lower Rouge at Beck Road (L01)							
Collection Date	Result	Daily Maximum	30-Day Rolling Geomean	Collection Date	Result	Daily Maximum	30-Day Rolling Geomean
5/13/2005	240	211	---	8/4/2005	1,000	1,382	907
5/13/2005	280			8/4/2005	600		
5/13/2005	140			8/4/2005	4,400		
5/20/2005	260	252	---	8/11/2005	400	635	818
5/20/2005	180			8/11/2005	800		
5/20/2005	340			8/11/2005	800		
5/27/2005	240	249	---	8/18/2005	200	252	832
5/27/2005	400			8/18/2005	200		
5/27/2005	160			8/18/2005	400		
6/3/2005	420	594	---	8/25/2005	460	604	659
6/3/2005	500			8/25/2005	600		
6/3/2005	1,000			8/25/2005	800		
6/10/2005	12,800	12,789	631	9/1/2005	1,400	1,003	669
6/10/2005	19,000			9/1/2005	600		
6/10/2005	8,600			9/1/2005	1,200		
6/17/2005	600	783	821	9/8/2005	780	595	565
6/17/2005	800			9/8/2005	500		
6/17/2005	1,000			9/8/2005	540		
6/23/2005	11,600	4,058	1,431	9/15/2005	800	783	589
6/23/2005	1,800			9/15/2005	1,000		
6/23/2005	3,200			9/15/2005	600		
6/30/2005	2,800	2,077	2,188	9/22/2005	400	660	715
6/30/2005	1,600			9/22/2005	600		
6/30/2005	2,000			9/22/2005	1,200		
7/7/2005	1,000	1,063	2,458	9/29/2005	800	727	742
7/7/2005	1,200			9/29/2005	800		
7/7/2005	1,000			9/29/2005	600		
7/14/2005	400	231	1,101	10/6/2005	20	93	461
7/14/2005	220			10/6/2005	200		
7/14/2005	140			10/6/2005	200		
7/21/2005	1,800	1,939	1,320	10/13/2005	2,400	2,713	624
7/21/2005	3,000			10/13/2005	2,600		
7/21/2005	1,350			10/13/2005	3,200		
7/28/2005	480	931	983				
7/28/2005	1,200						
7/28/2005	1,400						

Table F-3. Fowler Creek at Beck Road (G93) MDEQ 2005 *E. coli* Monitoring Data (cfu/100 ml).

Fowler Creek at Beck Road (G93)							
Collection Date	Result	Daily Maximum	30-Day Rolling Geomean	Collection Date	Result	Daily Maximum	30-Day Rolling Geomean
5/13/2005	120	190	---	8/4/2005	2,000	1,170	1,105
5/13/2005	240			8/4/2005	1,000		
5/13/2005	240			8/4/2005	800		
5/20/2005	1,320	1,280	---	8/11/2005	800	727	1,097
5/20/2005	1,020			8/11/2005	1,200		
5/20/2005	1,556			8/11/2005	400		
5/27/2005	200	211	---	8/18/2005	400	621	1,305
5/27/2005	260			8/18/2005	600		
5/27/2005	180			8/18/2005	1,000		
6/3/2005	480	461	---	8/25/2005	400	458	913
6/3/2005	600			8/25/2005	400		
6/3/2005	340			8/25/2005	600		
6/10/2005	3,200	1,973	542	9/1/2005	1,000	621	685
6/10/2005	1,200			9/1/2005	200		
6/10/2005	2,000			9/1/2005	1,200		
6/17/2005	520	584	678	9/8/2005	400	679	614
6/17/2005	480			9/8/2005	1,400		
6/17/2005	800			9/8/2005	560		
6/23/2005	1,800	2,904	799	9/15/2005	7,000	8,759	1,010
6/23/2005	4,000			9/15/2005	8,000		
6/23/2005	3,400			9/15/2005	12,000		
6/30/2005	3,400	3,047	1,363	9/22/2005	1,200	695	1,033
6/30/2005	3,200			9/22/2005	1,400		
6/30/2005	2,600			9/22/2005	200		
7/7/2005	540	756	1,505	9/29/2005	1,000	794	1,153
7/7/2005	800			9/29/2005	1,000		
7/7/2005	1,000			9/29/2005	500		
7/14/2005	200	260	1,003	10/6/2005	400	252	963
7/14/2005	220			10/6/2005	200		
7/14/2005	400			10/6/2005	200		
7/21/2005	3,800	2,738	1,366	10/13/2005	800	363	850
7/21/2005	3,000			10/13/2005	200		
7/21/2005	1,800			10/13/2005	300		
7/28/2005	1,000	2,621	1,339				
7/28/2005	4,500						
7/28/2005	4,000						

Table F-4. Lower Rouge at Canton Center Road (G65) MDEQ 2005 *E. coli* Monitoring Data (cfu/100 ml).

Lower Rouge at Canton Center Road (G65)							
Collection Date	Result	Daily Maximum	30-Day Rolling Geomean	Collection Date	Result	Daily Maximum	30-Day Rolling Geomean
5/13/2005	140	88	---	8/4/2005	100	112	441
5/13/2005	80			8/4/2005	100		
5/13/2005	60			8/4/2005	140		
5/20/2005	40	73	---	8/11/2005	400	252	445
5/20/2005	120			8/11/2005	200		
5/20/2005	80			8/11/2005	200		
5/27/2005	60	52	---	8/18/2005	200	200	449
5/27/2005	60			8/18/2005	200		
5/27/2005	40			8/18/2005	200		
6/3/2005	120	105	---	8/25/2005	100	158	234
6/3/2005	120			8/25/2005	180		
6/3/2005	80			8/25/2005	220		
6/10/2005	380	400	107	9/1/2005	200	342	198
6/10/2005	400			9/1/2005	1,000		
6/10/2005	420			9/1/2005	200		
6/17/2005	180	282	135	9/8/2005	200	129	204
6/17/2005	520			9/8/2005	180		
6/17/2005	240			9/8/2005	60		
6/23/2005	380	1,031	230	9/15/2005	800	504	234
6/23/2005	1,600			9/15/2005	400		
6/23/2005	1,800			9/15/2005	400		
6/30/2005	660	903	406	9/22/2005	860	396	268
6/30/2005	620			9/22/2005	300		
6/30/2005	1,800			9/22/2005	240		
7/7/2005	240	240	479	9/29/2005	100	138	261
7/7/2005	160			9/29/2005	120		
7/7/2005	360			9/29/2005	220		
7/14/2005	180	192	413	10/6/2005	240	290	253
7/14/2005	280			10/6/2005	300		
7/14/2005	140			10/6/2005	340		
7/21/2005	2,800	4,132	707	10/13/2005	240	343	307
7/21/2005	6,000			10/13/2005	600		
7/21/2005	4,200			10/13/2005	280		
7/28/2005	400	783	669				
7/28/2005	1,200						
7/28/2005	1,000						

Table F-5. Sines Drain at Sheldon Road (G94) MDEQ 2005 *E. coli* Monitoring Data (cfu/100 ml).

Sines Drain at Sheldon Road (G94)							
Collection Date	Result	Daily Maximum	30-Day Rolling Geomean	Collection Date	Result	Daily Maximum	30-Day Rolling Geomean
5/13/2005	500	288	---	8/4/2005	1,200	1,687	2,464
5/13/2005	400			8/4/2005	1,600		
5/13/2005	120			8/4/2005	2,500		
5/20/2005	940	628	---	8/11/2005	400	543	2,132
5/20/2005	1,200			8/11/2005	400		
5/20/2005	220			8/11/2005	1,000		
5/27/2005	2,400	584	---	8/18/2005	400	317	1,424
5/27/2005	180			8/18/2005	200		
5/27/2005	460			8/18/2005	400		
6/3/2005	600	611	---	8/25/2005	1,200	1,613	987
6/3/2005	380			8/25/2005	3,500		
6/3/2005	1,000			8/25/2005	1,000		
6/10/2005	4,600	5,615	816	9/1/2005	200	458	735
6/10/2005	5,200			9/1/2005	400		
6/10/2005	7,400			9/1/2005	1,200		
6/17/2005	800	1,038	1,055	9/8/2005	2,500	2,488	795
6/17/2005	1,000			9/8/2005	2,800		
6/17/2005	1,400			9/8/2005	2,200		
6/23/2005	1,800	1,446	1,246	9/15/2005	2,000	862	872
6/23/2005	1,400			9/15/2005	400		
6/23/2005	1,200			9/15/2005	800		
6/30/2005	5,400	5,263	1,935	9/22/2005	600	756	1,037
6/30/2005	5,000			9/22/2005	600		
6/30/2005	5,400			9/22/2005	1,200		
7/7/2005	1,000	1,119	2,184	9/29/2005	3,000	1,533	1,026
7/7/2005	1,000			9/29/2005	1,200		
7/7/2005	1,400			9/29/2005	1,000		
7/14/2005	2,200	2,394	1,841	10/6/2005	800	986	1,196
7/14/2005	2,400			10/6/2005	1,200		
7/14/2005	2,600			10/6/2005	1,000		
7/21/2005	9,000	10,086	2,901	10/13/2005	260	592	898
7/21/2005	9,500			10/13/2005	800		
7/21/2005	12,000			10/13/2005	1,000		
7/28/2005	2,200	1,993	3,094				
7/28/2005	2,000						
7/28/2005	1,800						

Table F-6. McKinstry Drain at Michigan Avenue, east of Morton Taylor Road (L51) MDEQ 2005 *E. coli* Monitoring Data (cfu/100ml).

McKinstry Drain at Michigan Avenue, east of Morton Taylor Road (L51)							
Collection Date	Result	Daily Maximum	30-Day Rolling Geomean	Collection Date	Result	Daily Maximum	30-Day Rolling Geomean
5/13/2005	100	78	---	8/4/2005	1,600	3,443	1,017
5/13/2005	60			8/4/2005	8,500		
5/13/2005	80			8/4/2005	3,000		
5/20/2005	220	284	---	8/11/2005	400	342	1,448
5/20/2005	260			8/11/2005	200		
5/20/2005	400			8/11/2005	500		
5/27/2005	160	99	---	8/18/2005	400	317	1,151
5/27/2005	60			8/18/2005	400		
5/27/2005	100			8/18/2005	200		
6/3/2005	180	148	---	8/25/2005	20	101	548
6/3/2005	100			8/25/2005	200		
6/3/2005	180			8/25/2005	260		
6/10/2005	8,800	7,356	299	9/1/2005	40	63	299
6/10/2005	7,800			9/1/2005	80		
6/10/2005	5,800			9/1/2005	80		
6/17/2005	400	431	420	9/8/2005	4,200	2,603	283
6/17/2005	1,000			9/8/2005	2,800		
6/17/2005	200			9/8/2005	1,500		
6/23/2005	3,400	3,394	691	9/15/2005	200	165	245
6/23/2005	11,500			9/15/2005	140		
6/23/2005	1,000			9/15/2005	160		
6/30/2005	5,000	5,161	1,524	9/22/2005	260	238	231
6/30/2005	5,000			9/22/2005	200		
6/30/2005	5,500			9/22/2005	260		
7/7/2005	20	58	1,266	9/29/2005	2,600	1,428	392
7/7/2005	20			9/29/2005	1,400		
7/7/2005	500			9/29/2005	800		
7/14/2005	2,000	1,000	849	10/6/2005	1,000	493	591
7/14/2005	500			10/6/2005	600		
7/14/2005	1,000			10/6/2005	200		
7/21/2005	5,000	4,121	1,334	10/13/2005	800	862	474
7/21/2005	3,500			10/13/2005	400		
7/21/2005	4,000			10/13/2005	2,000		
7/28/2005	600	1,310	1,103				
7/28/2005	1,500						
7/28/2005	2,500						

Table F-7. Lower Rouge at Haggerty Road (G92) MDEQ 2005 *E. coli* Monitoring Data (cfu/100 ml).

Lower Rouge at Haggerty Road (G92)							
Collection Date	Result	Daily Maximum	30-Day Rolling Geomean	Collection Date	Result	Daily Maximum	30-Day Rolling Geomean
5/13/2005	120	185	---	8/4/2005	820	839	1,132
5/13/2005	240			8/4/2005	1,000		
5/13/2005	220			8/4/2005	720		
5/20/2005	460	398	---	8/11/2005	340	325	996
5/20/2005	360			8/11/2005	280		
5/20/2005	380			8/11/2005	360		
5/27/2005	400	504	---	8/18/2005	800	458	972
5/27/2005	320			8/18/2005	400		
5/27/2005	1,000			8/18/2005	300		
6/3/2005	340	387	---	8/25/2005	600	577	595
6/3/2005	340			8/25/2005	1,000		
6/3/2005	500			8/25/2005	320		
6/10/2005	2,200	1,692	475	9/1/2005	800	800	565
6/10/2005	1,000			9/1/2005	1,600		
6/10/2005	2,200			9/1/2005	400		
6/17/2005	260	511	582	9/8/2005	260	630	534
6/17/2005	640			9/8/2005	800		
6/17/2005	800			9/8/2005	1,200		
6/23/2005	1,200	702	652	9/15/2005	1,200	832	644
6/23/2005	600			9/15/2005	600		
6/23/2005	480			9/15/2005	800		
6/30/2005	3,000	1,829	844	9/22/2005	800	884	734
6/30/2005	3,400			9/22/2005	480		
6/30/2005	600			9/22/2005	1,800		
7/7/2005	540	616	926	9/29/2005	1,000	1,026	824
7/7/2005	800			9/29/2005	600		
7/7/2005	540			9/29/2005	1,800		
7/14/2005	580	518	731	10/6/2005	400	577	772
7/14/2005	460			10/6/2005	600		
7/14/2005	520			10/6/2005	800		
7/21/2005	5,800	6,689	1,223	10/13/2005	600	876	825
7/21/2005	8,600			10/13/2005	800		
7/21/2005	6,000			10/13/2005	1,400		
7/28/2005	800	1,038	1,323				
7/28/2005	1,000						
7/28/2005	1,400						

Table F-8. Fellows Creek at Ford Road, between Canton Center and Sheldon Road (G211) MDEQ 2005 *E. coli* Monitoring Data (cfu/100 ml).

Fellows Creek at Ford Road, between Canton Center and Sheldon Road (G211)							
Collection Date	Result	Daily Maximum	30-Day Rolling Geomean	Collection Date	Result	Daily Maximum	30-Day Rolling Geomean
5/13/2005	240	429	---	8/4/2005	2,200	2,363	1,947
5/13/2005	1,100			8/4/2005	3,000		
5/13/2005	300			8/4/2005	2,000		
5/20/2005	400	276	---	8/11/2005	800	986	1,866
5/20/2005	220			8/11/2005	1,000		
5/20/2005	240			8/11/2005	1,200		
5/27/2005	600	762	---	8/18/2005	400	928	1,739
5/27/2005	900			8/18/2005	2,000		
5/27/2005	820			8/18/2005	1,000		
6/3/2005	1,600	2,374	---	8/25/2005	600	416	1,245
6/3/2005	3,800			8/25/2005	600		
6/3/2005	2,200			8/25/2005	200		
6/10/2005	6,200	4,406	989	9/1/2005	800	660	901
6/10/2005	4,600			9/1/2005	600		
6/10/2005	3,000			9/1/2005	600		
6/17/2005	1,540	1,405	1,254	9/8/2005	1,000	843	733
6/17/2005	1,800			9/8/2005	600		
6/17/2005	1,000			9/8/2005	1,000		
6/23/2005	2,400	2,417	1,934	9/15/2005	400	635	672
6/23/2005	4,200			9/15/2005	800		
6/23/2005	1,400			9/15/2005	800		
6/30/2005	4,200	3,813	2,669	9/22/2005	800	1,200	707
6/30/2005	3,000			9/22/2005	1,200		
6/30/2005	4,400			9/22/2005	1,800		
7/7/2005	1,400	1,220	2,336	9/29/2005	800	1,018	846
7/7/2005	720			9/29/2005	2,200		
7/7/2005	1,800			9/29/2005	600		
7/14/2005	2,400	1,320	1,836	10/6/2005	320	382	758
7/14/2005	1,020			10/6/2005	620		
7/14/2005	940			10/6/2005	280		
7/21/2005	1,600	2,207	2,009	10/13/2005	480	546	695
7/21/2005	2,800			10/13/2005	500		
7/21/2005	2,400			10/13/2005	680		
7/28/2005	7,200	3,328	2,142				
7/28/2005	6,400						
7/28/2005	800						

Table F-9. Fellows Creek at Palmer Road (L02) MDEQ 2005 *E. coli* Monitoring Data (cfu/100 ml).

Fellows Creek at Palmer Road (L02)							
Collection Date	Result	Daily Maximum	30-Day Rolling Geomean	Collection Date	Result	Daily Maximum	30-Day Rolling Geomean
5/13/2005	460	268	---	8/4/2005	640	1,587	1,389
5/13/2005	300			8/4/2005	2,400		
5/13/2005	140			8/4/2005	2,600		
5/20/2005	2,600	2,521	---	8/11/2005	1,400	964	1,415
5/20/2005	2,200			8/11/2005	1,600		
5/20/2005	2,800			8/11/2005	400		
5/27/2005	380	634	---	8/18/2005	6,800	4,906	2,049
5/27/2005	1,400			8/18/2005	2,800		
5/27/2005	480			8/18/2005	6,200		
6/3/2005	2,400	1,457	---	8/25/2005	1,400	1,455	1,774
6/3/2005	920			8/25/2005	2,200		
6/3/2005	1,400			8/25/2005	1,000		
6/10/2005	5,000	5,148	1,263	9/1/2005	800	727	1,513
6/10/2005	4,400			9/1/2005	1,200		
6/10/2005	6,200			9/1/2005	400		
6/17/2005	4,400	2,712	2,006	9/8/2005	600	660	1,270
6/17/2005	2,060			9/8/2005	600		
6/17/2005	2,200			9/8/2005	800		
6/23/2005	5,800	4,963	2,298	9/15/2005	200	458	1,094
6/23/2005	6,200			9/15/2005	600		
6/23/2005	3,400			9/15/2005	800		
6/30/2005	3,200	3,641	3,259	9/22/2005	800	1,200	826
6/30/2005	5,800			9/22/2005	1,200		
6/30/2005	2,600			9/22/2005	1,800		
7/7/2005	800	879	2,945	9/29/2005	4,200	2,005	880
7/7/2005	800			9/29/2005	1,200		
7/7/2005	1,060			9/29/2005	1,600		
7/14/2005	880	770	2,014	10/6/2005	800	596	846
7/14/2005	740			10/6/2005	440		
7/14/2005	700			10/6/2005	600		
7/21/2005	2,800	2,996	2,054	10/13/2005	800	452	784
7/21/2005	2,400			10/13/2005	340		
7/21/2005	4,000			10/13/2005	340		
7/28/2005	1,600	1,608	1,640				
7/28/2005	2,600						
7/28/2005	1,000						

Table F-10. Lower Rouge at Hannan Road (L07) MDEQ 2005 *E. coli* Monitoring Data (cfu/100 ml).

Lower Rouge at Hannan Road (L07)							
Collection Date	Result	Daily Maximum	30-Day Rolling Geomean	Collection Date	Result	Daily Maximum	30-Day Rolling Geomean
5/13/2005	240	226	---	8/4/2005	1,400	1,104	1,448
5/13/2005	160			8/4/2005	1,200		
5/13/2005	300			8/4/2005	800		
5/20/2005	240	375	---	8/11/2005	740	702	1,429
5/20/2005	580			8/11/2005	600		
5/20/2005	380			8/11/2005	780		
5/27/2005	800	458	---	8/18/2005	820	809	1,434
5/27/2005	500			8/18/2005	1,040		
5/27/2005	240			8/18/2005	620		
6/3/2005	1,000	1,368	---	8/25/2005	1,600	1,832	1,093
6/3/2005	1,600			8/25/2005	1,600		
6/3/2005	1,600			8/25/2005	2,400		
6/10/2005	2,800	2,274	655	9/1/2005	400	395	853
6/10/2005	3,000			9/1/2005	320		
6/10/2005	1,400			9/1/2005	480		
6/17/2005	800	838	852	9/8/2005	1,200	904	820
6/17/2005	800			9/8/2005	1,400		
6/17/2005	920			9/8/2005	440		
6/23/2005	1,200	1,841	1,171	9/15/2005	800	607	797
6/23/2005	2,600			9/15/2005	400		
6/23/2005	2,000			9/15/2005	700		
6/30/2005	2,600	4,094	1,814	9/22/2005	600	832	801
6/30/2005	6,000			9/22/2005	1,600		
6/30/2005	4,400			9/22/2005	600		
7/7/2005	1,600	750	1,609	9/29/2005	1,200	1,616	781
7/7/2005	220			9/29/2005	2,200		
7/7/2005	1,200			9/29/2005	1,600		
7/14/2005	840	795	1,304	10/6/2005	1,200	1,342	998
7/14/2005	880			10/6/2005	840		
7/14/2005	680			10/6/2005	2,400		
7/21/2005	9,800	7,128	2,001	10/13/2005	800	793	972
7/21/2005	6,600			10/13/2005	1,200		
7/21/2005	5,600			10/13/2005	520		
7/28/2005	1,600	1,356	1,882				
7/28/2005	2,600						
7/28/2005	600						

Table F-11. McClaughrey Drain at Annapolis and Treadwell (G64) MDEQ 2005 *E. coli* Monitoring Data (cfu/100 ml).

McClaughrey Drain at Annapolis and Treadwell (G64)							
Collection Date	Result	Daily Maximum	30-Day Rolling Geomean	Collection Date	Result	Daily Maximum	30-Day Rolling Geomean
5/13/2005	420	264	---	8/4/2005	2,000	1,082	1,119
5/13/2005	220			8/4/2005	880		
5/13/2005	200			8/4/2005	720		
5/20/2005	1,640	1,795	---	8/11/2005	360	465	895
5/20/2005	2,800			8/11/2005	1,000		
5/20/2005	1,260			8/11/2005	280		
5/27/2005	200	337	---	8/18/2005	540	756	961
5/27/2005	600			8/18/2005	1,000		
5/27/2005	320			8/18/2005	800		
6/3/2005	180	442	---	8/25/2005	360	366	672
6/3/2005	1,200			8/25/2005	400		
6/3/2005	400			8/25/2005	340		
6/10/2005	14,200	13,654	993	9/1/2005	120	179	478
6/10/2005	16,600			9/1/2005	120		
6/10/2005	10,800			9/1/2005	400		
6/17/2005	520	397	1,077	9/8/2005	140	150	322
6/17/2005	600			9/8/2005	60		
6/17/2005	200			9/8/2005	400		
6/23/2005	1,000	1,423	1,028	9/15/2005	320	223	278
6/23/2005	1,800			9/15/2005	60		
6/23/2005	1,600			9/15/2005	580		
6/30/2005	4,800	2,846	1,575	9/22/2005	80	99	185
6/30/2005	1,600			9/22/2005	120		
6/30/2005	3,000			9/22/2005	100		
7/7/2005	1,200	1,423	1,990	9/29/2005	600	536	200
7/7/2005	2,400			9/29/2005	800		
7/7/2005	1,000			9/29/2005	320		
7/14/2005	280	529	1,039	10/6/2005	60	76	168
7/14/2005	220			10/6/2005	120		
7/14/2005	2,400			10/6/2005	60		
7/21/2005	2,400	2,181	1,460	10/13/2005	420	281	190
7/21/2005	2,400			10/13/2005	240		
7/21/2005	1,800			10/13/2005	220		
7/28/2005	800	986	1,357				
7/28/2005	1,200						
7/28/2005	1,000						

Table F-12. Lower Rouge at Wayne Road (L06) MDEQ 2005 *E. coli* Monitoring Data (cfu/100 ml).

Lower Rouge at Wayne Road (L06)							
Collection Date	Result	Daily Maximum	30-Day Rolling Geomean	Collection Date	Result	Daily Maximum	30-Day Rolling Geomean
5/13/2005	60	139	---	8/4/2005	1,160	1,722	1,887
5/13/2005	140			8/4/2005	2,000		
5/13/2005	320			8/4/2005	2,200		
5/20/2005	1,400	1,245	---	8/11/2005	6,400	3,935	3,022
5/20/2005	460			8/11/2005	3,400		
5/20/2005	3,000			8/11/2005	2,800		
5/27/2005	400	256	---	8/18/2005	1,160	836	1,919
5/27/2005	60			8/18/2005	840		
5/27/2005	700			8/18/2005	600		
6/3/2005	580	455	---	8/25/2005	800	1,600	1,536
6/3/2005	540			8/25/2005	1,600		
6/3/2005	300			8/25/2005	3,200		
6/10/2005	6,600	5,766	650	9/1/2005	800	1,154	1,599
6/10/2005	4,400			9/1/2005	2,000		
6/10/2005	6,600			9/1/2005	960		
6/17/2005	1,400	1,227	1,005	9/8/2005	2,000	4,469	1,935
6/17/2005	600			9/8/2005	7,200		
6/17/2005	2,200			9/8/2005	6,200		
6/23/2005	400	727	903	9/15/2005	280	267	1,130
6/23/2005	1,200			9/15/2005	340		
6/23/2005	800			9/15/2005	200		
6/30/2005	2,200	2,265	1,396	9/22/2005	600	515	1,026
6/30/2005	2,400			9/22/2005	600		
6/30/2005	2,200			9/22/2005	380		
7/7/2005	360	373	1,341	9/29/2005	2,800	2,996	1,163
7/7/2005	240			9/29/2005	2,400		
7/7/2005	600			9/29/2005	4,000		
7/14/2005	12,600	7,244	1,436	10/6/2005	1,200	1,321	1,195
7/14/2005	4,800			10/6/2005	1,600		
7/14/2005	8,800			10/6/2005	1,200		
7/21/2005	3,800	4,868	1,892	10/13/2005	800	928	872
7/21/2005	4,600			10/13/2005	1,000		
7/21/2005	6,600			10/13/2005	1,000		
7/28/2005	1,000	944	1,993				
7/28/2005	1,400						
7/28/2005	600						

Table F-13. Lower Rouge at Henry Ruff Road (G97) MDEQ 2005 *E. coli* Monitoring Data (cfu/100 ml).

Lower Rouge at Henry Ruff Road (G97)							
Collection Date	Result	Daily Maximum	30-Day Rolling Geomean	Collection Date	Result	Daily Maximum	30-Day Rolling Geomean
5/13/2005	140	201	---	8/4/2005	4,000	1,973	2,273
5/13/2005	360			8/4/2005	3,200		
5/13/2005	160			8/4/2005	600		
5/20/2005	540	616	---	8/11/2005	15,400	5,458	3,248
5/20/2005	460			8/11/2005	8,800		
5/20/2005	940			8/11/2005	1,200		
5/27/2005	820	434	---	8/18/2005	2,200	2,882	3,261
5/27/2005	200			8/18/2005	3,200		
5/27/2005	500			8/18/2005	3,400		
6/3/2005	6,600	6,572	---	8/25/2005	800	832	2,044
6/3/2005	8,600			8/25/2005	1,800		
6/3/2005	5,000			8/25/2005	400		
6/10/2005	2,200	1,833	916	9/1/2005	1,400	2,046	2,211
6/10/2005	1,000			9/1/2005	1,800		
6/10/2005	2,800			9/1/2005	3,400		
6/17/2005	1,320	929	1,245	9/8/2005	1,800	1,629	2,128
6/17/2005	800			9/8/2005	1,000		
6/17/2005	760			9/8/2005	2,400		
6/23/2005	2,600	3,664	1,779	9/15/2005	1,500	2,336	1,796
6/23/2005	8,600			9/15/2005	3,400		
6/23/2005	2,200			9/15/2005	2,500		
6/30/2005	2,800	2,892	2,599	9/22/2005	1,200	727	1,363
6/30/2005	2,400			9/22/2005	400		
6/30/2005	3,600			9/22/2005	800		
7/7/2005	1,600	916	1,753	9/29/2005	3,000	2,932	1,754
7/7/2005	2,400			9/29/2005	2,400		
7/7/2005	200			9/29/2005	3,500		
7/14/2005	4,400	2,824	1,911	10/6/2005	400	684	1,409
7/14/2005	3,200			10/6/2005	400		
7/14/2005	1,600			10/6/2005	2,000		
7/21/2005	8,200	8,595	2,981	10/13/2005	1,000	1,308	1,348
7/21/2005	8,800			10/13/2005	1,400		
7/21/2005	8,800			10/13/2005	1,600		
7/28/2005	1,000	1,382	2,453				
7/28/2005	2,200						
7/28/2005	1,200						

Table F-14. Lower Rouge at John Daly Road (G98) MDEQ 2005 *E. coli* Monitoring Data (cfu/100 ml).

Lower Rouge at John Daly Road (G98)							
Collection Date	Result	Daily Maximum	30-Day Rolling Geomean	Collection Date	Result	Daily Maximum	30-Day Rolling Geomean
5/13/2005	100	158	---	8/4/2005	1,600	1,793	3,561
5/13/2005	280			8/4/2005	2,000		
5/13/2005	140			8/4/2005	1,800		
5/20/2005	2,400	1,498	---	8/11/2005	10,500	7,407	4,852
5/20/2005	1,400			8/11/2005	8,600		
5/20/2005	1,000			8/11/2005	4,500		
5/27/2005	660	797	---	8/18/2005	2,000	1,533	3,719
5/27/2005	1,200			8/18/2005	600		
5/27/2005	640			8/18/2005	3,000		
6/3/2005	15,400	14,999	---	8/25/2005	1,600	1,887	2,706
6/3/2005	13,200			8/25/2005	1,400		
6/3/2005	16,600			8/25/2005	3,000		
6/10/2005	9,000	3,538	1,585	9/1/2005	1,400	1,215	2,157
6/10/2005	8,200			9/1/2005	1,600		
6/10/2005	600			9/1/2005	800		
6/17/2005	1,600	1,308	2,420	9/8/2005	2,000	2,000	2,204
6/17/2005	1,000			9/8/2005	2,500		
6/17/2005	1,400			9/8/2005	1,600		
6/23/2005	2,000	2,884	2,758	9/15/2005	1,200	1,533	1,609
6/23/2005	4,000			9/15/2005	2,000		
6/23/2005	3,000			9/15/2005	1,500		
6/30/2005	5,000	7,306	4,296	9/22/2005	600	832	1,424
6/30/2005	5,200			9/22/2005	1,200		
6/30/2005	15,000			9/22/2005	800		
7/7/2005	1,400	1,577	2,738	9/29/2005	22,000	21,227	2,310
7/7/2005	2,000			9/29/2005	18,500		
7/7/2005	1,400			9/29/2005	23,500		
7/14/2005	4,500	5,793	3,022	10/6/2005	2,000	1,724	2,477
7/14/2005	5,400			10/6/2005	3,200		
7/14/2005	8,000			10/6/2005	800		
7/21/2005	6,000	9,252	4,468	10/13/2005	1,400	944	2,132
7/21/2005	11,000			10/13/2005	1,000		
7/21/2005	12,000			10/13/2005	600		
7/28/2005	7,000	3,777	4,716				
7/28/2005	3,500						
7/28/2005	2,200						

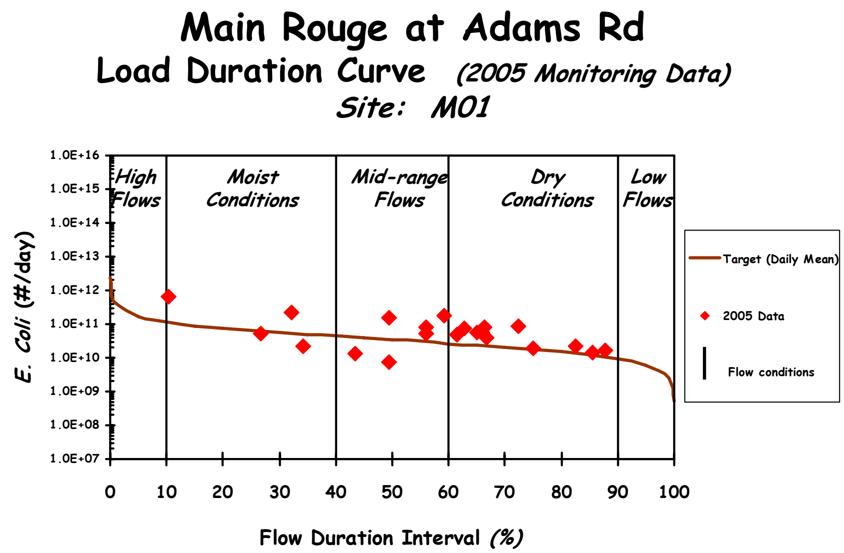
Table F-15. Lower Rouge at Military Road (L05D) MDEQ 2005 *E. coli* Monitoring Data (cfu/100 ml).

Lower Rouge at Military Road (L05D)							
Collection Date	Result	Daily Maximum	30-Day Rolling Geomean	Collection Date	Result	Daily Maximum	30-Day Rolling Geomean
5/13/2005	220	135	---	8/4/2005	3,000	3,211	6,410
5/13/2005	80			8/4/2005	2,400		
5/13/2005	140			8/4/2005	4,600		
5/20/2005	1,600	2,153	---	8/11/2005	2,400	3,248	5,375
5/20/2005	2,600			8/11/2005	3,400		
5/20/2005	2,400			8/11/2005	4,200		
5/27/2005	720	702	---	8/18/2005	4,000	3,761	5,341
5/27/2005	1,600			8/18/2005	3,800		
5/27/2005	300			8/18/2005	3,500		
6/3/2005	600	796	---	8/25/2005	800	928	3,139
6/3/2005	600			8/25/2005	1,000		
6/3/2005	1,400			8/25/2005	1,000		
6/10/2005	60,000	6,952	1,025	9/1/2005	13,000	9,782	3,239
6/10/2005	800			9/1/2005	8,000		
6/10/2005	7,000			9/1/2005	9,000		
6/17/2005	600	1,003	1,530	9/8/2005	1,500	6,240	3,699
6/17/2005	1,200			9/8/2005	12,000		
6/17/2005	1,400			9/8/2005	13,500		
6/23/2005	9,400	10,179	2,087	9/15/2005	1,400	1,263	3,062
6/23/2005	11,000			9/15/2005	800		
6/23/2005	10,200			9/15/2005	1,800		
6/30/2005	6,000	6,113	3,218	9/22/2005	1,000	1,063	2,378
6/30/2005	6,800			9/22/2005	1,200		
6/30/2005	5,600			9/22/2005	1,000		
7/7/2005	12,500	7,837	5,085	9/29/2005	7,000	7,846	3,644
7/7/2005	11,000			9/29/2005	7,500		
7/7/2005	3,500			9/29/2005	9,200		
7/14/2005	3,000	3,882	4,525	10/6/2005	400	922	2,272
7/14/2005	3,000			10/6/2005	1,400		
7/14/2005	6,500			10/6/2005	1,400		
7/21/2005	12,500	13,248	7,583	10/13/2005	1,400	851	1,526
7/21/2005	15,500			10/13/2005	200		
7/21/2005	12,000			10/13/2005	2,200		
7/28/2005	5,000	8,363	7,291				
7/28/2005	13,000						
7/28/2005	9,000						

APPENDIX G

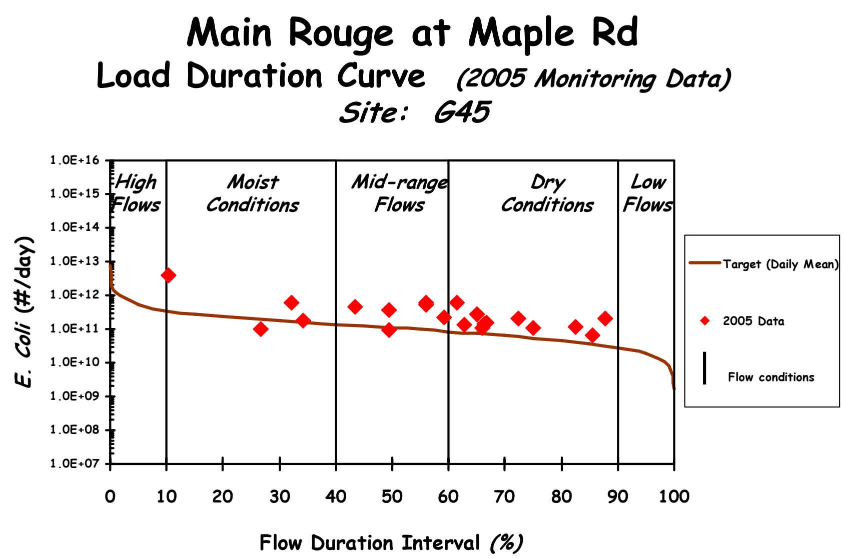
LOAD DURATION CURVES
MAIN ROUGE RIVER
2005 MDEQ DATA

Figure G-1



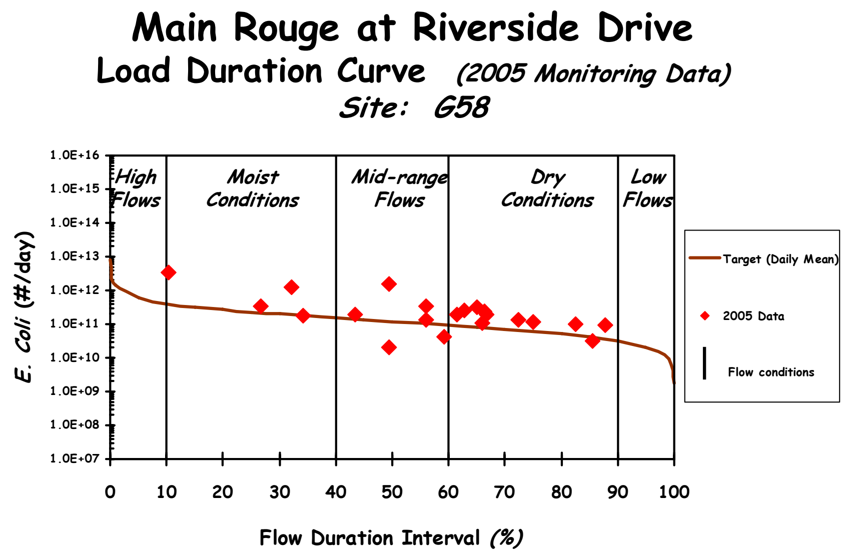
E. Coli Data & USGS Gage Duration Interval 04166000 *11.89 square miles*

Figure G-2



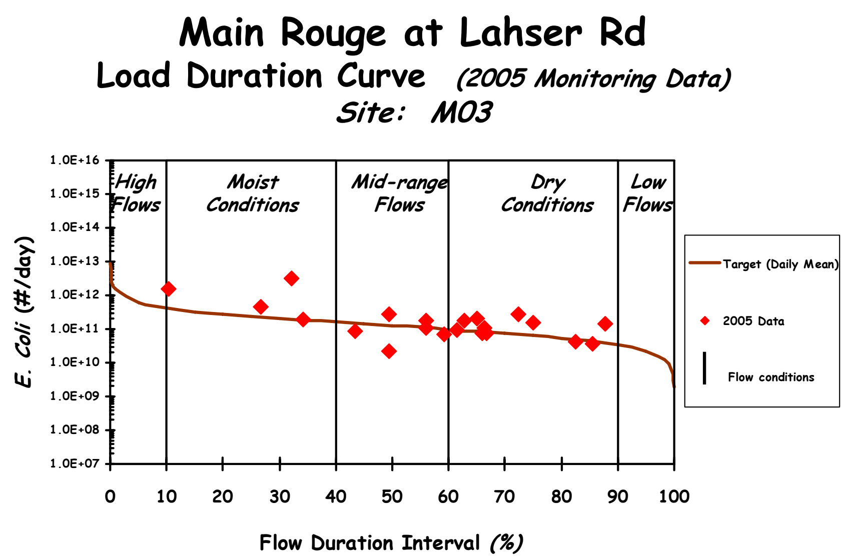
E. Coli Data & USGS Gage Duration Interval 04166000 *36.71 square miles*

Figure G-3



E. Coli Data & USGS Gage Duration Interval 04166000 *41.37 square miles*

Figure G-4



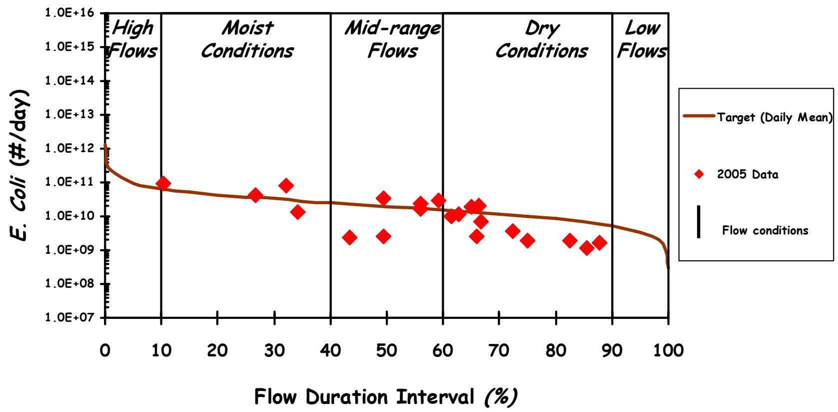
E. Coli Data & USGS Gage Duration Interval 04166000 *43.13 square miles*

Figure G-5

Franklin Branch at Middlebelt between Walnut Lake and 15 Mile Rd

Load Duration Curve *(2005 Monitoring Data)*

Site: G38



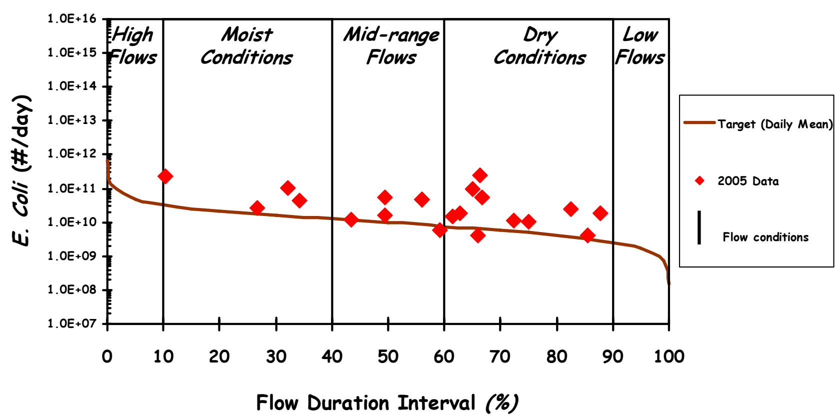
E. Coli Data & USGS Gage Duration Interval 04166000 *6.78 square miles*

Figure G-6

Franklin Branch at Middlebelt between 14 Mile Rd and 15 Mile Rd

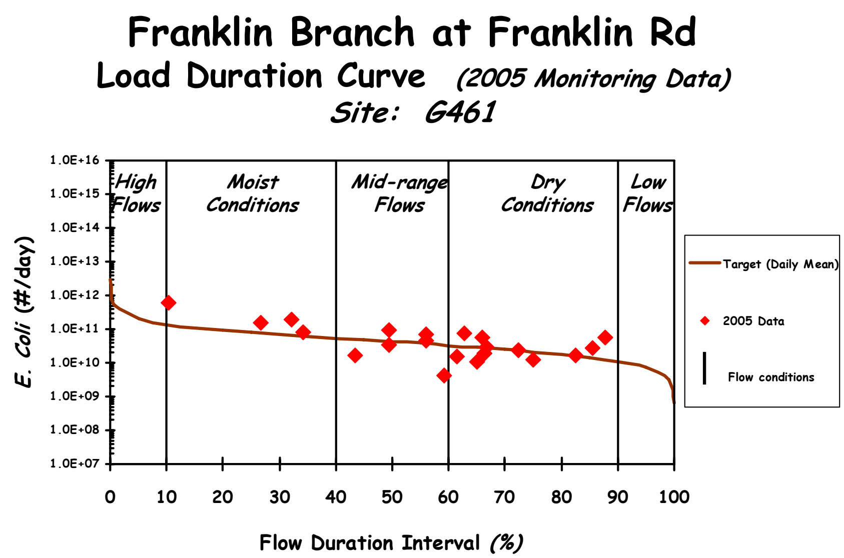
Load Duration Curve *(2005 Monitoring Data)*

Site: G39



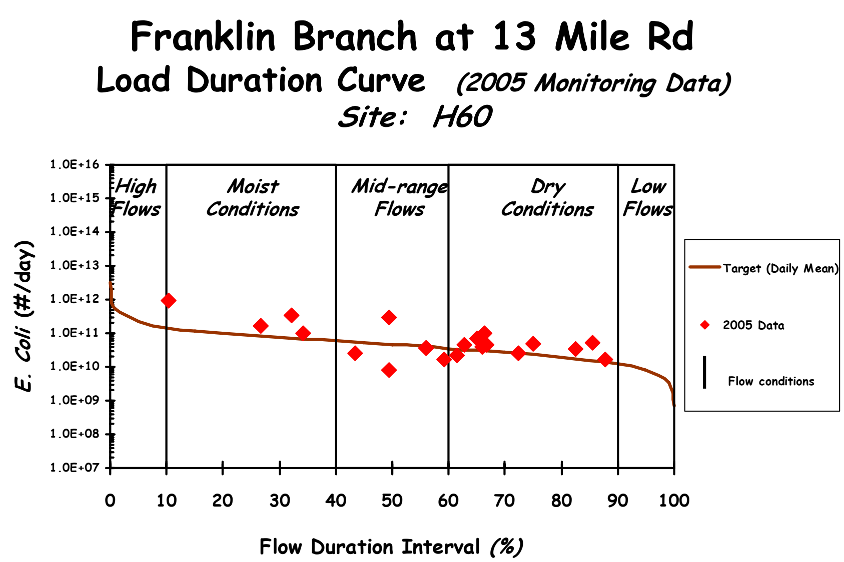
E. Coli Data & USGS Gage Duration Interval 04166000 *3.36 square miles*

Figure G-7



E. Coli Data & USGS Gage Duration Interval 04166000 14.34 square miles

Figure G-8



E. Coli Data & USGS Gage Duration Interval 04166000 15.6 square miles

Figure G-9

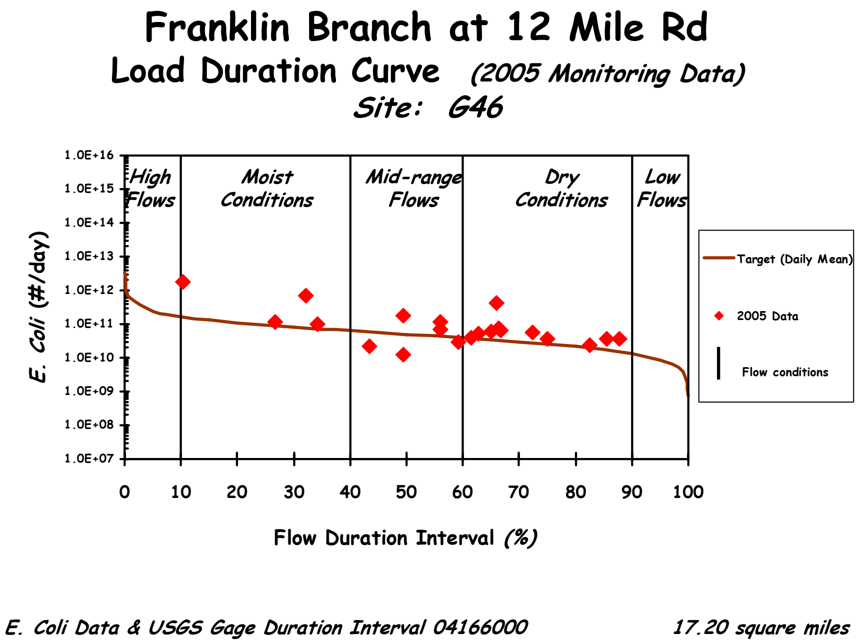


Figure G-10

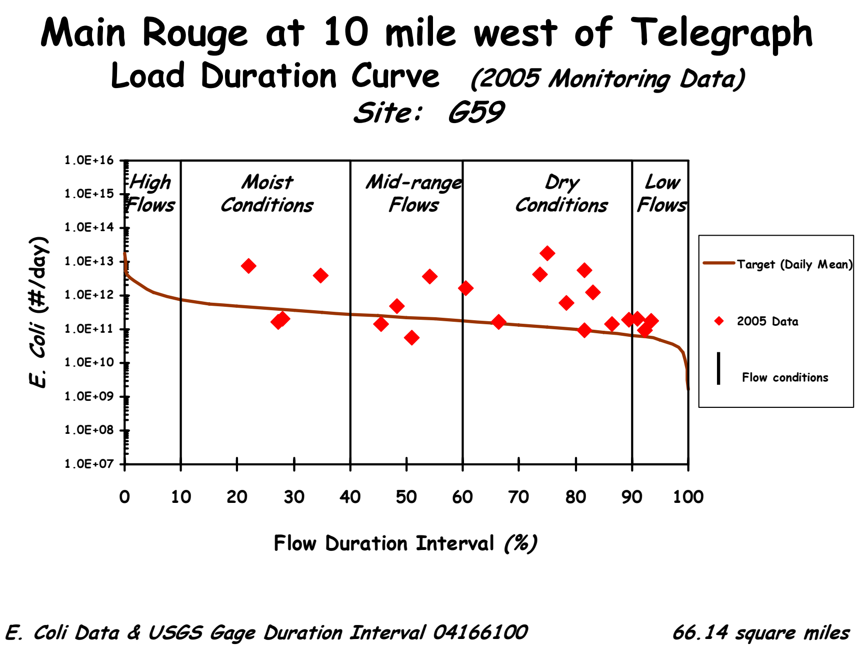
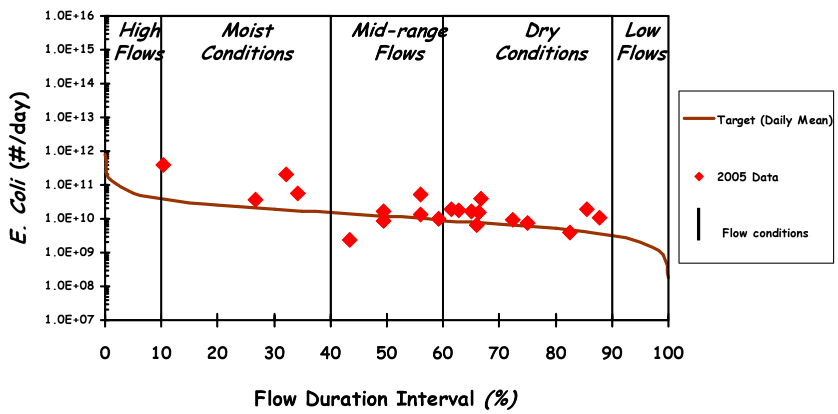


Figure G-11

Pebble Creek west of Middlebelt and south of 13 Mile Rd

Load Duration Curve *(2005 Monitoring Data)*

Site: H47



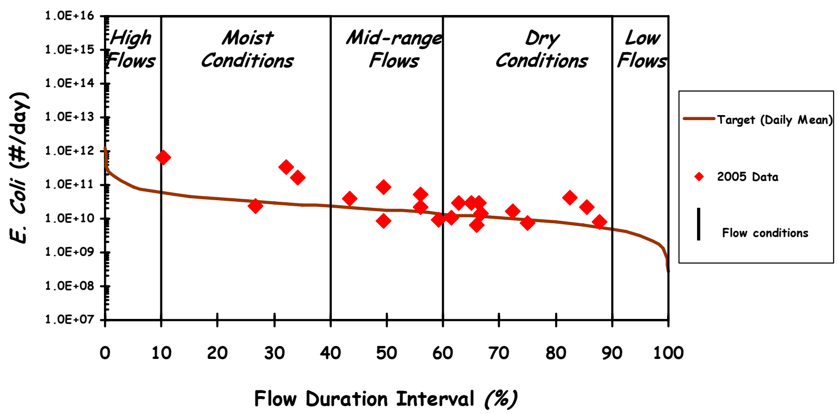
E. Coli Data & USGS Gage Duration Interval 04166000 *4.02 square miles*

Figure G-12

Pebble Creek at 11 Mile Rd

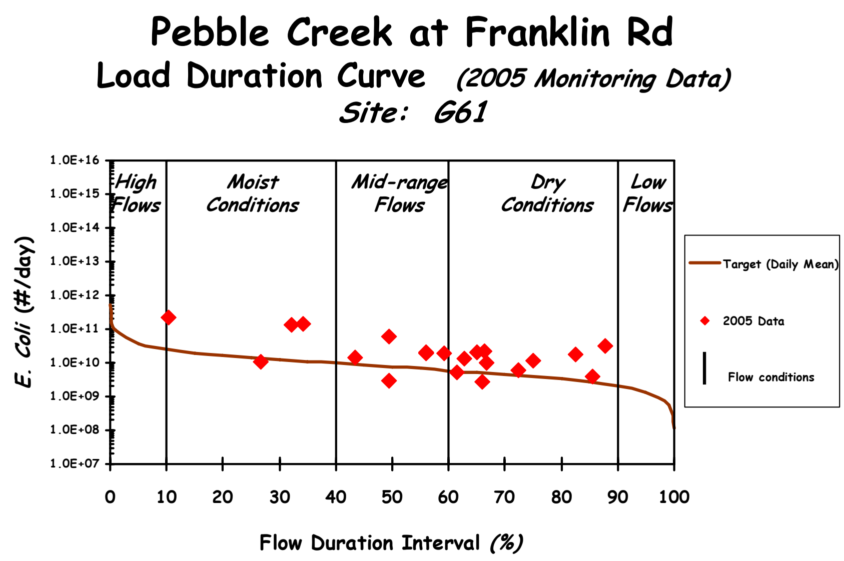
Load Duration Curve *(2005 Monitoring Data)*

Site: G60



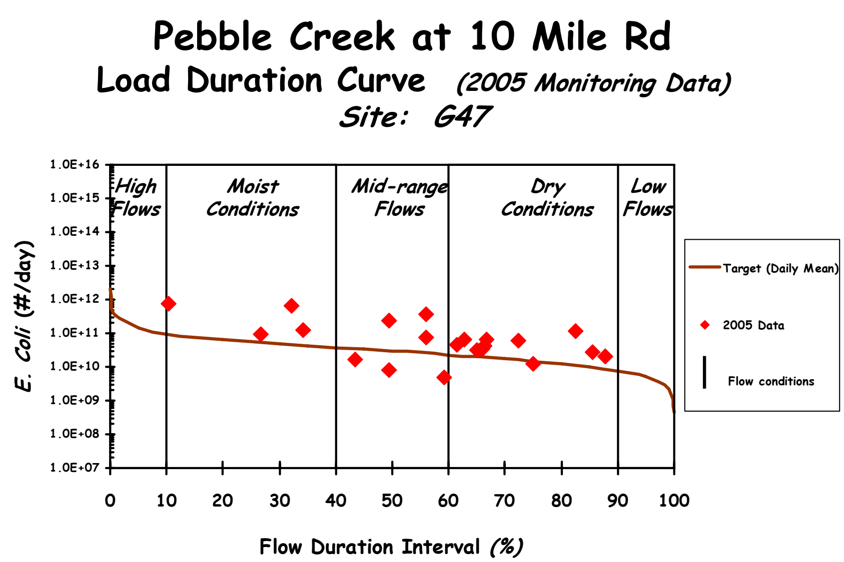
E. Coli Data & USGS Gage Duration Interval 04166000 *6.23 square miles*

Figure G-13



E. Coli Data & USGS Gage Duration Interval 04166000 *2.62 square miles*

Figure G-14



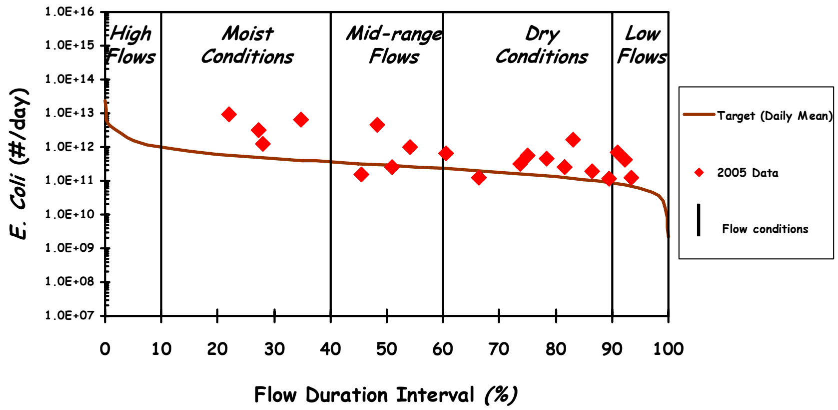
E. Coli Data & USGS Gage Duration Interval 04166000 *10.05 square miles*

Figure G-15

Main Rouge at Beech Road

Load Duration Curve *(2005 Monitoring Data)*

Site: US5



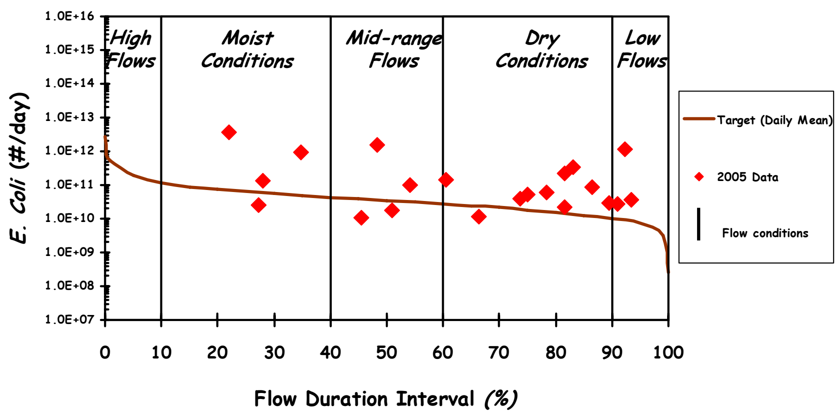
E. Coli Data & USGS Gage Duration Interval 04166100 — *86.89 square miles*

Figure G-16

Evans Ditch at Tamarack off 10 Mile Rd

Load Duration Curve *(2005 Monitoring Data)*

Site: H44



E. Coli Data & USGS Gage Duration Interval 04166100 — *10.21 square miles*

Figure G-17

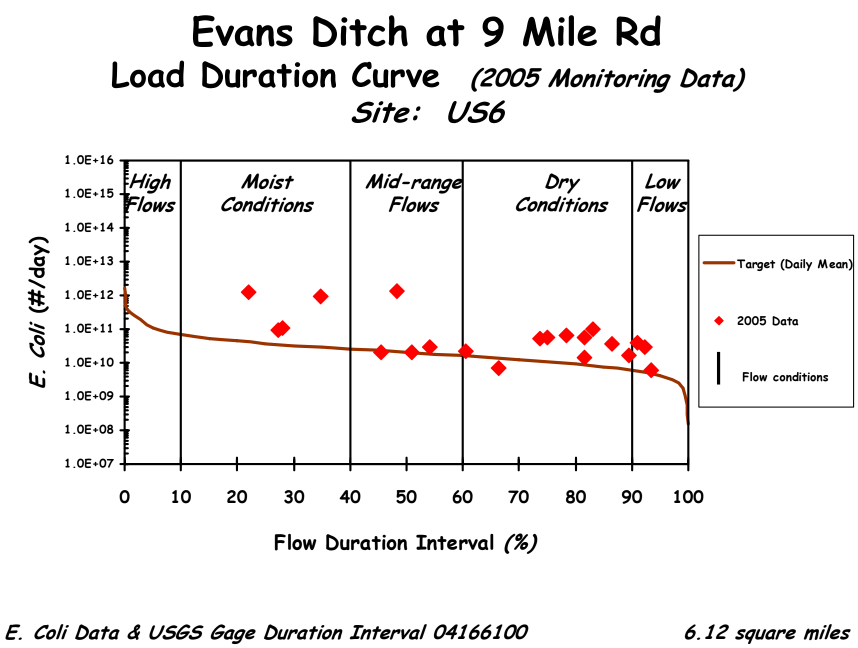


Figure G-18

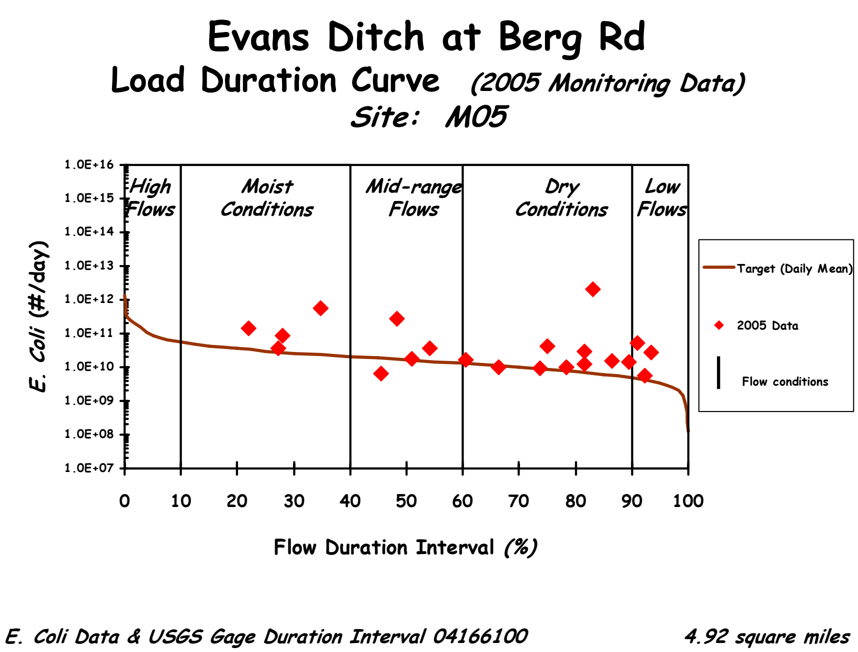
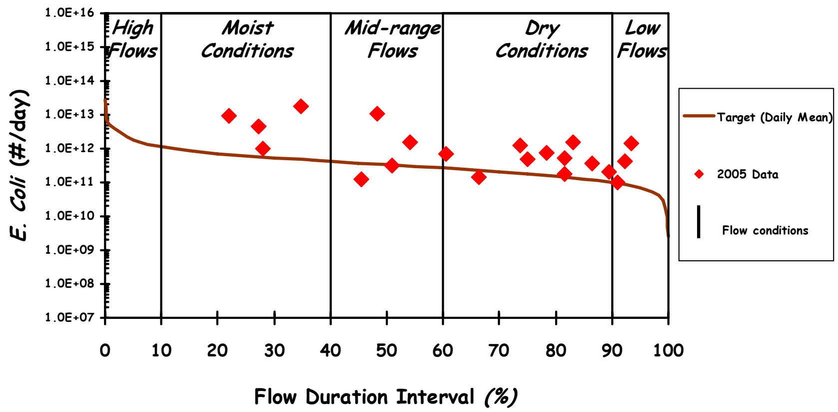


Figure G-19

Main Rouge north of 7 Mile Rd at Bonnie Brook Golf Course

Load Duration Curve *(2005 Monitoring Data)*

Site: M15



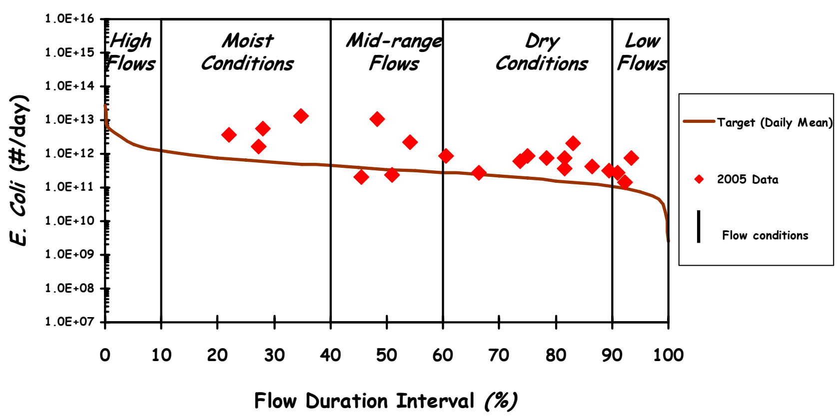
E. Coli Data & USGS Gage Duration Interval 04166100 *100.74 square miles*

Figure G-20

Main Rouge at Fenkell Rd

Load Duration Curve *(2005 Monitoring Data)*

Site: G43 (above confluence with the Upper)



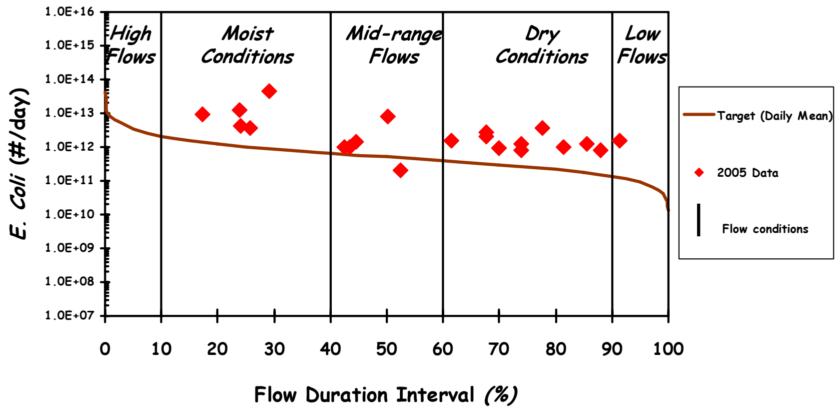
E. Coli Data & USGS Gage Duration Interval 04166100 *105.36 square miles*

Figure G-21

Main Rouge at Plymouth Rd

Load Duration Curve *(2005 Monitoring Data)*

Site: US7



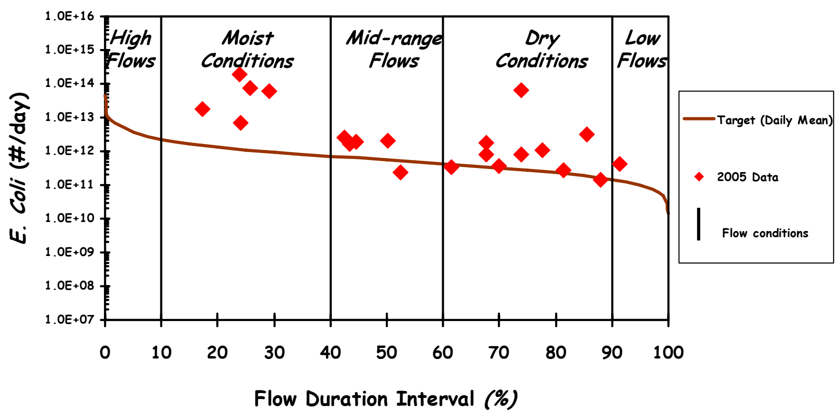
E. Coli Data & USGS Gage Duration Interval 04166500 *184.26 square miles*

Figure G-22

Main Rouge at Ann Arbor Trail

Load Duration Curve *(2005 Monitoring Data)*

Site: G42 (above confluence with the Middle)



E. Coli Data & USGS Gage Duration Interval 04166500 *199.74 square miles*

Figure G-23

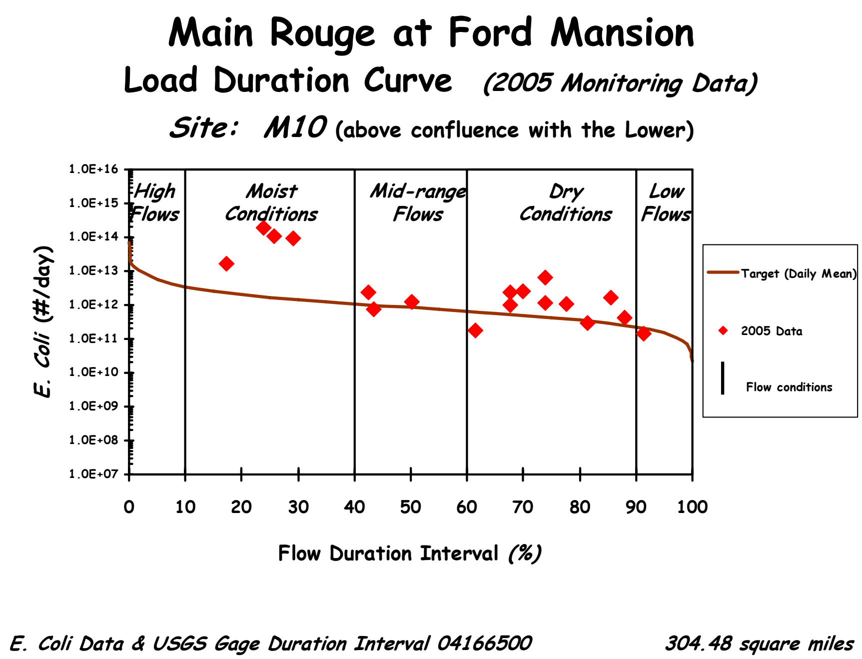


Figure G-24

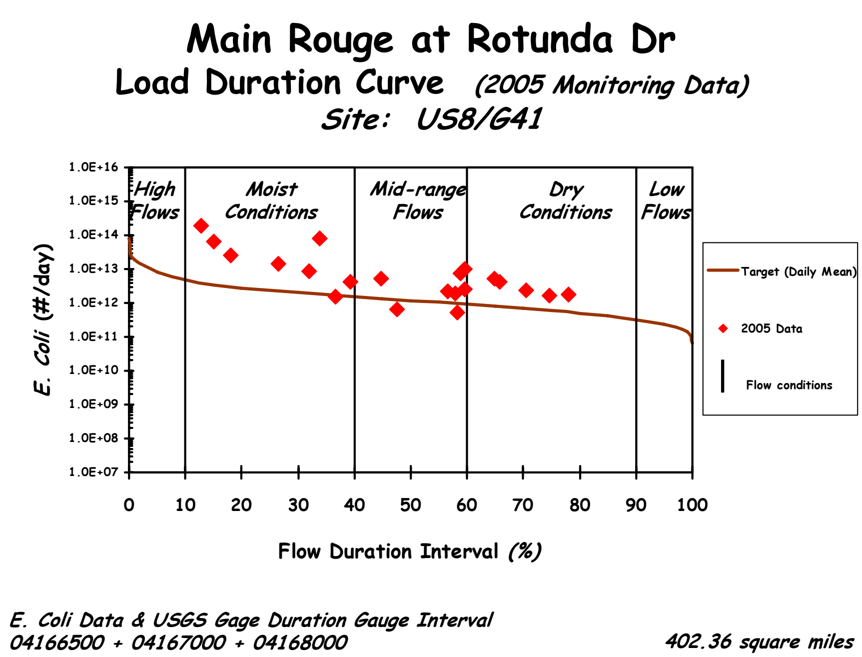
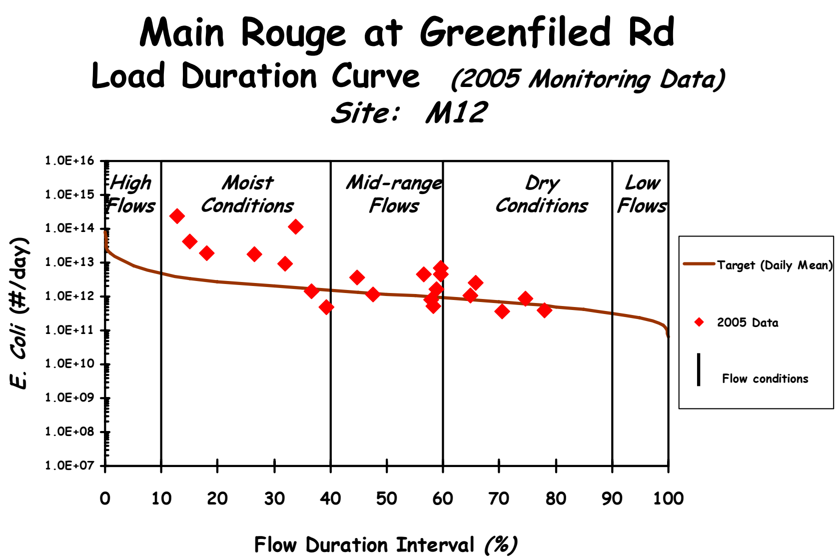


Figure G-25



E. Coli Data & USGS Gage Duration Gauge Interval
04166500 + 04167000 + 04168000

403.54 square miles

APPENDIX H

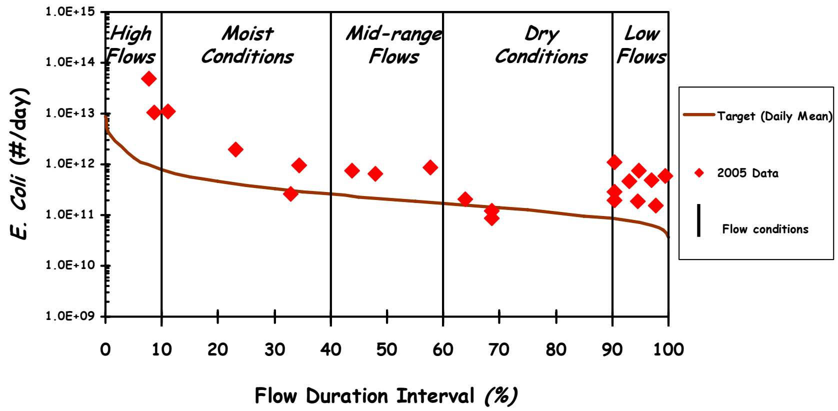
LOAD DURATION CURVES
UPPER ROUGE RIVER
2005 MDEQ DATA

Figure H-1

Upper Rouge at Powers Rd

Load Duration Curve *(2005 Monitoring Data)*

Site: UO1



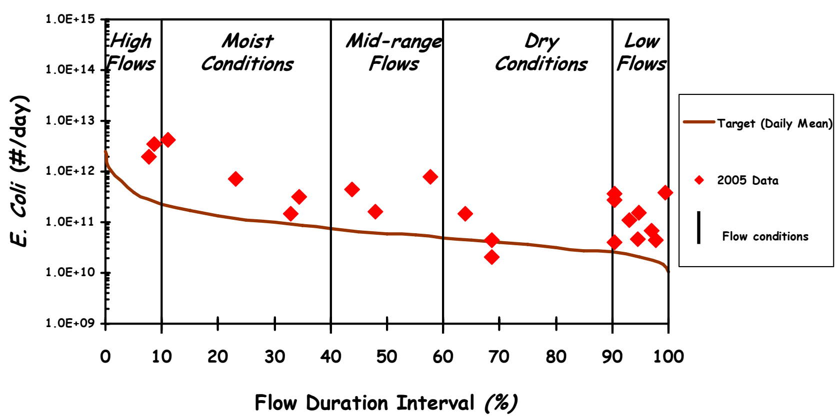
E. Coli Data & USGS Gage 04166470 Duration Interval *17.72 square miles*

Figure H-2

Upper Rouge at Tuck Rd

Load Duration Curve *(2005 Monitoring Data)*

Site: G72



E. Coli Data & USGS Gage 04166470 Duration Interval *19.46 square miles*

Figure H-3

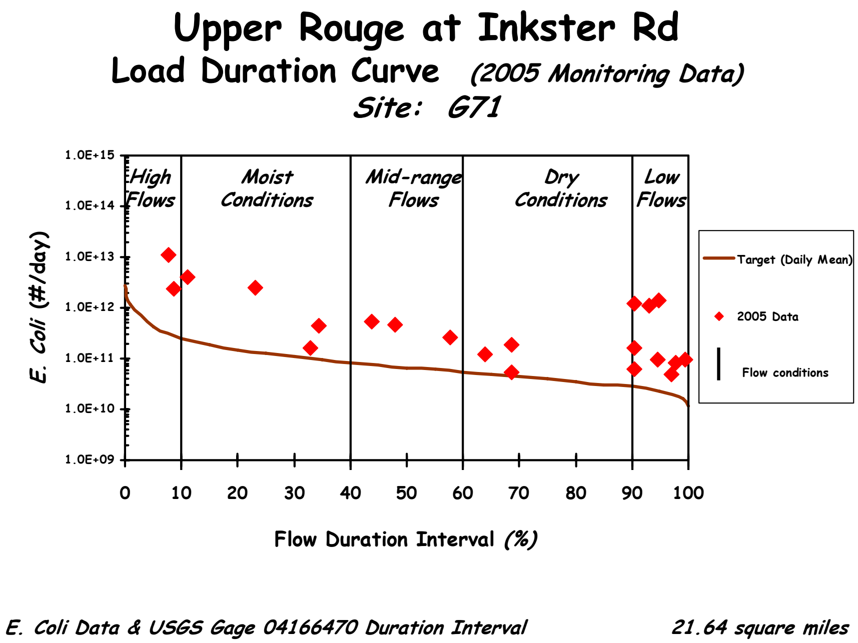


Figure H-4

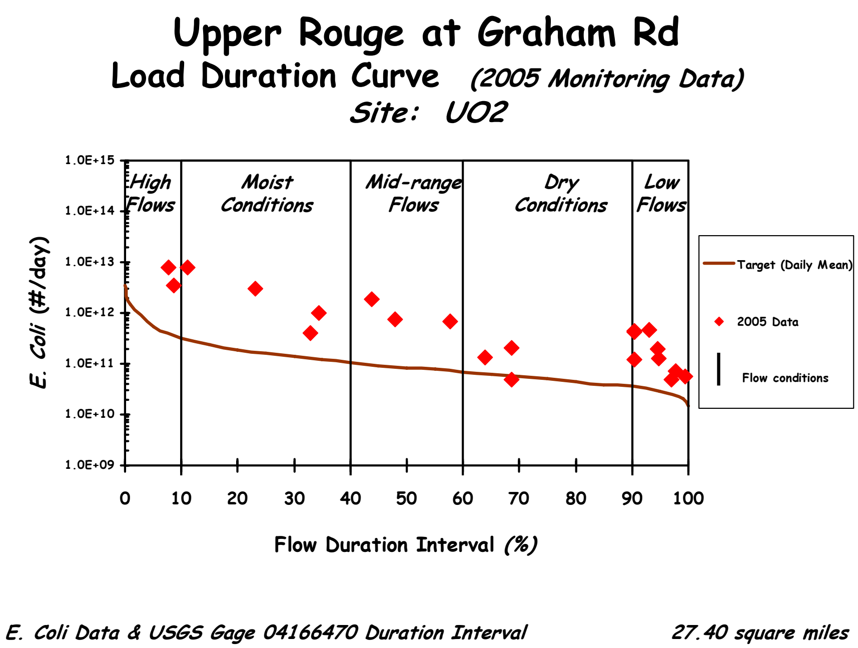


Figure H-5

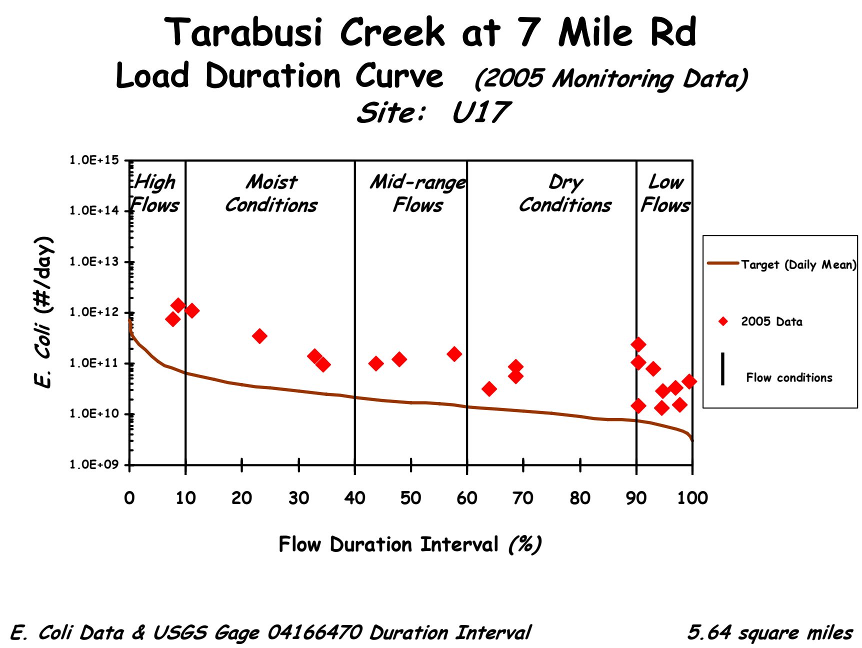


Figure H-6

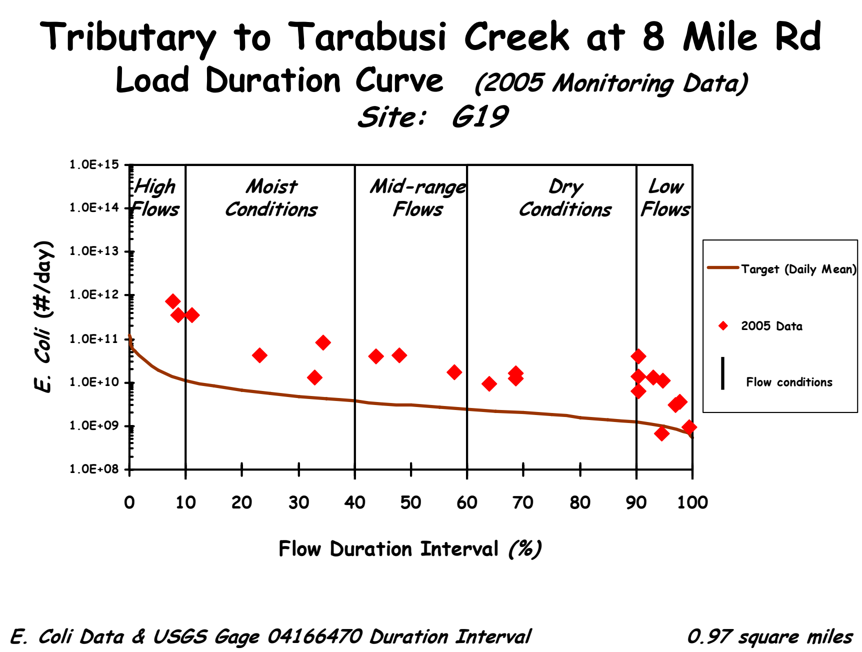
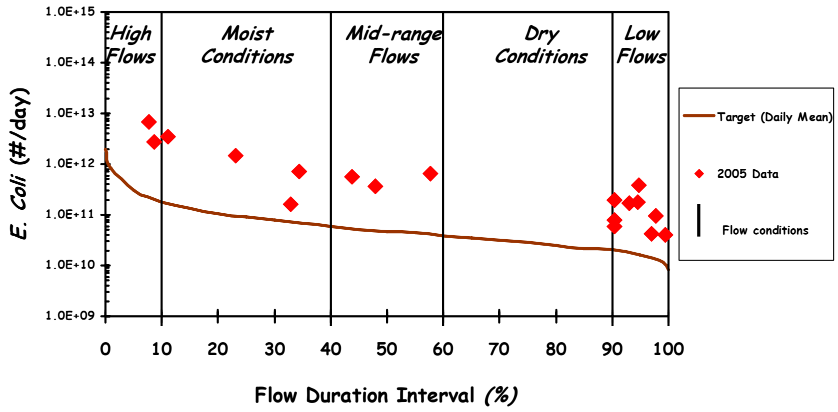


Figure H-7

Bell Branch at Riverside Street

Load Duration Curve *(2005 Monitoring Data)*

Site: U14



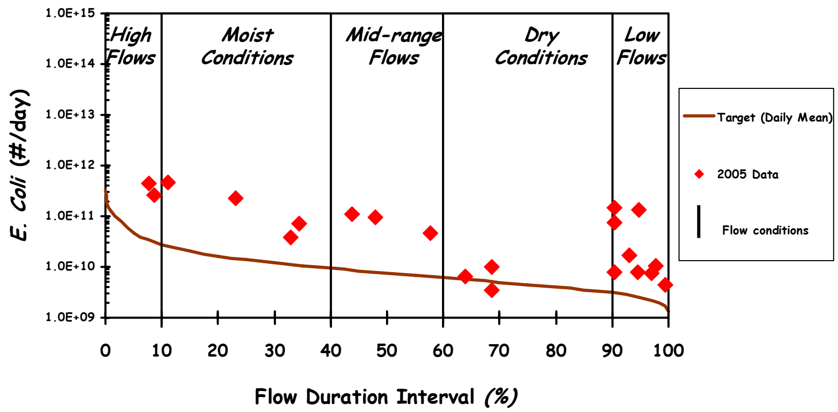
E. Coli Data & USGS Gage 04166470 Duration Interval *15.43 square miles*

Figure H-8

Bell Branch at 6 Mile Rd

Load Duration Curve *(2005 Monitoring Data)*

Site: U15



E. Coli Data & USGS Gage 04166470 Duration Interval *2.41 square miles*

Figure H-9

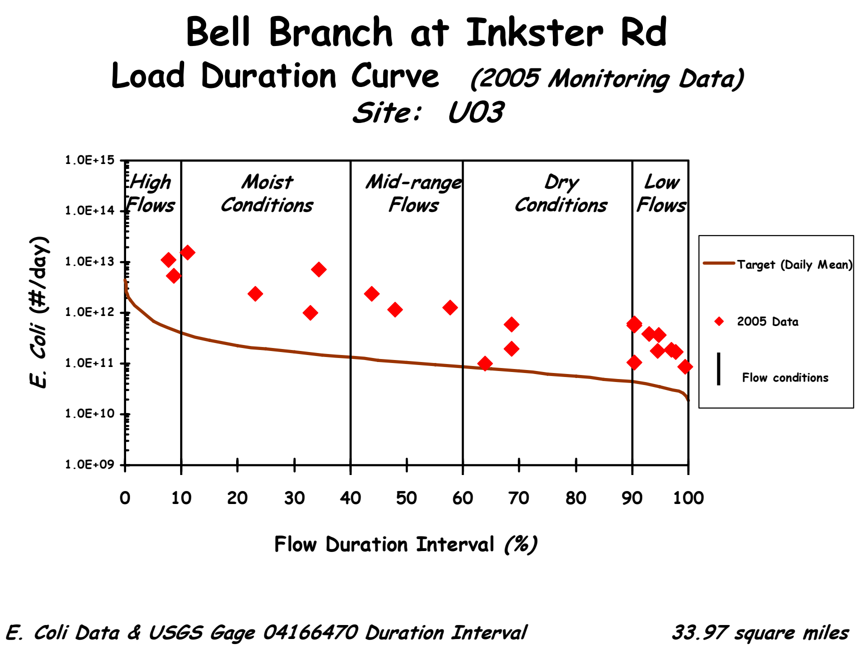


Figure H-10

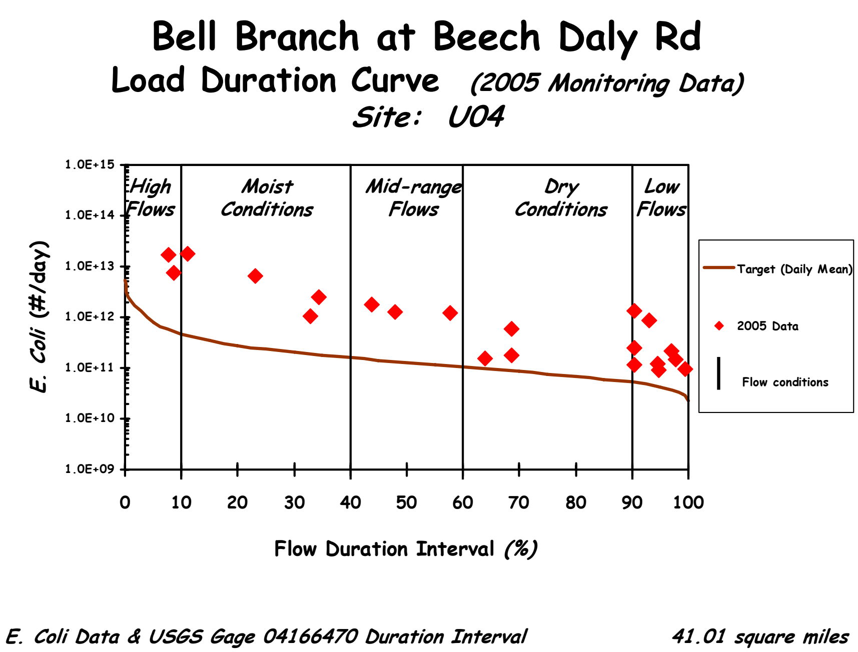
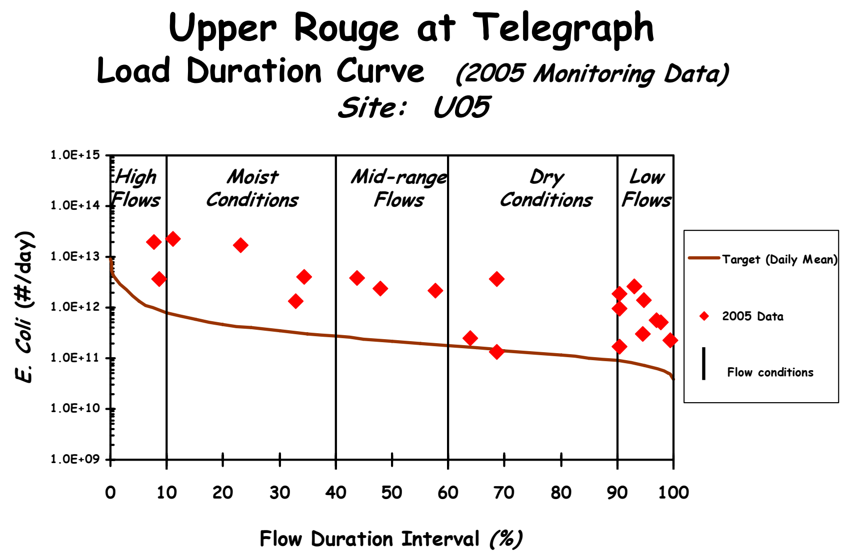


Figure H-11



E. Coli Data & USGS Gage 04166470 Duration Interval *69.35 square miles*

APPENDIX I

LOAD DURATION CURVES
MIDDLE ROUGE RIVER
2005 MDEQ DATA

Figure I-1

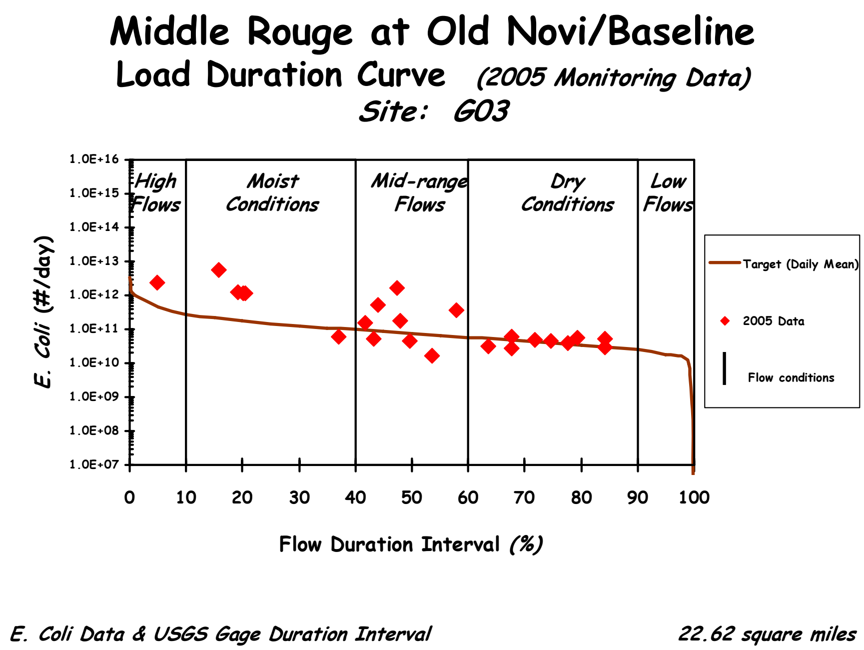


Figure I-2

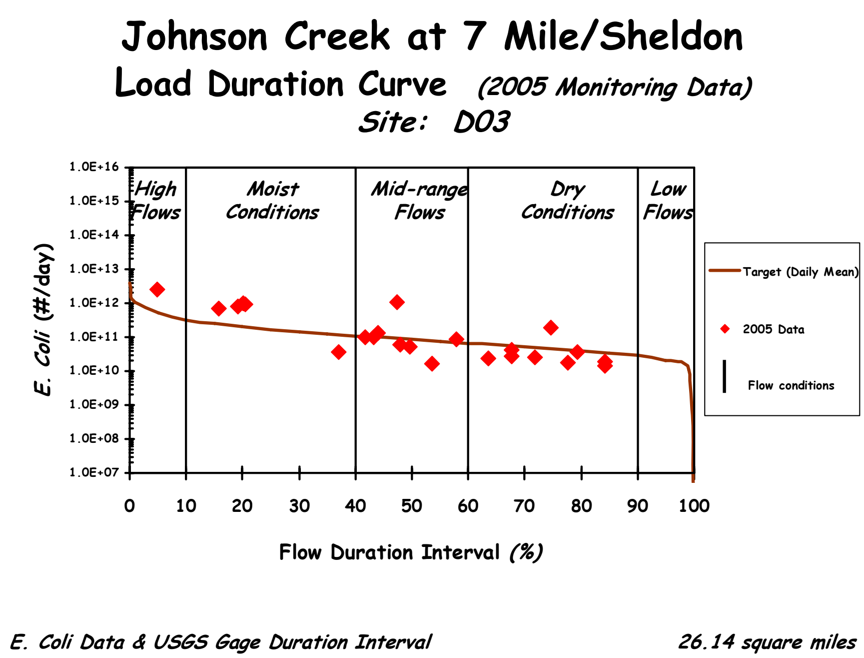


Figure I-3

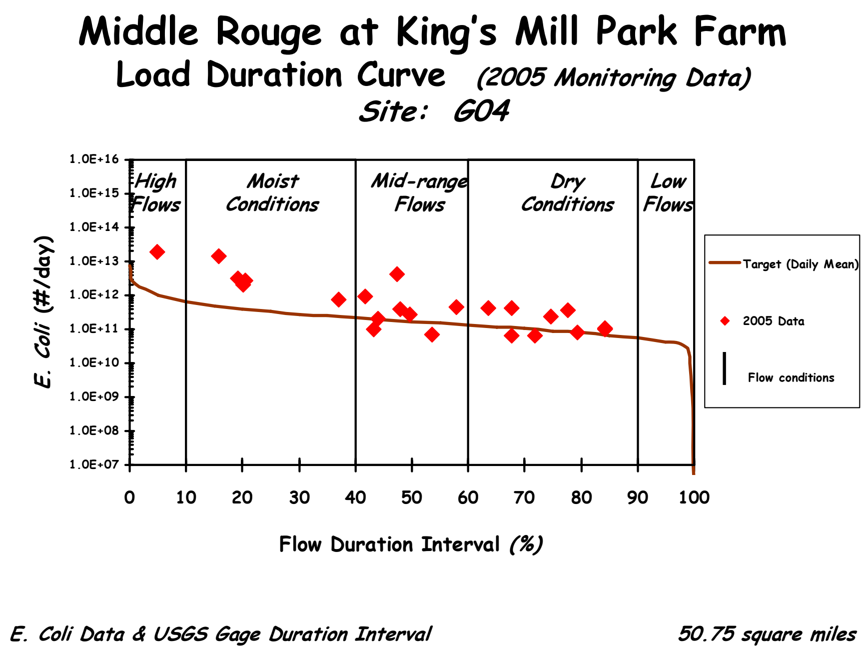


Figure I-4

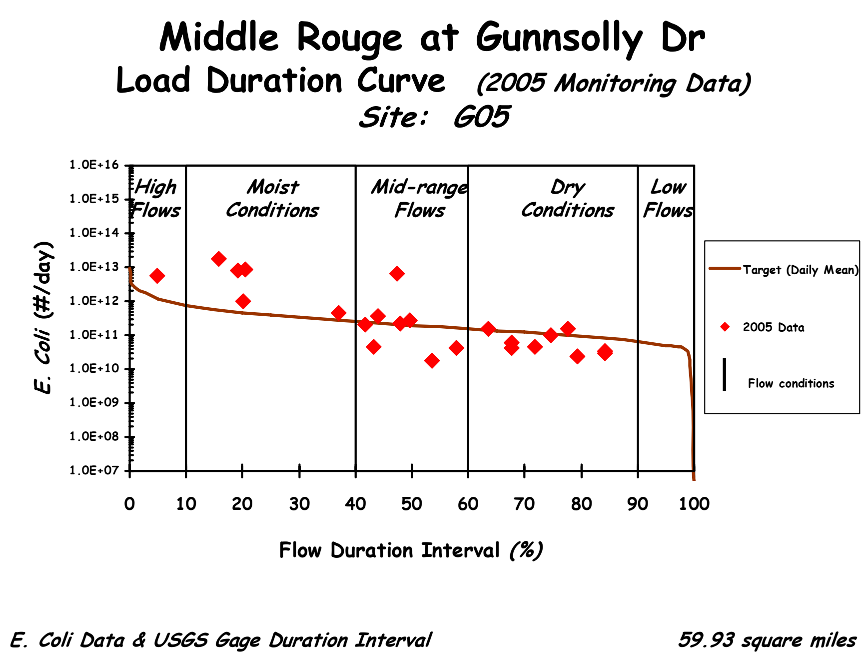


Figure I-5

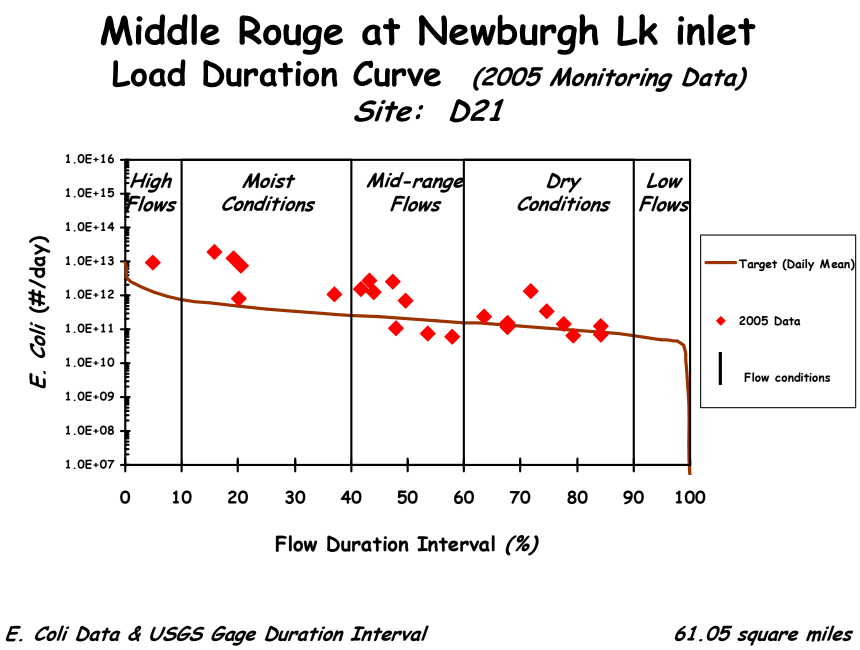


Figure I-6

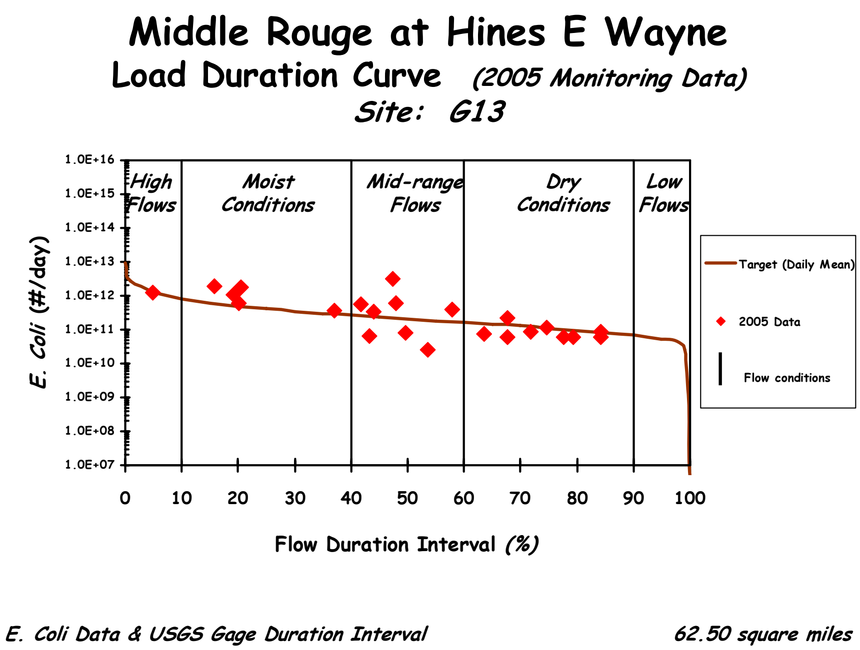
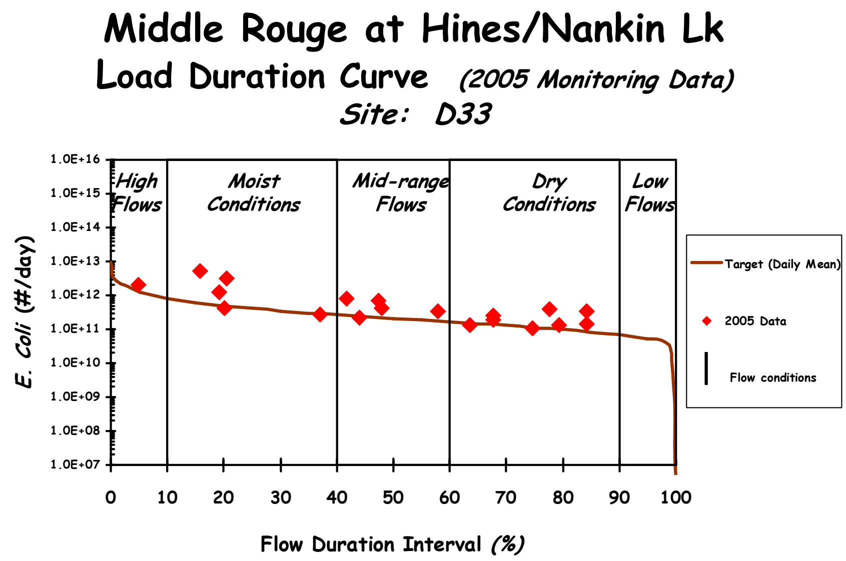
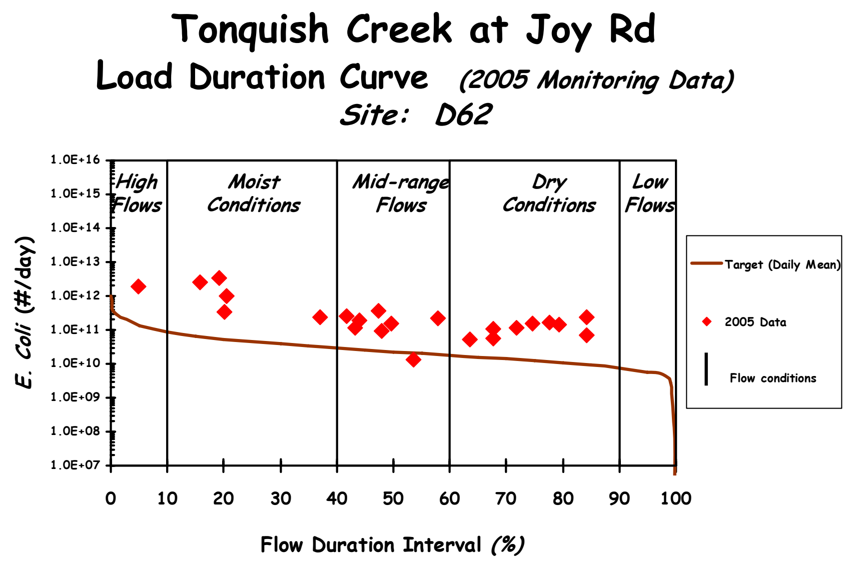


Figure I-7



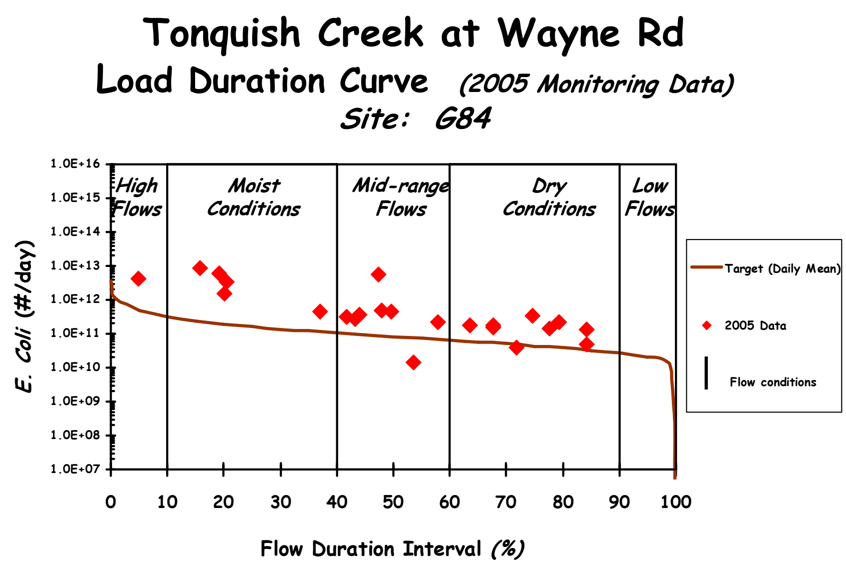
E. Coli Data & USGS Gage Duration Interval *62.84 square miles*

Figure I-8



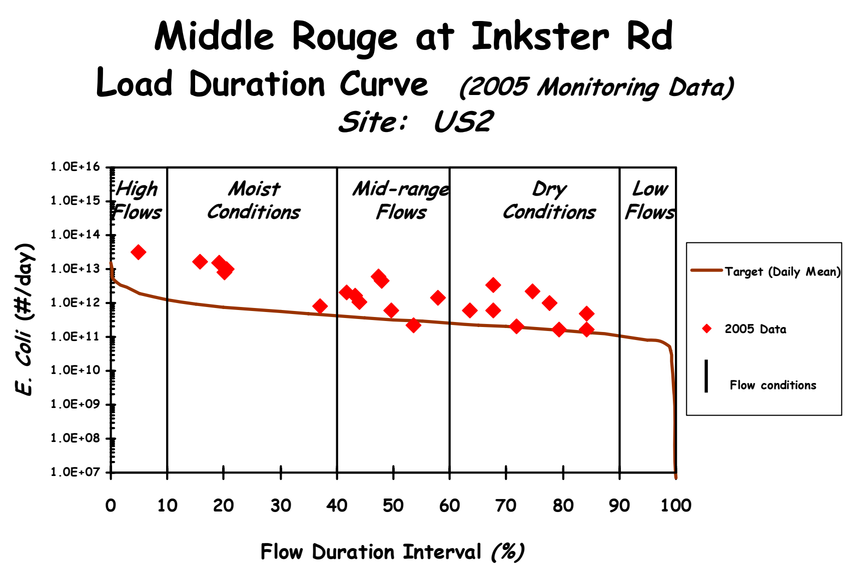
E. Coli Data & USGS Gage Duration Interval *6.83 square miles*

Figure I-9



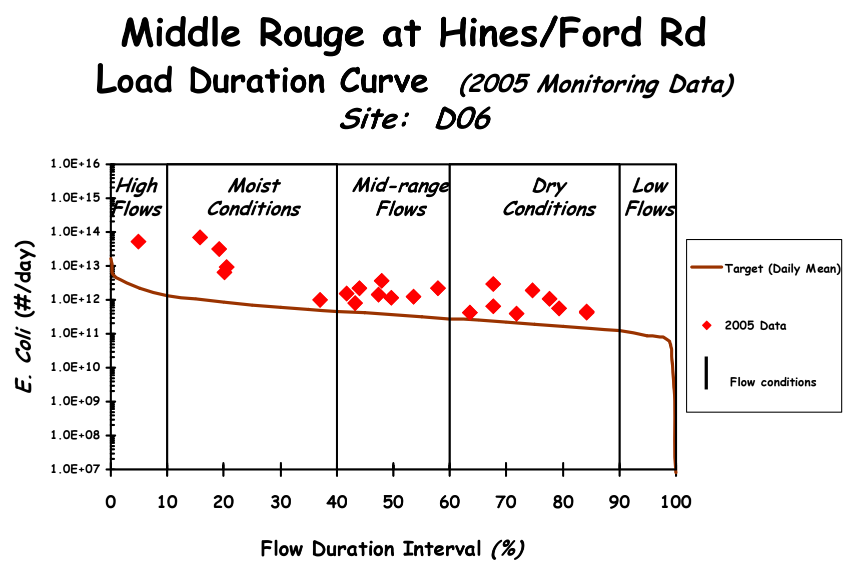
E. Coli Data & USGS Gage Duration Interval *24.75 square miles*

Figure I-10



E. Coli Data & USGS Gage Duration Interval *98.39 square miles*

Figure I-11



E. Coli Data & USGS Gage Duration Interval *109.33 square miles*

APPENDIX J

LOAD DURATION CURVES
LOWER ROUGE RIVER
2005 MDEQ DATA

Figure J-1

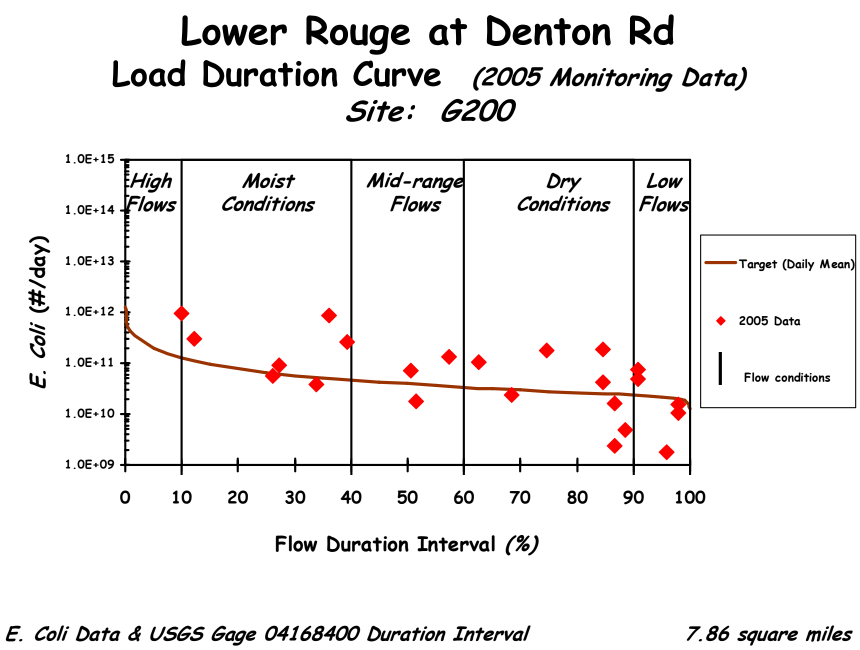


Figure J-2

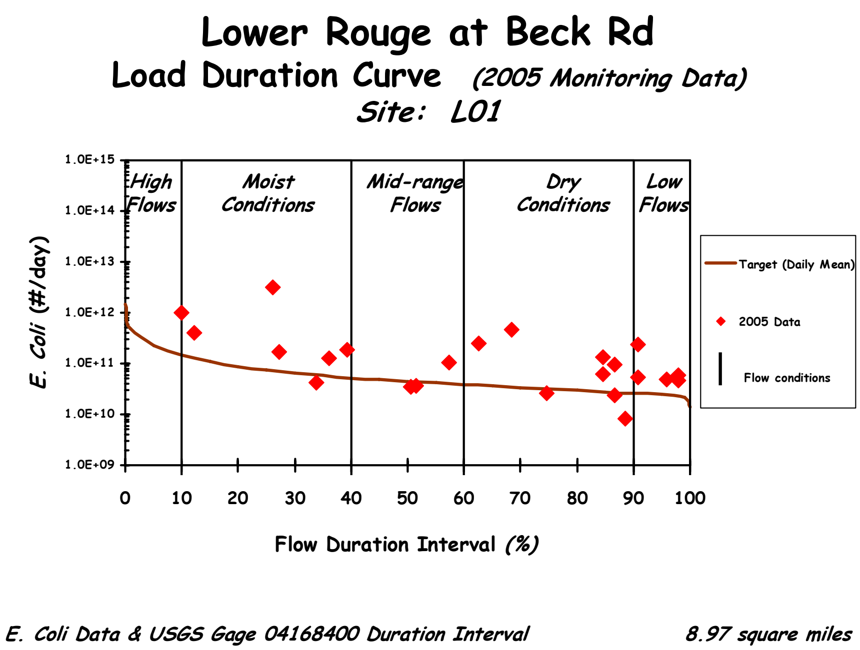


Figure J-3

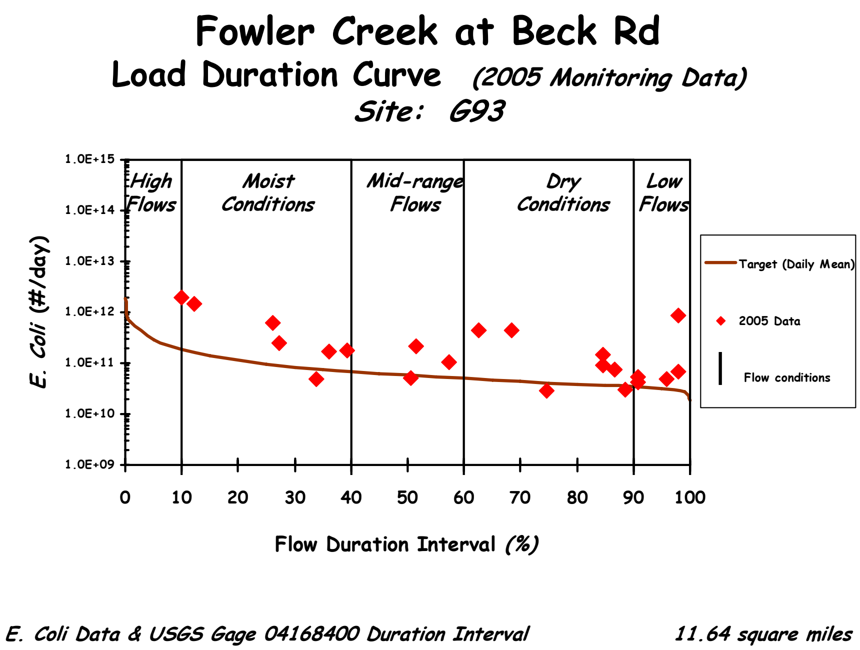


Figure J-4

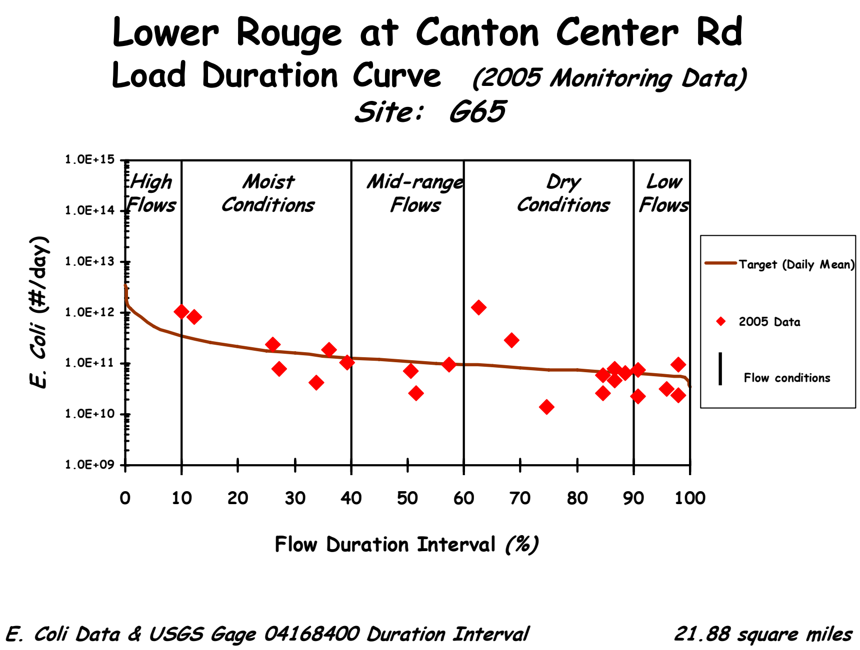


Figure J-5

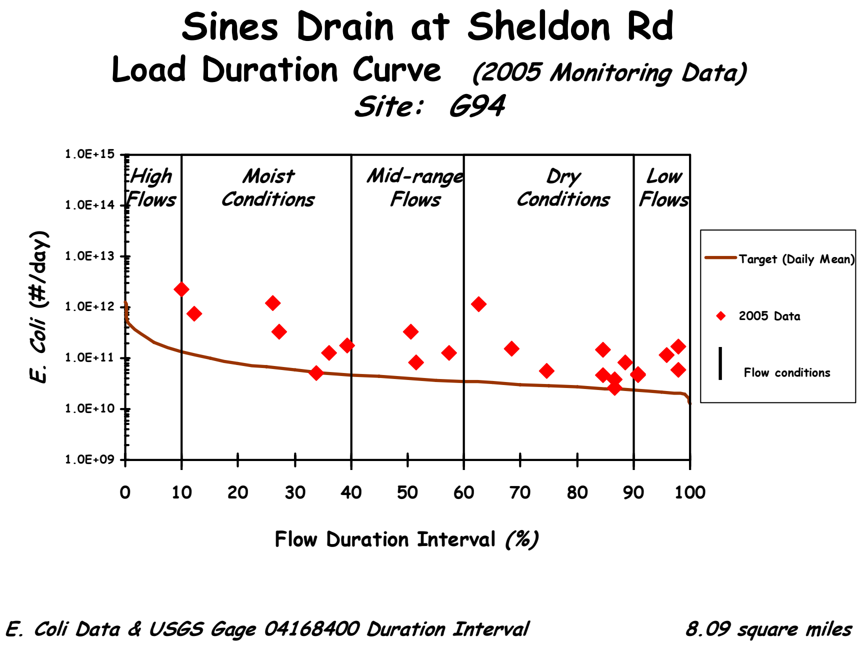


Figure J-6

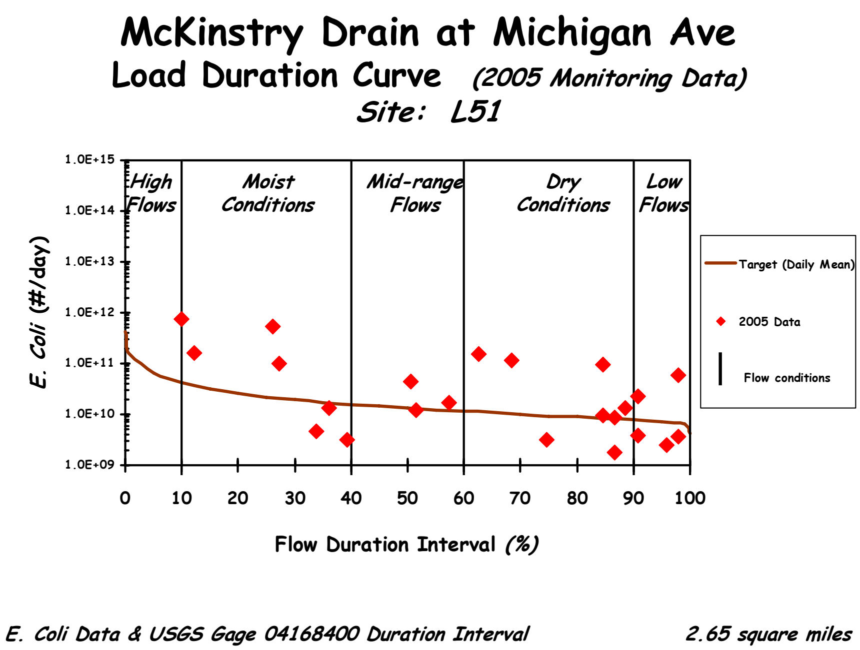
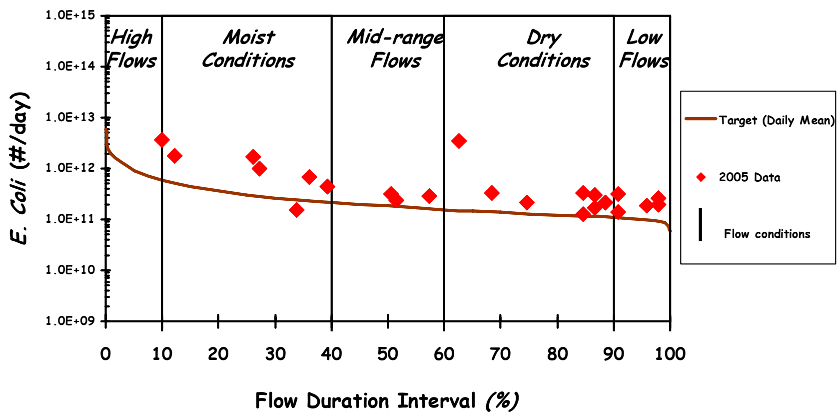


Figure J-7

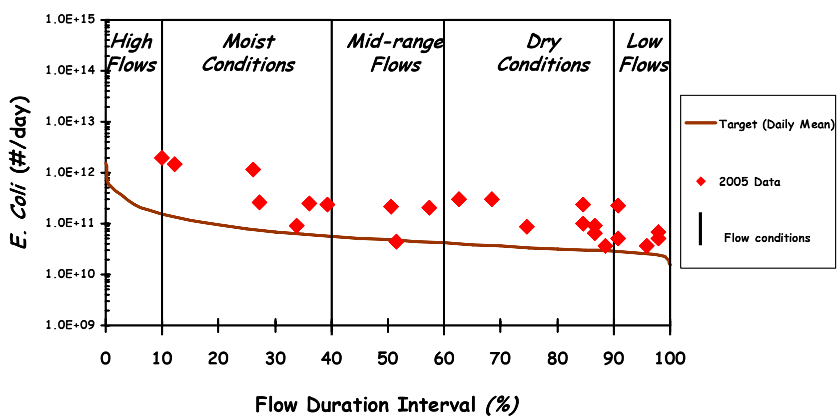
Lower Rouge at Haggerty Rd
Load Duration Curve *(2005 Monitoring Data)*
Site: G92



E. Coli Data & USGS Gage 04168400 Duration Interval *36.5 square miles*

Figure J-8

Fellows Creek at Ford Rd
Load Duration Curve *(2005 Monitoring Data)*
Site: G211



E. Coli Data & USGS Gage 04168400 Duration Interval *9.58 square miles*

Figure J-9

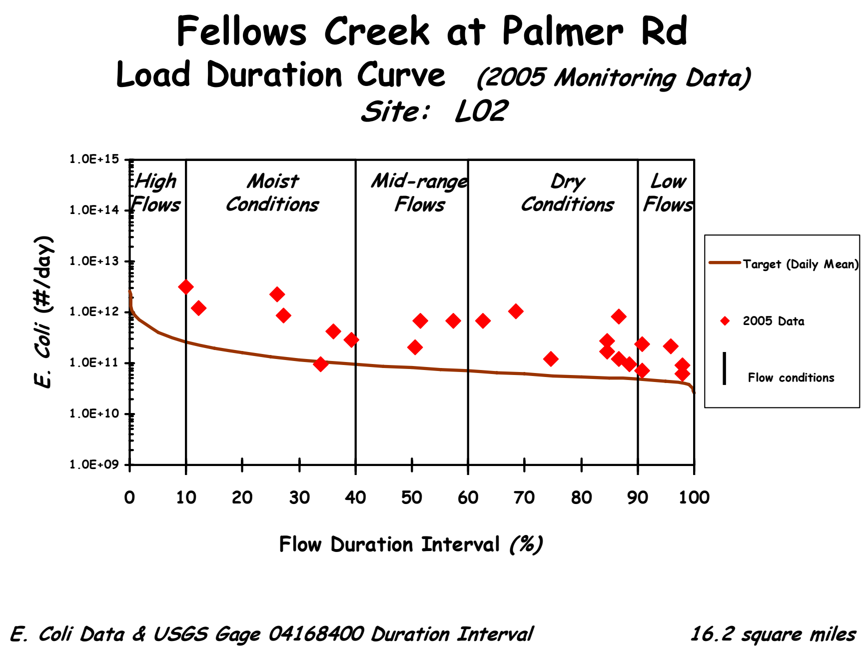


Figure J-10

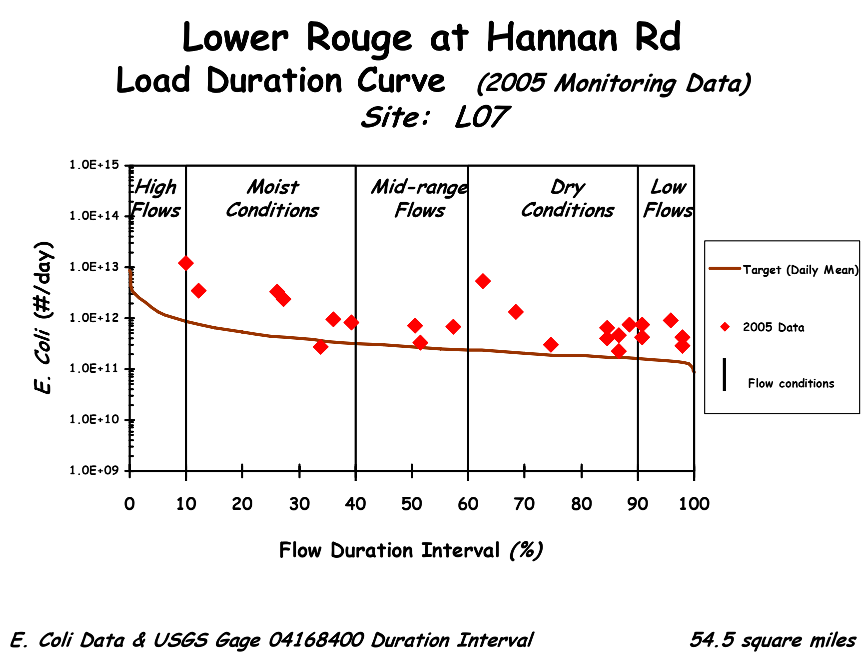


Figure J-11

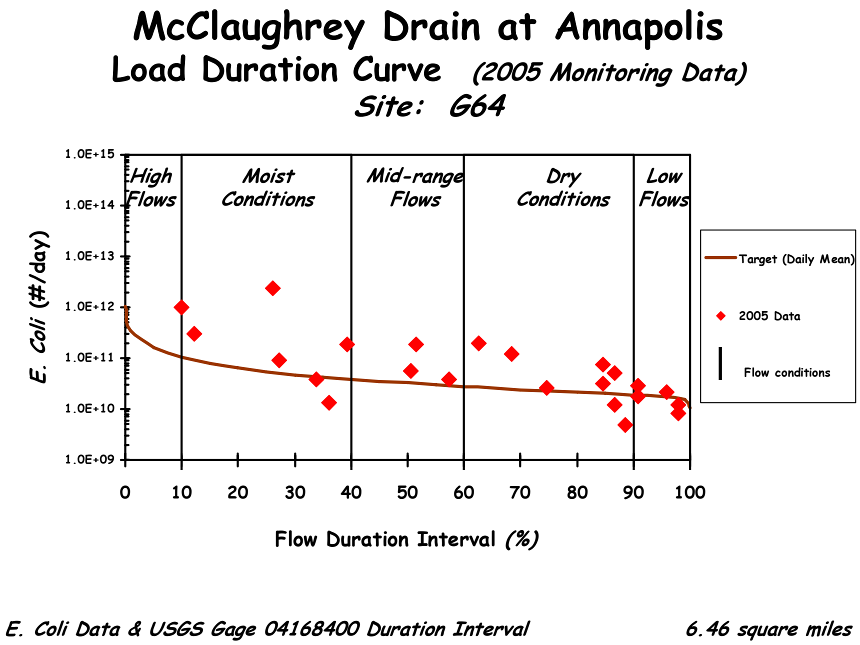


Figure J-12

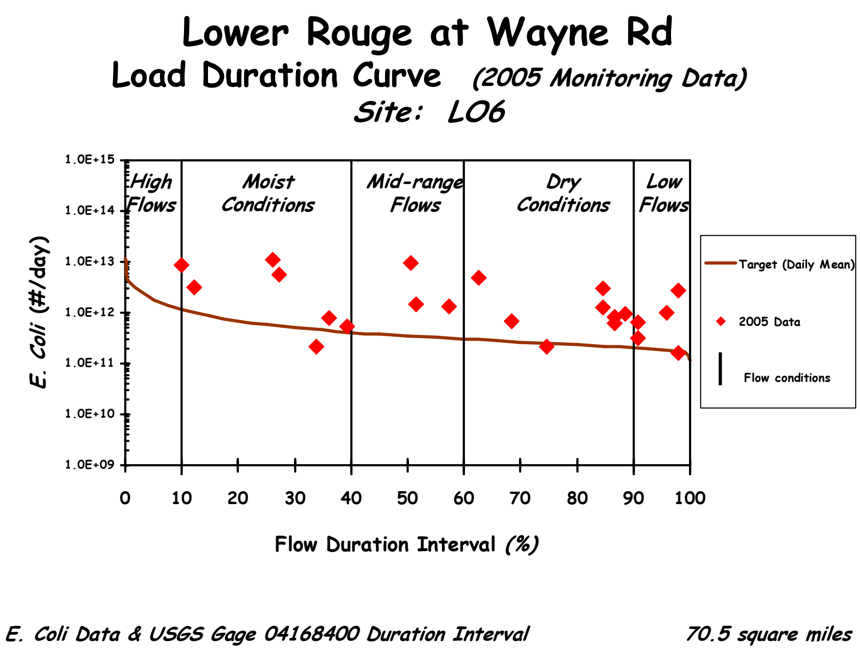


Figure J-13

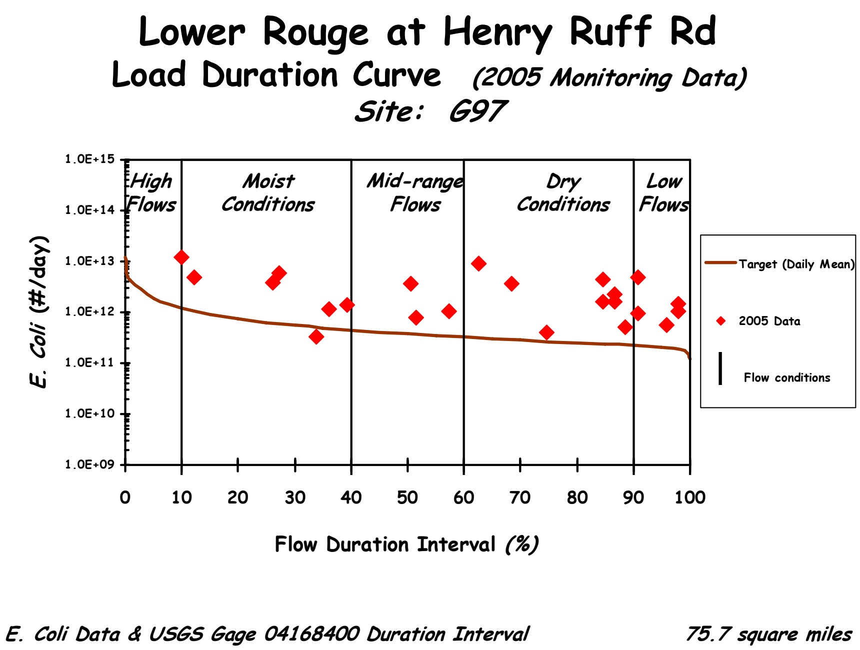


Figure J-14

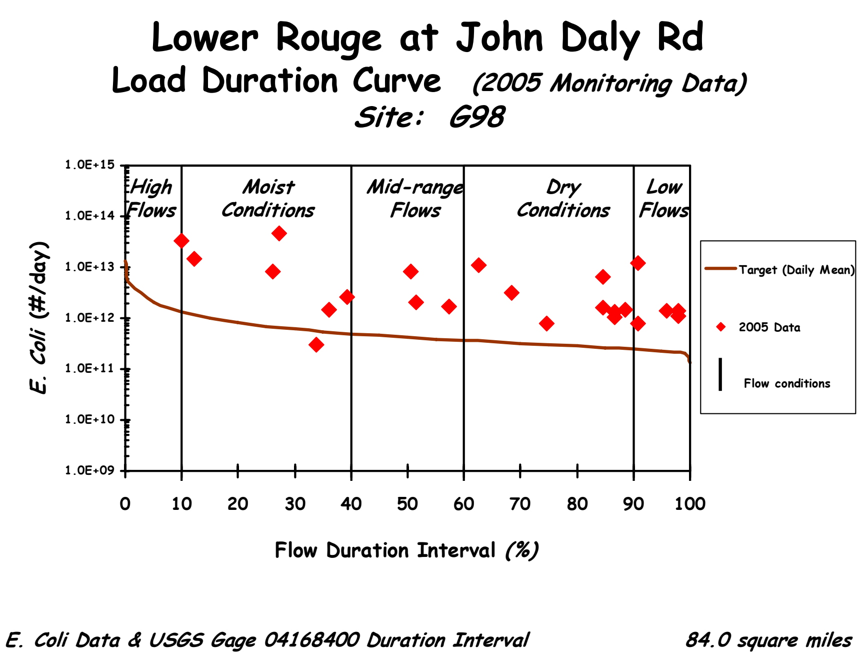
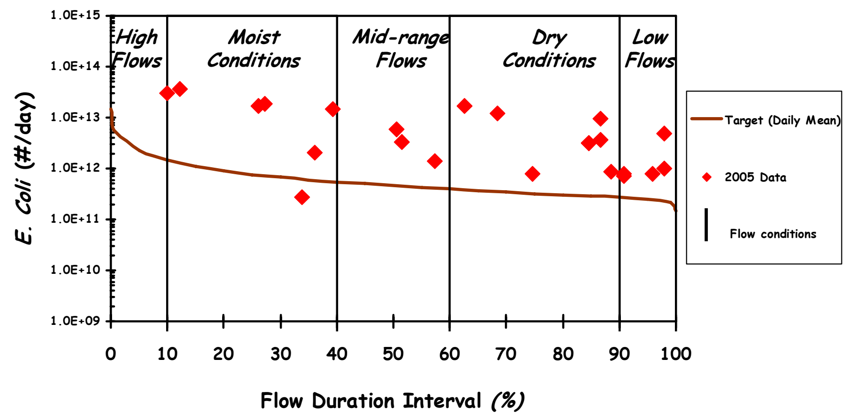


Figure J-15

Lower Rouge at Military Rd

Load Duration Curve *(2005 Monitoring Data)*

Site: L05D



E. Coli Data & USGS Gage 04168400 Duration Interval *91.2 square miles*

APPENDIX K

LOAD DURATION CURVES
ROUGE RIVER
1994-2004 ARC/RPO DATA

Figure K-1

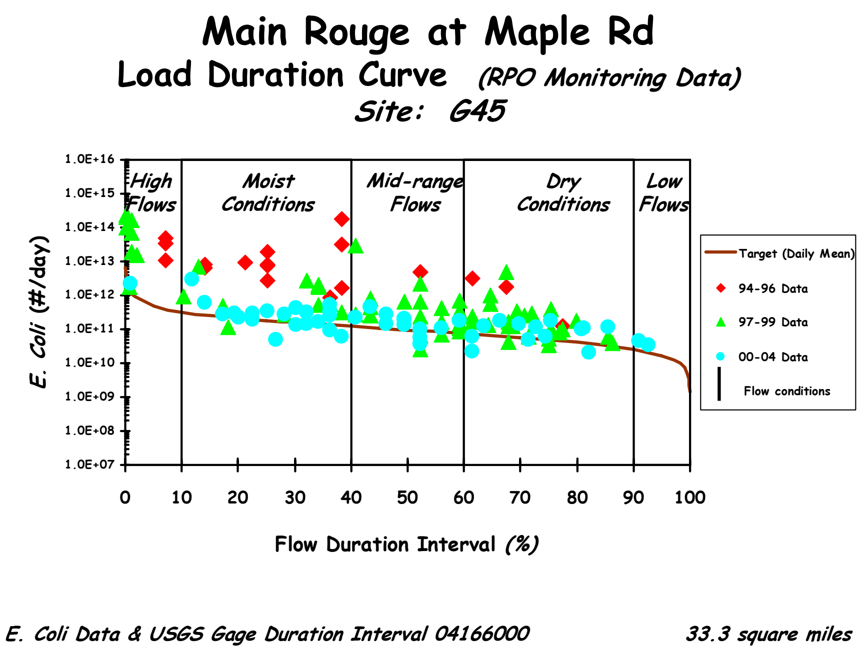


Figure K-2

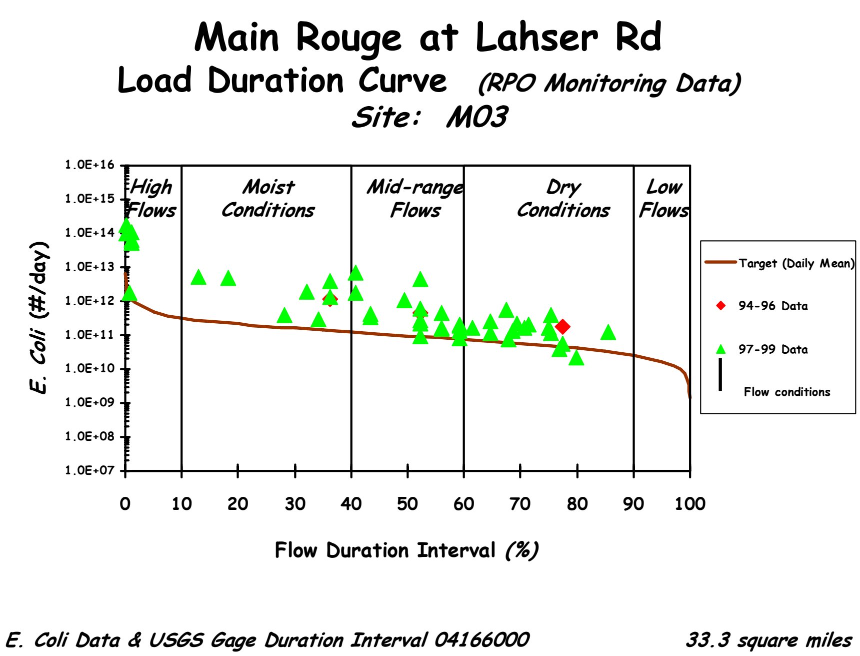
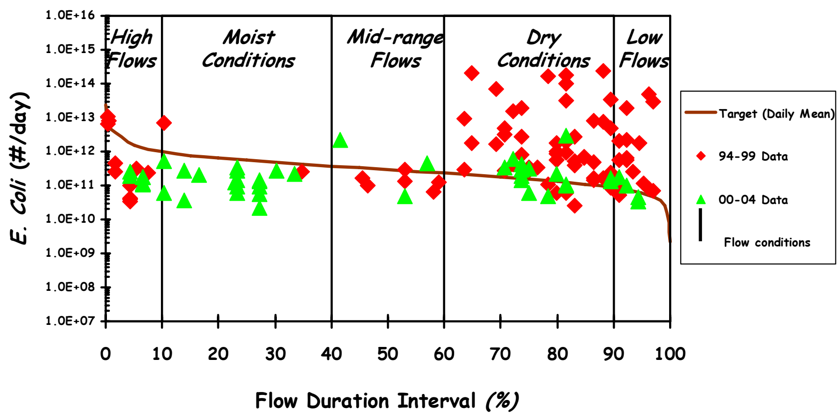


Figure K-3

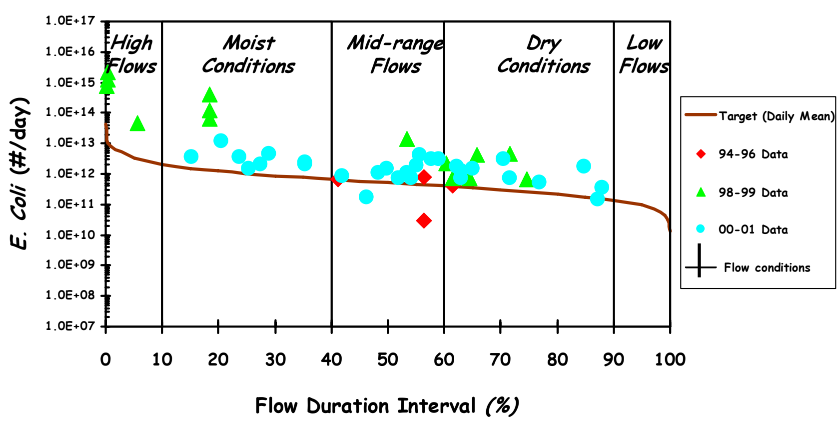
Main Rouge at Beech Road
Load Duration Curve *(RPO Monitoring Data)*
Site: US5



E. Coli Data & USGS Gage Duration Interval 04166100 *87.9 square miles*

Figure K-4

Main Rouge at Plymouth Rd
Load Duration Curve *(RPO Monitoring Data)*
Site: US7



E. Coli Data & USGS Gage Duration Interval 04166500 *187 square miles*

Figure K-5

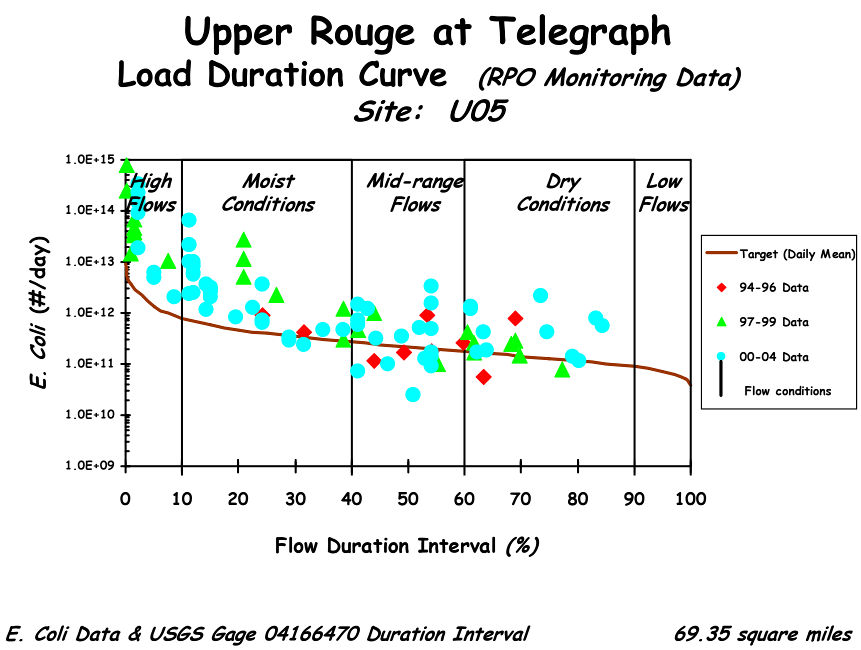


Figure K-6

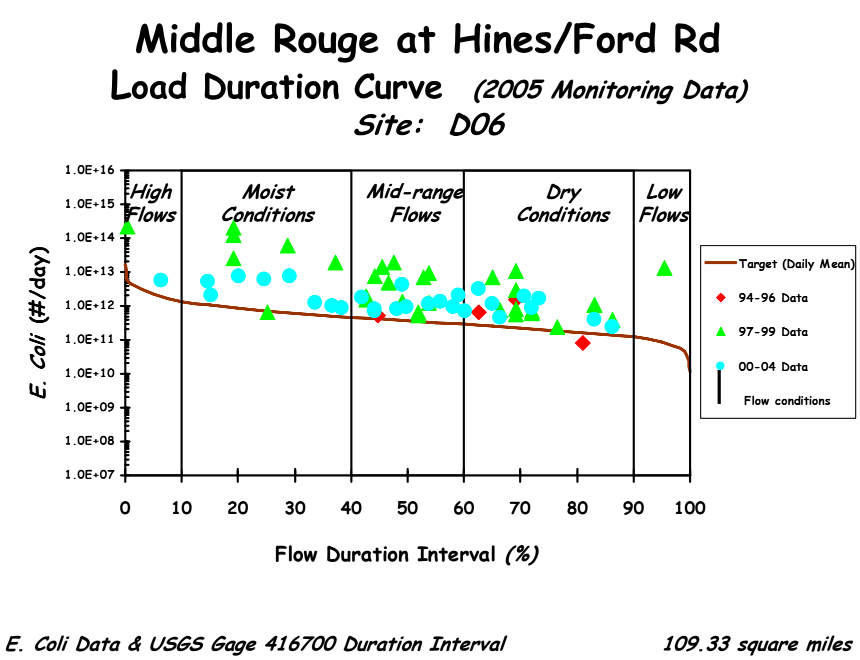
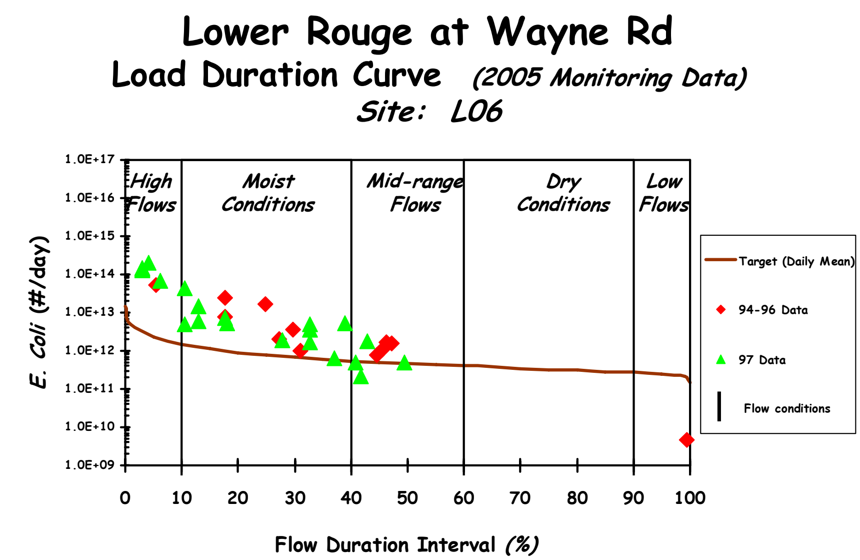
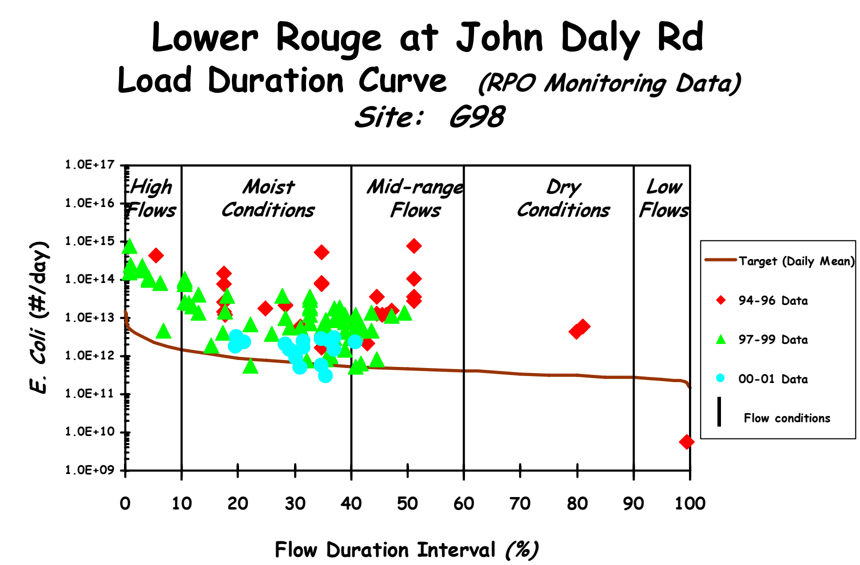


Figure K-7



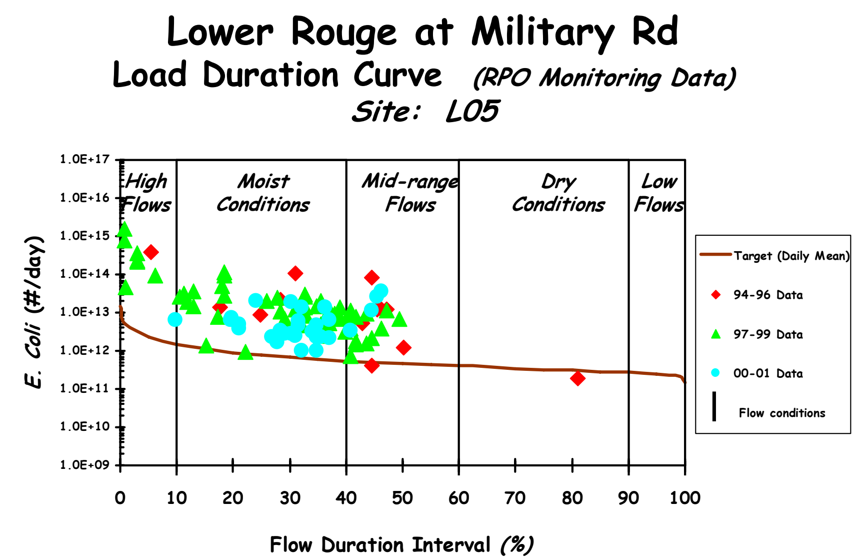
E. Coli Data & USGS Gage 04168000 Duration Interval *70.5 square miles*

Figure K-8



E. Coli Data & USGS Gage 04168000 Duration Interval *84.0 square miles*

Figure K-9



E. Coli Data & USGS Gage 04168000 Duration Interval *91.2 square miles*

APPENDIX L

NPDES PERMITTED DISCHARGES
TO THE
ROUGE RIVER

Table L-1
Individual permits and Certificates of Coverage in the Main Branch Rouge River watershed.

Facility	Number	County	Latitude	Longitude	Receiving Water
Individual Permit					
MDOT MS4	MI0057364	Statewide	---	---	---
***St Marys Cement Co**	MI0004243	Wayne	42.2833	-83.1367	River Rouge
Detroit WWTP	MI0022802	Wayne	42.2842	-83.1281	---
River Rouge CSO RTB	MI0028819	Wayne	42.2792	-83.1314	River Rouge
Birmingham CSO RTB	MI0025534	Oakland	42.5406	-83.2281	River Rouge
Oakland Co-Acacia Park CSO RTB	MI0037427	Oakland	42.5231	-83.2456	River Rouge
*Severstal North America Inc	MI0043524	Wayne	42.2978	-83.1578	River Rouge
*Double Eagle Steel Coating Co	MI0044415	Wayne	42.3119	-83.1583	River Rouge
Bloomfield Village CSO RTB	MI0048046	Oakland	42.5367	-83.2467	---
Dearborn Ind Generation Plt	MI0056235	Wayne	42.3053	-83.1528	River Rouge
*Carmeuse Lime-River Rouge	MI0057126	Wayne	42.2792	-83.1292	River Rouge
Dearborn CSO Const Dewatering	MI0057738	Wayne	42.3064	-83.2156	River Rouge
Dearborn CSO Const Dewater 2	MI0057886	Wayne	42.3	-83.1997	River Rouge
*Triton Petroleum-Detroit	MI0058068	Wayne	42.2817	-83.1419	River Rouge
General Permit MIG080000	Wastewater from Cleanup of Water Contaminated by Gasoline & Related Petroleum Products				
BP Products NA Inc-River Rouge	MIG080778	Wayne	42.2767	-83.1248	---
BP Products NA Inc-River Rouge	MIG670081	Wayne	42.2767	-83.1248	---
Norfolk Southern RR-Detroit	MIG081017	Wayne	42.2792	-83.1667	River Rouge
Sunoco-River Rouge Term	MIG081067	Wayne	42.2954	-83.1539	River Rouge
Michigan Fuels Inc	MIG081075	Oakland	42.4812	-83.2857	River Rouge
General Permit MIG250000	Non Contact Cooling Water				
Ford-Rouge Mfg Complex	MIG250460	Wayne	42.3058	-83.1639	River Rouge
General Permit MIG619000	Municipal Separate Storm Sewer System				
Beverly Hills MS4-Oakland	MIG610005	Oakland	42.5253	-83.2642	---
Bingham Farms MS4-Oakland	MIG610006	Oakland	42.5069	-83.2856	---
Lathrup Village MS4-Oakland	MIG610013	Oakland	42.5031	-83.2225	---
Allen Park MS4-Wayne	MIG610020	Wayne	42.2447	-83.2222	---
W Bloomfield Twp MS4-Oakland	MIG610022	Oakland	42.5639	-83.3611	---
Pontiac MS4 - Oakland	MIG610023	Oakland	---	---	---
Bloomfield Twp MS4-Oakland	MIG610026	Oakland	42.5603	-83.2992	---
Southfield MS4-Oakland	MIG610027	Oakland	42.4883	-83.2861	---
Auburn Hills MS4 - Oakland	MIG610031	Oakland	---	---	---
Franklin MS4-Oakland	MIG610041	Oakland	42.5000	-83.3083	---
Oakland County MS4	MIG610042	Oakland	---	---	---
Birmingham MS4-Oakland	MIG610044	Oakland	42.5417	-83.2208	---
Troy MS4-Oakland	MIG610053	Oakland	---	---	---
Rochester PS	MIG610250	Oakland	---	---	---
Orchard Lake MS-Oakland	MIG610270	Oakland	---	---	---
Rochester Hills MS4-Oakland	MIG610283	Oakland	---	---	---
Bloomfield Hills MS4-Oakland	MIG610284	Oakland	---	---	---
Oak Park MS4-Oakland	MIG610285	Oakland	---	---	---
Avondale PS MS4-Oakland	MIG610294	Oakland	---	---	---
General Permit MIS040000	Storm Water Discharges from Municipal Separate Storm Sewer Systems (MS4s) with Controls				
Dearborn PS MS4-Wayne	MIS040012	Wayne	---	---	---
West Bloomfield PS MS4-Oakland	MIS040014	Oakland	---	---	---
Bloomfield Hills PS MS4-Oakland	MIS040048	Oakland	---	---	---
Melvin-N AP PS MS4-Wayne	MIS040052	Wayne	---	---	---
Wayne-Westland PS MS4-Wayne	MIS040060	Wayne	---	---	Rouge River
Detroit MS4-Wayne	MIS040066	Wayne	---	---	Rouge River
Henry Ford Comm Coll MS4-Wayne	MIS040067	Wayne	---	---	Rouge River
Birmingham PS	MIS040072	Oakland	---	---	---
Southfield PS	MIS040074	Oakland	---	---	---

Facility	Number	County	Latitude	Longitude	Receiving Water
River Rouge	MIS040079	Wayne	---	---	---
General Permit MIS210000	Storm Water Discharges From Industrial Activities				
Arlans Manufacturing	MIS210290	Oakland	42.4442	-83.2781	Rouge River
Wisne Center-Southfield	MIS210293	Oakland	42.4444	-83.2781	Rouge River
Progressive Tool & Industries	MIS210299	Oakland	42.4456	-83.2781	Rouge River
Angelo Iafrate-Southfield	MIS210301	Oakland	42.4442	-83.2311	Rouge River
Waste Mgmt MI-Recycle America	MIS210303	Oakland	42.4442	-83.2386	Rouge River
Great Lakes Waste-Southfield	MIS210314	Oakland	42.4433	-83.2528	Rouge River
Waste Mgt of Mich-Detroit N	MIS210324	Oakland	42.4442	-83.2303	Rouge River
Dearborn Sausage Co	MIS210332	Wayne	42.3042	-83.1472	Rouge River
Levy-Clawson Concrete Plt 12	MIS210352	Oakland	42.4442	-83.2311	Rouge River
Owens Corning-Detroit	MIS210366	Wayne	42.2869	-83.1447	Rouge River
Yellow Freight System-Detroit	MIS210368	Wayne	42.2933	-83.1103	Rouge River
Mich Foundation Co-Wayne Plt 4	MIS210374	Wayne	42.2686	-83.4161	Rouge River
Peterson Spring-Southfield	MIS210391	Oakland	42.4458	-83.2781	Rouge River
USG Corp-River Rouge	MIS210411	Wayne	42.2792	-83.1319	Rouge River
Carmeuse Lime-Detroit	MIS210438	Wayne	42.2958	-83.1511	Rouge River
Smart-Inkster	MIS210441	Wayne	42.2847	-83.3358	Rouge River
DHL Express-Southfield	MIS210586	Oakland	42.4478	-83.2531	River Rouge
Crystal Auto Parts-Dearborn	MIS210655	Wayne	42.3189	-83.1642	Rouge River
Ford-Rouge Mfg Complex	MIS210753	Wayne	42.3058	-83.1639	Rouge River
Superior Mtls-Plt 17-Detroit	MIS210782	Wayne	42.3582	-83.097	Rouge River
Detroit Diesel Corporation	MIS210789	Wayne	42.4393	-83.2075	Rouge River
Bernal Inc-Rochester Hills	MIS210812	Oakland	42.6358	-83.1953	Sprague Branch
A Raymond Inc-Rochester Hills	MIS210813	Oakland	42.6414	-83.1942	Sprague Branch
Saturn Electronics Corp	MIS210845	Wayne	42.2226	-83.3249	Rouge River
X-Cel Industries Inc	MIS210857	Oakland	42.4446	-83.2803	Trib to Rouge River
International Wholesale Inc	MIS210880	Oakland	42.4455	-83.2469	Owens Drain
General Permit MIS220000	Storm Water Discharges with Required Monitoring				
Great Lakes Agg-River Rouge	MIS220028	Wayne	42.2661	-83.1286	River Rouge

Table L-2

Individual permits and Certificates of Coverage in the Upper Rouge River watershed.

Facility	Number	County	Latitude	Longitude	Receiving Water
Individual Permit					
MDOT MS4	MI0057364	Statewide	---	---	---
Commerce Twp WWTP	MI0025071	Oakland	42.5458	-83.4625	---
Wayne Co/RDFrd/Livonia CSO	MI0051535	Wayne	42.4061	-83.2947	Upper River Rouge
General Permit MIG080000	Wastewater from Cleanup of Water Contaminated by Gasoline & Related Petroleum Products				
Speedway SuperAmerica 2236	MIG081070	Oakland	42.4636	-83.364	---
Diversified Fuels – Livonia	MIG081086	Wayne	42.3831	-83.3736	River Rouge
General Permit MIG250066	Non contact cooling water				
Robert Bosch Corp	MIG250066	Oakland	42.4914	-83.4233	---
General Permit MIG619000	Municipal Separate Storm Sewer System				
Farmington MS4-Oakland	MIG610010	Oakland	42.4683	-83.3872	---
Farmington Hills MS4-Oakland	MIG610011	Oakland	42.4828	-83.3919	---
Livonia MS4-Wayne	MIG610015	Wayne	42.3917	-83.35	---
Redford Twp MS4-Wayne	MIG610016	Wayne	42.4028	-83.2953	---
Commerce Twp MS4-Oakland	MIG610033	Oakland	---	---	---
Wayne Co MS4	MIG610040	Wayne	42.4083	-83.2917	---
General Permit MIS040000	Storm Water Discharges from Municipal Separate Storm Sewer Systems (MS4s) with Controls				
Farmingto Hill PS MS4-Oakland	MIS040047	Oakland	---	---	---
Livonia PS MS4-Wayne	MIS040054	Wayne	---	---	---
General Permit MIS210000	Storm water discharges from industrial activities				
Specialty Steel Treating-FHill	MIS210007	Oakland	42.4408	-83.3564	Upper Rouge River
Trend Tool Inc-Livonia	MIS210268	Wayne	42.3728	-83.3664	Shaw Drain
Prince Industries-Livonia	MIS210270	Wayne	42.3728	-83.3689	Shaw Drain
Sure Fit Metal Products	MIS210288	Wayne	42.38	-83.3458	Shaw Drain
Diamond Automation	MIS210294	Oakland	42.4614	-83.4344	Upper River Rouge
Washers Inc-Livonia	MIS210295	Wayne	42.3767	-83.3697	Belle Branch
BASF Corp-Livonia	MIS210296	Wayne	42.3775	-83.4017	Barlow Drain
Corrigan-Farmington Hills	MIS210305	Oakland	42.4639	-83.4286	Walled Lake
GM-Powertrain Div-Livonia	MIS210318	Wayne	42.3761	-83.3331	Shaw Drain
US Fabricating-Walled Lake	MIS210333	Oakland	42.5408	-83.4378	Seeley Drain
Quality Metalcraft Inc	MIS210342	Wayne	42.3767	-83.3681	Shaw Drain
Standard Die & Fabricating Inc	MIS210345	Wayne	42.3772	-83.3881	Barlow Drain
Kopacz Industrial Painting Inc	MIS210346	Wayne	42.3744	-83.3528	Shaw Drain
Sales & Engineering-Livonia	MIS210347	Wayne	42.3797	-83.3681	Shaw Drain
Fittings Prod Co-Livonia	MIS210349	Wayne	42.3772	-83.3139	Bell Branch
US Postal Service-Livonia	MIS210361	Wayne	42.3697	-83.3522	Shaw Drain
UPS-Livonia	MIS210362	Wayne	42.3831	-83.3381	Rouge River
Argent Limited-Livonia	MIS210370	Wayne	42.3714	-83.3644	Shaw Drain
Tru-Line-31100 Industrial	MIS210377	Wayne	42.3789	-83.3461	Shaw Drain
Tru-Line-30844 Industrial	MIS210378	Wayne	42.3806	-83.345	Shaw Drain
Tru-Line-30622 Industrial	MIS210379	Wayne	42.3806	-83.3431	Shaw Drain
Dept Army-AMSA 134G	MIS210382	Wayne	42.3817	-83.3828	Barlow Drain
Giffin-Farmington Hills	MIS210389	Oakland	42.4606	-83.4278	Upper River Rouge
ATW-Adv Tech & Testing-Livonia	MIS210394	Wayne	42.3789	-83.3789	Barlow Drain
Ductile Chrome Process-Livonia	MIS210414	Wayne	42.3794	-83.3461	Rouge River
Williams Panel Brick-Detroit	MIS210417	Wayne	42.4419	-83.3139	Upper River Rouge
Cass Erectors-Livonia	MIS210422	Wayne	42.3792	-83.3789	Barlow Drain
Ryan Transportation	MIS210440	Wayne	42.3728	-83.3722	Shaw Drain
Ideal Fabricators-Livonia	MIS210537	Wayne	42.3825	-83.3453	Shaw Drain
Fendt Builders-Farmington	MIS210587	Oakland	42.4525	-83.3858	Tarabusi Creek
City of Livonia DPS-Livonia LF	MIS210590	Wayne	42.3769	-83.3664	Shaw Drain
MSD Stamping LLC-Livonia	MIS210591	Wayne	42.3728	-83.37	Shaw Drain
O Keller Tool Engineering Co	MIS210593	Wayne	42.3772	-83.3139	Bell Branch

Facility	Number	County	Latitude	Longitude	Receiving Water
General Permit MIS210000	Storm water discharges from industrial activities				
Trio Tool Co-Livonia	MIS210596	Wayne	42.3817	-83.3822	Barlow Drain
Dedoes Industries-Walled Lake	MIS210597	Oakland	42.5378	-83.4781	Seeley Drain
Williams Diversified-Livonia	MIS210602	Wayne	42.3781	-83.3528	Shaw Drain
Quigley Industries-Farm Hills	MIS210626	Oakland	42.4706	-83.4297	Walled Lake
Metaldyne-Farmington Hills	MIS210640	Oakland	42.4728	-83.4186	Upper River Rouge
CSM Manufacturing Corp-Plt 1	MIS210642	Oakland	42.4711	-83.4247	Walled Lake
State Fabricators Inc	MIS210656	Oakland	42.4411	-83.3461	Upper Rouge River
Wayne Craft-Livonia	MIS210666	Wayne	42.3803	-83.3886	Barlow Drain
Lockwood Manufacturing-Livonia	MIS210667	Wayne	42.3778	-83.3456	River Rouge
Chemical Systems Corp-Livonia	MIS210671	Wayne	42.3772	-83.3886	Barlow Drain
Piedmont Concrete Inc	MIS210675	Oakland	42.4411	-83.3397	Upper River Rouge
Carlesimo Products Inc	MIS210682	Oakland	42.4411	-83.3383	Upper Rouge River
Quality Metalcraft-Livonia	MIS210683	Wayne	42.3767	-83.3697	Bell Branch
TAG Mfg-Farmington Hills	MIS210691	Oakland	42.4642	-83.4211	Tarabusi Creek
Producto Chemicals	MIS210714	Wayne	42.38	-83.3458	Bell Branch
A & J Precision Inc	MIS210762	Oakland	42.4592	-83.4225	Tarabusi Creek
Microheat Inc-Farmington Hills	MIS210769	Oakland	42.4956	-83.4197	Seeley Drain
Country Fresh LLC-Livonia	MIS210780	Wayne	42.3711	-83.3558	Shaw Drain
Tramar Industries-Redford	MIS210810	Wayne	42.3803	-83.2906	Bell Branch
Autotek Sealants Inc	MIS210843	Oakland	42.4588	-83.4321	River Rouge
Gehring LP	MIS210858	Oakland	42.4782	-83.3943	Upper Rouge River
Quality Metalcraft Inc-Livonia	MIS210868	Wayne	42.3775	-83.3702	Hawkins Drain
General Permit MIS710000	Storm water from municipally operated industrial activity				
Commerce Twp WWTP	MIS710004	Oakland	42.5458	-83.4625	trib to Greenaway Dr

Table L-3

Individual permits and Certificates of Coverage in the Middle Rouge River watershed.

Facility	Number	County	Latitude	Longitude	Receiving Water
Individual Permit					
MDOT MS4	MI0057364	Statewide	---	---	---
Oakland Co Walled Lk/Novi WWTP	MI0024287	Oakland	42.5086	-83.4978	---
Wayne Co-Lift Station 1A	MI0026123	Wayne	42.3292	-83.2486	Walled Lake Branch
***Onyx Arbor Hills LF**	MI0045713	Wayne	42.4014	-83.5458	Johnson Drain
Wayne Co/Dearborn Heights CSO	MI0051489	Wayne	42.3444	-83.2731	Walled Lake Branch
Redford Twp CSO	MI0051829	Wayne	42.3675	-83.2756	Drain
Salem Twp WWTP	MI0054798	Washtenaw	42.3994	-83.5781	Johnson Drain
CECO-Northville Compressor	MI0058016	Wayne	42.4322	-83.5514	Sump Drain
General Permit MIG080000	Wastewater from Cleanup of Water Contaminated by Gasoline & Related Petroleum Products				
Buckeye Pipeline-Plymouth	MIG080782	Wayne	42.3897	-83.4383	River Rouge
Falcon Center GWCU	MIG081027	Wayne	42.3533	-83.4519	---
Diversified Fuels-Northville	MIG081077	Oakland	42.4374	-83.493	---
General Permit MIG250000	Non Contact Cooling Water				
Detroit Diesel Corp	MIG250058	Wayne	42.3758	-83.2694	---
Rock Tool & Machine-Plymouth	MIG250484	Wayne	42.3858	-83.5029	Walled Lake Branch
General Permit MIG619000	Municipal Separate Storm Sewer System				
Westland MS4-Wayne	MIG610001	Wayne	42.3167	-83.3736	---
Dearborn Heights MS4-Wayne	MIG610009	Wayne	42.3256	-83.3014	---
Garden City MS4-Wayne	MIG610012	Wayne	42.3206	-83.3425	---
Northville MS4-Oakland	MIG610024	Oakland	42.4375	-83.4875	---
Northville Twp MS4-Wayne	MIG610025	Oakland	42.4361	-83.4806	---
Walled Lake MS4-Oakland	MIG610028	Oakland	---	---	---
Novi MS4-Oakland	MIG610030	Oakland	42.4656	-83.4428	---
Plymouth MS4-Wayne	MIG610032	Wayne	42.3681	-83.4528	---
Lyon Twp MS4-Oakland	MIG610034	Oakland	---	---	---
Wixom MS4-Oakland	MIG610035	Oakland	---	---	---
Plymouth Twp MS4-Wayne	MIG610038	Wayne	42.3875	-83.4708	---
Plymouth-Canton PS MS4-Wayne	MIG610343	Wayne	---	---	---
General Permit MIS040000	Storm Water Discharges from Municipal Separate Storm Sewer Systems (MS4s)				
Wayne-Westland PS MS4-Wayne	MIS040060	Wayne	---	---	Tonquish Creek
			---	---	
Novi Twp MS4-Oakland	MIS040061	Oakland			Thornton Creek
Salem Twp MS4-Washtenaw	MIS040068	Washtenaw	---	---	---
Novi PS	MIS040076	Oakland	---	---	---
Northville PS	MIS040076	Oakland	---	---	---
General Permit MIG670000	Hydrostatic Pressure Test Water				
CECO - Newburgh Rd Pipeline	MIG670325	Wayne	42.4042	-83.4875	Walled Lake Branch
General Permit MIS210000	Storm Water Discharges From Industrial Activities				
Baron Drawn Steel Corp-Canton	MIS210006	Wayne	42.3431	-83.4542	Rouge River
Corrigan Moving Systems-Novi	MIS210009	Oakland	42.4847	-83.4936	Walled Lake
Koenig Fuel-Plymouth Yard	MIS210256	Wayne	42.3714	-83.2753	Ashcroft-Sherwood Drain
C & B Machiner-Livonia	MIS210269	Wayne	42.3697	-83.4094	Middle River Rouge
Nagle Paving Co-Livonia	MIS210282	Wayne	42.3747	-83.4053	Middle Rouge River
Metaltec Steel Abrasive-Canton	MIS210286	Wayne	42.3517	-83.4467	Deer Drain
Wisne Automation & Engineering	MIS210292	Oakland	42.4664	-83.4661	Walled Lake
Lacy Tool-Novi	MIS210298	Oakland	42.4733	-83.445	Bishop Creek
Ajax Materials-Plt 5	MIS210300	Wayne	42.3542	-83.3125	Sherman Drain
Temperform Corp-Novi	MIS210306	Oakland	42.4767	-83.4744	Walled Lake
Plymouth Plating Works	MIS210307	Wayne	42.35	-83.4583	Tonquish Creek
Spartan Distribution-Plymouth	MIS210310	Wayne	42.355	-83.4447	Tonquish Creek
Xmation	MIS210313	Oakland	42.4664	-83.4689	Walled Lake
Lyon Manufacturing-Livonia	MIS210316	Wayne	42.3778	-83.4119	Middle River Rouge
Vico Products-Plymouth	MIS210317	Wayne	42.3589	-83.4508	Tonquish Creek
Baron Drawn Steel Corporation	MIS210320	Wayne	42.3489	-83.4531	Tonquish Creek

Facility	Number	County	Latitude	Longitude	Receiving Water
Polynorm Automotive-Novi	MIS210330	Oakland	42.4839	-83.4894	Walled Lake
Fendt Transit Mix-Novi	MIS210334	Oakland	42.4783	-83.4761	Walled Lake
Accum-Matic Systems Livonia	MIS210335	Wayne	42.3711	-83.3669	Middle Rouge River
Tower Automotive Inc	MIS210336	Wayne	42.3825	-83.4775	Middle River Rouge
Packaging Corp Amer-Plymouth	MIS210340	Wayne	42.3822	-83.4806	Tonquish Creek
E & E Manufacturing-Plymouth	MIS210343	Wayne	42.3725	-83.4483	Middle Rouge River
Hercules Drawn Steel Corp	MIS210348	Wayne	42.3742	-83.4264	Newburgh Lake
CSX Transportation-Plymouth	MIS210364	Wayne	42.3797	-83.4678	Middle Rouge River
General Permit MIS210000	Storm Water Discharges From Industrial Activities				
Cadillac Asphalt-Plt 3A-Wixom	MIS210392	Oakland	42.4964	-83.4503	Novi Lyon Drain
AAA Industries-Detroit	MIS210405	Wayne	42.3764	-83.2792	Middle Rouge River
Applied Process-Livonia	MIS210413	Wayne	42.3733	-83.4114	Middle Rouge River
National Concrete Products	MIS210415	Wayne	42.3625	-83.4583	Tonquish Creek
Sun Plastic Coating-Plymouth	MIS210421	Wayne	42.3564	-83.4597	Tonquish Creek
Plastomer Corp-Livonia	MIS210423	Wayne	42.3808	-83.4147	Patter Drain
Nat Block Co-Westland	MIS210431	Wayne	42.3236	-83.4239	Willow Creek
Mcgean-Rohco Inc	MIS210432	Wayne	42.3811	-83.4228	Gunn Branch
Ford-Livonia-Transmission Plt	MIS210444	Wayne	42.3678	-83.3992	Middle River Rouge
E & E Mfg Co-Plymouth	MIS210522	Wayne	42.3722	-83.4486	Middle Rouge River
Unco Automotive Products	MIS210531	Wayne	42.3694	-83.4092	Middle River Rouge
Mich Truck Parts-Westland	MIS210538	Wayne	42.3236	-83.4203	Willow Creek
Gil-Mar Mfg-Canton	MIS210553	Wayne	42.3442	-83.4528	Tonquish Creek
Automotive Comp Hold-Sheldon	MIS210588	Wayne	42.3533	-83.4716	Tonquish Creek
NSS Ind-Plymouth	MIS210592	Wayne	42.3544	-83.4542	Tonquish Creek
Westside Flame Hardening	MIS210611	Wayne	42.3297	-83.4175	Tonquish Creek
Plymouth Concrete Inc	MIS210617	Wayne	42.3797	-83.4692	Middle Rouge River
Dynamic Metal Treating-Canton	MIS210619	Wayne	42.3431	-83.4522	Tonquish Creek
Guardian Manufacturing-Livonia	MIS210633	Wayne	42.3719	-83.4017	Middle River Rouge
Tony Angelo-Heltzel 902TA	MIS210636	Oakland	42.4886	-83.5103	various
Tony Angelo-Heltzel 902 BC	MIS210637	Oakland	42.4886	-83.5103	various
Tony Angelo-Rex Model S	MIS210638	Oakland	42.4886	-83.5103	various
Tony Angelo-Heltzel 1000	MIS210639	Oakland	42.4886	-83.5103	various
NSS Ind-Ronda Plt	MIS210641	Wayne	42.3458	-83.4528	Tonquish Creek
Northfield Mfg Inc-Westland	MIS210647	Wayne	42.3269	-83.4211	Willow Creek
Tony Angelo-Hagan Model	MIS210662	Oakland	42.4886	-83.5103	various
AAR Cargo Systems-Livonia	MIS210672	Wayne	42.3772	-83.3139	Livonia storm sewer
Global CNC Industries	MIS210677	Wayne	42.3689	-83.4092	Rouge River
Key Plastics-Plymouth	MIS210681	Wayne	42.3731	-83.4372	Middle Rouge River
Inch Memorials-Northville	MIS210685	Wayne	42.4247	-83.4742	Johnson Drain
Webasto Roof-Livonia	MIS210692	Wayne	42.3786	-83.4092	Gunn Branch
General Filters Inc-Novi	MIS210696	Oakland	42.4819	-83.4803	Rouge River
General Permit MIS210000	Storm Water Discharges From Industrial Activities				
Fed Ex Ground	MIS210709	Wayne	42.3742	-83.4222	Newburgh Lake
Precision Com	MIS210725	Wayne	42.3947	-83.4992	Tonquish Creek
Great Lakes Agg-Northville	MIS210732	Washtenaw	42.4111	-83.5725	Rouge River
Novi Industries-Autotech	MIS210748	Oakland	42.4825	-83.4831	Walled Lake
Biologix-Novi	MIS210759	Oakland	42.4824	-83.4881	Walled Lake Branch
Spring Engin & Mfg-Canton	MIS210761	Wayne	42.3417	-83.4569	Tonquish Creek
Owens Corning Automotive-Novi	MIS210763	Oakland	42.5002	-83.5039	Walled Lake
Veolia ES Arbor Hills Landfill	MIS210766	Washtenaw	42.3975	-83.5508	nnamed trib to Johnson D
GDM Tool & Mfg-Canton	MIS210771	Wayne	42.3464	-83.4574	Tonquish Creek
AW Transmission Engineering	MIS210772	Wayne	42.3926	-83.5078	Middle Rouge River
Durr Industries-Rouge River	MIS210776				
J L Becker Co-Plymouth	MIS210778	Wayne	42.3539	-83.447	Tonquish Creek
Shiloh Ind-Canton-Haggerty	MIS210796	Wayne	42.3381	-83.4500	Tonquish Creek
AW Transmission Eng-Plymouth	MIS210797	Wayne	42.3926	-83.5078	med tributary to Tonquish
4 M Industries-Livonia	MIS210802	Wayne	42.3736	-83.3799	Ryder Drain
First Tech Safety Sys-Plymouth	MIS210806	Wayne	42.4366	-83.4511	Tonquish Creek

Facility	Number	County	Latitude	Longitude	Receiving Water
Frito-Lay-Great Lakes Facility	MIS210822	Wayne	42.3875	-83.4875	Tonquish Creek
Schuler	MIS210830	Wayne	42.3475	-82.8856	Tonquish Creek
LOC Performance Prod-Plymouth	MIS210835	Wayne	42.3791	-83.4482	Middle River Rouge
J & J Machine Products	MIS210855	Wayne	42.3755	-83.3117	Rouge River
US Farathane-Plymouth	MIS210859	Wayne	42.3858	-83.5029	Tonquish Creek
Durcon Laboratory Tops Inc	MIS210860	Wayne	42.343	-83.4524	Koss Drain
Durcon Laboratory Tops Inc	MIS210860	Wayne	42.343	-83.4524	Rouge River
Durcon Laboratory Tops Inc	MIS210860	Wayne	42.343	-83.4524	Tonquish Creek
Master Automatic Inc-Plymouth	MIS210870	Wayne	42.3903	-83.4389	Rouge River
Hayes Trucking Facility	MIS210881	Oakland	42.4898	-83.4835	Walled Lake Branch
Hayes Portable Crusher	MIS210882	Oakland	42.4898	-83.4835	various receiving waters
Rock Tool & Machine-Plymouth	MIS210883	Wayne	42.3858	-83.5029	Tramp Hollow Drain
General Permit MIS220000	Storm Water Discharges with Required Monitoring				
AVL North America Inc	MIS220038	Wayne	42.3819	-83.5125	Tonquish Creek
General Permit MIS319000	Storm Water Discharges From Industrial Activities				
Waste Mgt of Mich-Romulus	MIS310278	Wayne	42.1614	-83.3053	Sherman Drain
General Permit MIS710000	Storm water from municipally operated industrial activity				
Oakland Co Walled Lk/Novi WWTP	MIS710020	Oakland	42.5086	-83.4978	Fenley Drain

Table L-4
Individual permits and Certificates of Coverage in the Lower Rouge River watershed.

Facility	Number	County	Latitude	Longitude	Receiving Water
Individual Permit					
MDOT MS4	MI0057364	Statewide	---	---	---
Dearborn CSO	MI0025542	Wayne	42.3125	-83.2125	River Rouge
YCUA Regional WWTP	MI0042676	Washtenaw	42.2236	-83.5531	Lower Rouge River
*****Ford-Wayne Assembly Plt	MI0046183	Wayne	42.2778	-83.4069	Lower Rouge River
Wayne Co/Inkster/Drbrn Hts CSO	MI0051462	Wayne	42.3017	-83.2906	Lower Rouge River
Wayne Co/Inkster CSO	MI0051471	Wayne	42.2967	-83.3092	Lower Rouge River
Inkster/Dearborn Heights CSO	MI0051837	Wayne	42.3008	-83.2958	Lower Rouge River
Visteon Headquarters-Van Buren	MI0057156	Wayne	42.2364	-83.4377	---
General Permit MIG250000	Non Contact Cooling Water				
Steel Technologies Inc	MIG250070	Wayne	42.2658	-83.4867	---
General Permit MIG619000	Municipal Separate Storm Sewer System				
Canton Twp MS4-Wayne	MIG610002	Wayne	42.3083	-83.4917	---
Superior Twp MS4-Washtenaw	MIG610003	Washtenaw	42.3083	-83.5875	---
Dearborn MS4-Wayne	MIG610008	Wayne	42.3039	-83.2431	---
Inkster MS4-Wayne	MIG610014	Wayne	42.2889	-83.3047	---
Romulus MS4-Wayne	MIG610017	Wayne	---	---	---
Wayne MS4-Wayne	MIG610019	Wayne	42.2786	-83.3719	---
Van Buren Twp MS4-Wayne	MIG610021	Wayne	---	---	---
Melvindale MS4-Wayne	MIG610029	Wayne	42.2917	-83.1708	---
Ypsilanti Twp MS4-Washtenaw	MIG610037	Washtenaw	---	---	---
Washtenaw CDC MS4	MIG610039	Washtenaw	---	---	---
Wayne Co MS4	MIG610040	Wayne	---	---	---
Washtenaw CRC MS4	MIG610314	Washtenaw	---	---	---
Willow Run Airport MS4	MIG610368	Wayne	---	---	---
General Permit MIS040000	Storm Water Discharges from Municipal Separate Storm Sewer Systems (MS4s)				
Van Buren PS MS4-Wayne	MIS040011	Wayne	---	---	---
General Permit MIG670000	Hydrostatic Pressure Test Water				
Buckeye Terminals-Detroit	MIG670079	Wayne	42.2811	-83.1419	Lower Rouge River
General Permit MIS210000	Storm Water Discharges From Industrial Activities				
Levy-Dearborn-Falcon Trucking	MIS210252	Wayne	42.3158	-83.1508	Lower Rouge River
Levy-Dearborn-Stacy Trucking	MIS210253	Wayne	42.3106	-83.1406	Lower Rouge River
Levy-Detroit Plt 6	MIS210254	Wayne	42.2903	-83.1592	Lower Rouge River
Levy-Dearborn Plt 2	MIS210255	Wayne	42.3147	-83.1453	Baby Creek
Swiss American Screw	MIS210258	Wayne	42.2644	-83.4753	Yost Drain
Procoil-Canton	MIS210271	Wayne	42.2683	-83.4464	Lower Rouge River
Hajjar Plating-Wayne	MIS210285	Wayne	42.2667	-83.4125	Wilbur Drain
Weiser Recycling Inc	MIS210308	Wayne	42.2758	-83.3931	McClaughrey Drain
Levy-Clawson Concrete Plt 1	MIS210311	Wayne	42.2853	-83.1231	Lower Rouge River
Daikin Clutch Corp-Belleville	MIS210319	Wayne	42.24	-83.445	McClaughrey Drain
L & W Engineering Co-No 2	MIS210322	Wayne	42.2611	-83.4458	Bell Drain
Frito Lay-Allen Park	MIS210337	Wayne	42.2939	-83.1878	Lower Rouge River
Darling & Co-Melvindale	MIS210339	Wayne	42.4514	-83.1708	Lower Rouge River
Sauk Trail Hills	MIS210356	Wayne	42.2703	-83.4558	Lower Rouge River
Veolia ES Solid Waste Midwest	MIS210358	Wayne	42.3047	-83.1753	Lower Rouge River
Browning-Ferris-Wayne	MIS210365	Wayne	42.2669	-83.4089	Lower Rouge River
Causley Trucking-Melvindale	MIS210369	Wayne	42.2858	-83.1842	Lower Rouge River
Best Block Company-Canton	MIS210372	Wayne	42.27	-83.4872	Rouge River
Imperial Industries-Belleville	MIS210397	Wayne	42.2636	-83.4753	McKinstry Drain
AB Myr Industries-Belleville	MIS210399	Wayne	42.2625	-83.55	Belleville Lake
Norfolk Southern-Wayne	MIS210403	Wayne	42.2778	-83.4192	Bell Drain
Doan Companies-Inkster Plt	MIS210406	Wayne	42.2900	-83.3258	Lower Rouge River
GM-CPC-Romulus Engine	MIS210409	Wayne	42.2522	-83.4017	McClaughrey Drain
General Metal & Abrasive Co	MIS210412	Wayne	42.2514	-83.4142	McClaughrey Drain
Reilly Plating Co-Melvindale	MIS210418	Wayne	42.2806	-83.1708	Lower Rouge River

Facility	Number	County	Latitude	Longitude	Receiving Water
Linde Gas LLC-Canton	MIS210419	Wayne	42.2711	-83.4828	McKinstry Drain
Ford-Wayne Integral Stamping	MIS210420	Wayne	42.2783	-83.4103	Lower Rouge River
Plastipak Packaging	MIS210425	Wayne	42.3122	-83.4181	Hunter Drain
Waste Mgt-Woodland-Van Buren	MIS210435	Wayne	42.2656	-83.4264	Wilbur Drain
General Permit MIS210000	Storm Water Discharges From Industrial Activities				
H & H Metals-Inkster	MIS210437	Wayne	42.29	-83.3267	Lower Rouge River
Means Industries-Melvindale	MIS210540	Wayne	42.2753	-83.1931	Tyre Drain
US Postal Service-Allen Park	MIS210542	Wayne	42.2878	-83.2019	Allen Drain
Scrap Busters Auto & Truck	MIS210544	Wayne	42.2728	-83.4258	Bell Drain
Steel Technologies Inc	MIS210585	Wayne	42.2658	-83.4867	McKinstry Drain
L & W Engineering Co-No 1	MIS210600	Wayne	42.2561	-83.4456	Bell Drain
Galaxy Precision Products	MIS210601	Wayne	42.2667	-83.5042	Sines Drain
Broomes Auto Parts	MIS210643	Wayne	42.2733	-83.3994	McClaughrey Drain
Collins & Aikman-Westland Oper	MIS210648	Wayne	42.2972	-83.4072	Leng Drain
Bishop Auto Wrecking-Inkster	MIS210657	Wayne	42.2897	-83.3233	Lower Rouge River
Advanced Material Process	MIS210688	Wayne	42.2797	-83.3728	Lower Rouge River
NYX-Cherry Hill-Westland	MIS210764	Wayne	42.3067	-83.2884	Leng Drain
Powertrain Prod-Canton	MIS210791	Wayne	42.2625	-83.4375	Bell Drain
Plastech Eng Prod-Romulus	MIS210801	Wayne	42.2519	-83.4142	McClaughrey Drain
Norfolk Southern-Triple Crown	MIS210815	Wayne	42.2769	-83.1722	Rouge River
Norfolk Southern-Auto Ramp	MIS210816	Wayne	42.2797	-83.1631	Rouge River
Ford-Mich Truck Plt	MIS210829	Wayne	42.2753	-83.4139	Lower Rouge River
General Permit MIS220000	Storm Water Discharges with Required Monitoring				
Red Spot-Westland	MIS220019	Wayne	42.3000	-83.4125	Leng Drain
American Jetway Corp-Wayne	MIS220022	Wayne	42.2792	-83.375	Boyce Drain
SNF Polychemie Inc-Wayne	MIS220025	Wayne	42.2656	-83.4242	Wilbur Drain
Unistrut International Corp	MIS220040	Wayne	42.2761	-83.3900	McClaughrey Drain
General Permit MIS319000	Storm Water Discharges From Industrial Activities				
Woodbridge Corp-Romulus	MIS310219	Wayne	42.2833	-83.1958	Carter Drain
Ford-Allen Park Clay Mine LF	MIS310398	Wayne	42.2833	-83.2058	Allen Drain
Manfredi Motor Transit-Taylor	MIS310432	Wayne	42.2453	-83.2914	Lower Rouge River

APPENDIX M

NOTICES OF COVERAGE UNDER PERMIT BY RULE IN THE ROUGE RIVER

Table M-1. Notice of Coverage Permits in the Rouge River Watershed.
Source: MDEQ, Water Bureau's NPDES Permit Management System.

Designated Name	Permit No.	Facility Location City
16th Ave Sewer Separation Ph 3	MIR109553	Port Huron
19 Holdings Office Park	MIR109220	Clinton Township
21 Mile Sanitary Sewer	MIR108301	Shelby Township
23 Mile Rd Water Main	MIR109379	Macomb
23 Mile Road Sanitary Sewer	MIR108696	Macomb
2400 E-Kenning Sq Condos	MIR109106	Birmingham
25 & Romeo-Pheasant Run Trad	MIR108092	Macomb
33 Powell-Hidden River Condo	MIR106150	Farmington Hills
A R E Dev-Andrews Meadow	MIR108550	New Baltimore
A-1 Home Inv-Highwood Subdiv	MIR107773	Southfield
Aaa Dev-Westlake Commons Condo	MIR107074	West Bloomfield
A-Bach Dev-Brooklynn Est	MIR107449	Utica
Abp-Dana Corporation	MIR106330	Farmington Hills
Academy of the Sacred Heart	MIR108113	Bloomfield Hills
Acheson Venture-Semco Oper Ctr	MIR107864	Port Huron
Acheson Ventures-Office Bldg	MIR107306	Port Huron
Acheson-Desmond Landing	MIR106564	Port Huron
Acheson-Desmond Landing South	MIR106689	Port Huron
Acquistions-Auburn Grove	MIR106898	Bloomfield Hills
Adi-Cvs Pharmacy	MIR106095	Livonia
Admiral Dev-Admirals Cove Cond	MIR107603	Sterling Heights
Admiral-Windmill Pond Condo	MIR108031	Shelby Township
Adolph-Parcel Splits/Rd Const	MIR109963	Fort Gratiot
Aeroplex I & II	MIR105949	Southfield
AG Construction-Ava Center Dvp	MIR108322	Washington
Ag-B&A Steel Parcel A	MIR106939	Clinton Township

Ahepa 371 Addition	MIR106229	Harrison Township
Albert Weine & Sons-Huron Crk	MIR107617	Southfield
Alexandrea-Gorno Trans	MIR105813	Brownstown
Allendale Elem Schools	MIR107196	Melvindale
Almar Homes-Plum River Estates	MIR109425	Sterling Heights
Almar-Forest Creek # 3	MIR107407	Sterling Heights
Almar-Hidden Meadow	MIR106389	Sterling Heights
ALN Realty-Fairlane Green	MIR108146	Allen Park
Alpha Tech Buildings	MIR106371	Bloomfield Hills
Aluia-Lakeshore Estates	MIR108545	unknown
Ambassador-Timbers Edge	MIR106275	Shelby Township
Amer Land-Harvard Vllge Condo	MIR109219	Madison Heights
American House East I Villas	MIR108786	Roseville
American House Senior Village	MIR109687	Washington
American Quality-Eton St	MIR105806	Novi
AMG Inv-Knollwood Estates	MIR108050	Taylor
Amson-Beck/Cartier-Lot 12	MIR108091	Wixom
Angelina Estates Sub 2	MIR108214	Shelby Township
Ansara-Castle Court	MIR109178	Armada
Antlar-Parkway Meadows	MIR106625	Canton
Apostolic Church of Christ	MIR107258	Auburn Hills
Appolonio-Trailside	MIR107189	Washington
Arbors of Lyon	MIR107255	Farmington Hills
Archcon Mgmt-Stratford Place	MIR106520	Ypsilanti
Asbury Condo Community	MIR106266	Highland
Asbury Park Subdivision	MIR106653	Novi
Aspen/Auburn-Northbrooke Condo	MIR107217	Southfield
Aspen-Atwater Commons	MIR106559	Southfield
Atkins Meadow Condo	MIR109637	Kimball

ATMF IV LLC-Best Buy	MIR107726	Bloomfield Hills
Auburn Elem-Avondale High	MIR108074	Auburn Hills
Auburn Rdg-Borgwarner Headqrts	MIR107527	Southfield
Auburn-Rd Improvement Ph II	MIR106727	Auburn Hills
Auto Auction	MIR109259	Belleville
Autumn Ck-Pendleton Vlge	MIR107293	Washington
Autumn Creek-Phase #2	MIR107528	Washington
Avondale Schools-Graham Elem	MIR107998	Auburn Hills
B A P S Cultural Center	MIR107083	Redford
Baker Coll-New Bldg Addition	MIR109768	Auburn Hills
Baldwin Dev-Village Square PUD	MIR109083	unknown
Barbee-Kirkway Village	MIR107102	Royal Oak
Barnes-Belle Arbor Shop Center	MIR108486	Orion
BASF Corp-Riverview IRA	MIR109957	Riverview
BASF-Former Fmt Site	MIR105958	Wyandotte
Battaglia Subdivision	MIR108491	Macomb
Bay River Marketplace	MIR109519	unknown
Bay River Marketplace Ph II	MIR109783	unknown
Bayside Estates Subdivision	MIR109213	Fair Haven
Beacon Hill Phase 5	MIR108855	Auburn Hills
Beaumont West Bloomfield Med	MIR108226	West Bloomfield
Beck Corridor-North Corp Pk 2	MIR107338	Farmington Hills
Beck-Novi/Kirkway Place	MIR106467	Farmington Hills
Beech Goddard-Cove Ck Condo	MIR106489	Farmington Hills
Beier-Boulder Creek Ph II	MIR106232	Saint Clair
Bella Sera Condo	MIR106588	Mount Clemens
Belle Vista-Northville Twp	MIR106754	Northville
Bent-Trillium Vil of Clarkston	MIR106943	Clarkston
Bernasconi-Char Est Sub	MIR109184	unknown

Beydoun-Ramz Plaza	MIR105725	Canton
Beztak Co-Novaplex	MIR107890	Farmington Hills
Beztak-Canford Park A Condo	MIR106989	Farmington Hills
Bijani-Shore North Condo	MIR106339	Rochester
BIK Co-Mulberry Meadows Condo	MIR109540	Shelby Township
Biltmore-Birkdale Pointe 2	MIR109795	unknown
Biltmore-Birkdale Pointe 2	MIR109795	unknown
Biltmore-E Northville Hills 3	MIR109828	Northville
Blackberry Hills-White Lake	MIR106496	West Bloomfield
Blakes-Agg Irrigation Pond	MIR106865	Armada
Bluffs at Lakes of Milford	MIR109051	Milford
Bluffs of Beaufait Farms	MIR106132	Clinton Township
Bonks Bay Subdivision	MIR106152	Brownstown
Bozek-Lot Fill	MIR107526	Hamtramck
Bradley Assoc-Mill Town Condo	MIR109590	Rochester Hills
Brandenburg-Lakeview Est	MIR106709	Shelby Township
Brandenburg-Secluded Woods	MIR106710	Shelby Township
Brandon Comm Middle School Imp	MIR109840	Ortonville
Braver-Waters Edge Condos	MIR106308	West Bloomfield
Brentwood-Sherwood Est Sub	MIR108177	Sterling Heights
Brg-Dutton Corporate Ctr	MIR107237	Royal Oak
Bridgewater by Del Webb Ph 2	MIR109732	Brownstown
Brigewater by Del Webb Ph 1A	MIR109397	Brownstown
Brock Dev-Marsh Ck Condo	MIR106126	Brownstown
Brookhaven-10 Mile-Novi	MIR106597	Novi
Brookshire Office Plaza	MIR109198	Sterling Heights
Brooktown Village-Brooktown	MIR109818	Novi
Brookwood Counen & Homeowner	MIR107303	Rochester Hills
C A Kime-Cobblestone Creek	MIR107697	Warren

C A Kime-Ravensfield Condo	MIR106261	Warren
C&C Land Dvpt-Clarks Crossing	MIR108377	South Lyon
C/M-Fev Engine Tech Warehouse	MIR106787	Southfield
Cal Land-Meadows of Van Buren	MIR105849	Canton
Cambridge-Tuscany Reserve	MIR108191	Novi
Campbell-Hidden Acres	MIR106288	Leonard
Campus Tech Office Park	MIR109575	Novi
Canton Classic-Villas @ Maple	MIR107863	Columbus
Canton Twp-Denton Rd	MIR107831	Canton
Canton Twp-Denton Road Ph 2	MIR109202	Canton
Canton Twp-Fellows Ck Wetland	MIR108141	Canton
Canton-New Elem at Cherry Hill	MIR108752	Canton
Canton-Pilgrium Hills San Sew	MIR108557	Canton
Carmen-Crystal Crossing	MIR106057	Southfield
Carrell-Deerfield Estates	MIR109939	Belleville
Carriage Trace Condo	MIR106482	South Lyon
Carriage Trace Ph 5	MIR109618	Southfield
Carroll Rd Dev-Augusta Woods	MIR107027	Bloomfield Hills
Casa-Portofino Villas Sub	MIR108255	Macomb
Catalfio-Mr Cs Carwash	MIR108547	unknown
Catenacci-Siena Gardens Sub	MIR107394	Clinton Township
Cavaliere-Reg Commerce Ctr #2	MIR107530	Hazel Park
Cavaliere-Shoppes at The Trail	MIR107480	Warren
Cavaliere-Wolverine Ctry Clb 2	MIR107767	Macomb
Cavaliere-Wolverine Subdiv	MIR107475	Macomb
CE-City Gate Pipeline	MIR109555	Northville
Celtic Farms Subdivision	MIR108811	Flat Rock
Centex Homes-Forestbrook	MIR108562	Waterford
Centex Homes-Spring Haven	MIR109226	Southfield

Centex-Elmhurst Site Condo	MIR108071	Sterling Heights
Centex-Fairway of San Marino 2	MIR106822	Southfield
Centex-Highlands of Romulus	MIR107320	Southfield
Centex-Newberry Estates	MIR108620	Westland
Centex-Timberline Meadows	MIR109081	Taylor
Centofanti-Murray Dr Pvt Rd	MIR108502	Ray
Central Park of Shelby	MIR106916	Farmington Hills
Centrum-Boller Meadows	MIR106579	Southfield
Chaldean Comm Cultural Ctr	MIR106460	Southfield
Charles Ryan-Kingwoods Condo	MIR109432	China
Charter Oaks-Charter Oaks Vlge	MIR107035	Madison Heights
Chawney-Hampton Woods	MIR107274	Beverly Hills
Chelsea Square Condos-Canton	MIR105902	Birmingham
Cherry Hill Gardens Condo Dev	MIR106615	Birmingham
Cherry Hill Inv-Rivers Edge	MIR108043	unknown
Cherry Hill Inv-Village Ph IV	MIR107949	Troy
Cherry Hill Land-Cinnamon Pt 3	MIR107673	Bloomfield Hills
Cherry Hill Point Ph 2	MIR106217	Bloomfield Hills
Cherry Hill Village Ph 1	MIR109731	Canton
Cherry Hill Village Ph II	MIR109786	Canton
Cheshire Park	MIR107707	Farmington Hills
Chesterfield Corporate Center	MIR108057	Chesterfield
Chesterfield Lk-Milton Meadows	MIR108750	Chesterfield
Chesterfield Towne Centre	MIR109788	Chesterfield
Chesterfield Towne Ctr	MIR109289	Chesterfield
Chesterfield-The Landing Condo	MIR109381	Marine City
Ch-Fairways of San Marino #1	MIR106074	Farmington Hills
Chippewa Bld-Riverside Commons	MIR109060	Milford
Chippewa Valley High School	MIR109562	Clinton Township

Chippewa Valley-New Seneca MS	MIR108815	Macomb
Chippewa-Algonquin Middle Schl	MIR109714	Clinton Township
Chippewa-Cheyenne Elem School	MIR109560	Macomb
Chippewa-Dakota High School	MIR109715	Macomb
Chippewa-Huron Elem School	MIR109611	Clinton Township
Chippewa-New Dakota High 9th	MIR108854	Macomb
Chippewa-New Sequoyah Elem	MIR108641	Macomb
Chippewa-Wyandot Middle School	MIR109466	Clinton Township
Chirco-Harvard Square	MIR106904	Macomb
Choice Dev-Wattles Pk Condo	MIR106280	Troy
Christ The King Church	MIR109506	Oxford
Ciaramitaro Bros-Capac Commons	MIR109422	Capac
Citizens Bank-Novi	MIR108537	Novi
City of Port Huron-16th Avenue	MIR107651	Port Huron
City of Troy-Maplelawn Rd Rec	MIR107514	Troy
Ck-Kirkway Ravines Condo	MIR106852	Southfield
Claran Industrial Park	MIR106404	Farmington Hills
Clarkston Early Childhood Bldg	MIR108133	Clarkston
Clarkston Sashabaw Middle Sch	MIR108179	Clarkston
Clarkston-Clarkston Woods	MIR107219	Clarkston
Clarkston-Pine Knob Corp Cent	MIR109447	unknown
Classic Dev-Legacy Farms Sub	MIR107802	Saint Clair Shores
Classic Dvpt-Legacy Farms Sub2	MIR108400	Chesterfield
Clay Pk-Fairlane Green Ph II	MIR109785	Allen Park
Clintonville Creek Site Condo	MIR109238	Clarkston
Close-Saddle Ridge Condo	MIR107242	Northville
Cm-Carhartt Corp Hq	MIR106416	Southfield
Cobblestone Ridge	MIR107996	unknown
Coda-Birchcrest Condo	MIR106847	Clinton Township

Cohen-Wixom Village Ctr Area	MIR107981	Wixom
Cole Street Condo-Warren	MIR107119	Wixom
Columbus Corporate Off Centre	MIR108766	Novi
Const Solution-Merritt Academy	MIR109619	New Haven
Const Solutions-Bradford Acad	MIR109536	Southfield
Construction Solutions-Trilium	MIR108793	Taylor
Consumers-W Oakland Pipeline	MIR108768	unknown
Cook-Heights at Elkow Farms	MIR108185	New Hudson
Cortis-Timber Ridge Subdiv #3	MIR107496	Marine City
Costco Wholesale Inc	MIR106921	Issaquah
Cotton Creek Condos	MIR106272	Chesterfield
Courtyards at Heritage Vill	MIR109353	unknown
CPD-Mollertech Expansion	MIR109559	Shelby Township
Cranbrook Institute of Science	MIR108633	Bloomfield Hills
Creative Ld-Country Walk	MIR106490	Novi
Creative-Country Walk Ph 3-4	MIR107965	Belleville
Crescent Academy Bldg Exp	MIR108244	Canton
Crown Warehouse Development	MIR109817	Pontiac
CRS Acquisition-Villa Bogie Lk	MIR108888	Commerce Township
Crystal Commons Retail Center	MIR107982	Clinton Township
CSX Trans-TDSI Auto Facility	MIR107662	Jacksonville
Ct-Abbeys of Westland	MIR107161	Columbus
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
Curtis-Cherry Hill Vill Ph 3	MIR109655	Canton
CW Dev-Oakview Ridge Condos	MIR109263	Farmington Hills
D & E Lacasta-Rosewood Estates	MIR108672	Kimball

D&T Const-Sunkist IV Subdiv	MIR107534	Shelby Township
D&T-Emerald Creek Condos	MIR109830	Shelby Township
DAangelo-Moravian Manor	MIR107173	Utica
DaimlerChrysler-Paint Shop	MIR109709	Sterling Heights
Daj-Estates @ Cambridge	MIR106620	Troy
DAlasandro-Brookside Villas	MIR106492	Clinton Township
Dale Frenkel Bldg-Miller Farms	MIR109196	Clarkston
Dalloo Dev LLC-Gabriel Estates	MIR109366	Milford
Damone-Villas of Oakland Woods	MIR109584	Pontiac
Danou-Utica Center Townhomes	MIR107289	Trenton
De Mattia-Metro Plymouth Bus	MIR106951	Plymouth
Deaborn CSO Control Project A	MIR108797	Dearborn
Dearborn Schools-Career Ctr	MIR107336	Dearborn
Dearborn-Cso 013/ph A/no 2	MIR107818	Dearborn
Dearborn-CSO 014/Ph A/No 3	MIR107820	Dearborn
Dearborn-CSO 015/Ph A/No 4	MIR107819	Dearborn
Dearborn-CSO 016/Ph A/No 5	MIR108799	Dearborn
Decora Park 5 Condos	MIR107862	Washington
Deehl-Gravel Road Design	MIR108378	Holly
Deflorio Home-Rhode Island Est	MIR107636	Troy
Delano Place	MIR108639	Macomb
DeLaura-Crystal Pines Condos	MIR108880	Shelby Township
Delta Industrial-Delta Plaza	MIR108863	Chesterfield
DePestel Subdivision No 2	MIR109310	New Baltimore
DeSano-Village at Shelby	MIR108090	Sterling Heights
DESCO-Sterling Heights West	MIR109482	Sterling Heights
Detroit Newspaper-Expansion	MIR107490	Detroit
Detroit-Outer Dr Parking Lot	MIR109953	Detroit
Devers-Twin Lakes 9 Hole Golf	MIR107676	Oakland

DFL-Lyon Oaks Ind Park	MIR105898	Farmington Hills
DiDomenico-19 Acres Inkster Rd	MIR109821	Taylor
Dilusso Bldg-Harvard Oaks Cond	MIR108698	Chesterfield
Dimercurio-Brookfield Condos	MIR105825	Shelby Township
DiMercurio-Clearstone Subdiv	MIR108803	Macomb
Diversified-Preserve Romulus	MIR108812	Romulus
DKM-Warehouse Distribution	MIR109756	Warren
Doco-Oakland Plaza	MIR107282	Clarkston
Domenico-D&g Bldg-Romulus	MIR107137	Detroit
Down River Comm Serv-Prof Off	MIR108371	New Haven
Dte-16" E China Lateral	MIR105748	Detroit
DTE-James Bay Expansion	MIR109135	Avoca
Dutton/Bald Mtn-Auburn Hills	MIR107157	Orion
Dutton-Squirrel/Silverbell Rd	MIR109740	Orion
Dutton-Stonegate Park Condos	MIR109684	Orion
Dutton-Stonegate Ravines	MIR109052	Lake Orion
E Northville Hills Golf	MIR109712	Northville
Eagle Creek Condominiums	MIR107986	Shelby Township
Eagle Ottawa / BK North	MIR108651	Auburn Hills
Eagle Ridge at Morgan Lake	MIR108960	unknown
East 20 Ent-Schupan/Tomra/Ubur	MIR109438	unknown
East Bay Village-Walled Lake	MIR105672	Bloomfield Hills
Eastridge Court Condo	MIR108193	Chesterfield
Edward Rose-Woodland Hgts III	MIR105897	Farmington Hills
Elan Estates Corp-Elan Est	MIR108296	Macomb
Elder Land Rover/Jagua/Saab	MIR109234	Macomb
Elizabeth Trace Dev LLC	MIR107567	Commerce Township
Elmer-Catholic Central Hs	MIR107440	Redford
Elmhaven Manor-Pontiac	MIR106824	Dearborn

Elro-Legacy Park Subdivision	MIR108732	Romulus
Elro-Stillwater Crossing Sub	MIR109029	Macomb
ELRO-Wellington Estates Sub	MIR108714	Macomb
Eltel-Pontiac Woods/Tech Park	MIR105993	Southfield
Enmark-Hannebauer Site Condos	MIR109737	Sterling Heights
Equity-Northville Crossing	MIR109965	unknown
ER Thomas-Quail Creek Estates	MIR109127	Commerce Township
Er Thomas-Scotland Yard	MIR107008	Walled Lake
Erickson-Fox Run Village	MIR105976	Baltimore
Erie St South Sewer Separation	MIR109469	Port Huron
Esdon Prop-Contractors Steel	MIR108862	Belleville
Estates at Clairwood Lane	MIR109045	Bruce Township
Eva-River Park A Condo	MIR107195	Westland
Ev-Marque Corp Center	MIR106065	Novi
Evola-Maple Creek Manor	MIR108241	Washington
Fairlane Green Ph II Meijer	MIR109613	Allen Park
Fairview Estates Condo	MIR106461	Rochester Hills
Fairview Village-Pontiac	MIR106848	Rochester Hills
Fairways @ Gateway Ph 4	MIR107203	Oakland
Fairways of Farmington Hills	MIR106764	Farmington Hills
Farmington High Athletic Field	MIR108536	Farmington
Farmington HIlls Corp Center	MIR108516	Farmington Hills
Farmington PS-N High School	MIR108839	Farmington Hills
Farmington PS-OE Dunckel MS	MIR108840	Farmington Hills
Farmington PS-Warner MS	MIR108841	Farmington Hills
Farmington-East Middle School	MIR109398	Farmington Hills
Farmington-Harrison High Schl	MIR109470	Farmington Hills
Farmington-Power Middle School	MIR109437	Farmington Hills
Feldman-Liberty Chevrolet	MIR107989	unknown

Fellows Creek-Rustic Rdg Condo	MIR107844	Livonia
Ferndale HS/MS Activity Field	MIR108634	Ferndale
Field Acres Dvpt-Oakland Hunt	MIR108457	Oakland
Fieldstone Golf & Tennis #1	MIR105905	Birmingham
Fieldstone Village # 2	MIR106781	Birmingham
Fifth Third Bank-Rochester H	MIR108982	Rochester Hills
Fifth Third Bank-White Lake	MIR108521	White Lake
Fifty Eight-Wagon II	MIR109811	Wixom
Fiore Brothers Storage	MIR108668	Chesterfield
First Baptist Church	MIR106020	Lake Orion
First Distribution Center	MIR109053	Romulus
First Industrial-Nailco Group	MIR108942	New Hudson
Fish Creek-Oakbrooke Est Condo	MIR107914	Mount Clemens
Fisher Co Stamping Facility	MIR107460	Troy
Fitzgerald-New Westview Elem	MIR109640	Warren
Flat Rock-Community Center	MIR106926	Flat Rock
Flat Rock-Woodcreek Pk # 3	MIR106349	Bingham Farms
Flatrock-Woodcreek Park Sub #4	MIR107905	Bingham Farms
Floral Gardens	MIR108420	Mount Clemens
Floral Gardens	MIR108420	Mount Clemens
FMG Dev-Halsted Hollow	MIR108123	Farmington Hills
Ford Motor Co-Wayne Body Shop	MIR107887	Wayne
Ford Motor Land-Woodhaven 13	MIR109233	Woodhaven
Ford-Brownstown Truck	MIR106398	Brownstown
Ford-Dearborn Proving Grounds	MIR107973	Dearborn
Ford-Vet Admin Med Center	MIR106419	Dearborn
Ford-Woodhaven 11	MIR108258	Woodhaven
Forester Square-Auburn Hills	MIR109736	Auburn Hills
Founders-Vintage Valley Sub	MIR105745	Oak Park

Fountain Park North	MIR109163	unknown
Fountain Park South	MIR108974	Waterford
FPC-Summerlin of Novi	MIR105816	Farmington Hills
Frank Rewold & Son Office Bldg	MIR109719	Rochester
Frank-Belle River Woods # 1	MIR106765	East China
Freund-Tanglewood Grenelefe W	MIR108270	South Lyon
Fritz Ent-King Rd Property	MIR106849	Trenton
Froling-Palmer Woods Est	MIR105650	Sterling Heights
G & V-Glenmar Place South	MIR106812	Rochester
G E Tip-Corp Site Consultants	MIR107305	Devon
G/S/J Novi-Knightsbridge Gate	MIR108431	Novi
Garden City-Maplewood Avenue	MIR108782	Garden City
Gardens at Clinton	MIR108379	Clinton Township
Gargaro-Romulus Corp Park	MIR106015	Livonia
Gateway Comm Dev-Lexington Pl	MIR107468	Brighton
Gateway Village	MIR105838	Southfield
Gateway-Clubhouse Pavilion	MIR109762	Romulus
Genrich-Maybury Pk Est Ph I	MIR106218	Plymouth
Geric-Woodbridge Est	MIR106953	Clinton Township
Gerish-Pine Arbor A Condo	MIR107378	Plymouth
Gerish-Rolling Ridge Condo	MIR106068	Plymouth
GFA Dev-Hidden Forest	MIR108013	Troy
Gh-Colleen Meadows Condo	MIR106845	Shelby Township
Gilbert-Hidden Creek Sub	MIR109190	unknown
Ginzinger-Wyndridge Est	MIR105777	Rochester Hills
Giovanni Constr-Indian Springs	MIR108666	unknown
Glacier Club Golf Course	MIR109229	Washington
GLC-Silverman Grading Plan	MIR109099	Auburn Hills
Glen Eden Cemetery	MIR106647	Livonia

Glenmore Village	MIR109011	unknown
Global-Fort St Mini-Storage	MIR109328	Gibraltar
GM Powertrain/USPS	MIR108439	Pontiac
GM-Plt Consolidation Ph 1	MIR108980	Pontiac
Gm-Powertrain Site Parking Etc	MIR107921	Pontiac
GMPT Lab Consolidation-GC2	MIR109909	Pontiac
Goertz and Schiele Corp	MIR107670	Auburn Hills
Golden Park Condos	MIR106021	Shelby Township
Golf Ridge-Livonia	MIR108338	Livonia
Golfview Estates Subdivision	MIR108701	unknown
Golfview-Loons Landing	MIR106164	Commerce Township
Goodells Lake Sand Quarry	MIR109890	Goodells
Goodman-Clarkston 8/9 Bldg	MIR108274	Clarkston
GP&S 3 Generations Dev	MIR107181	Livonia
Grand/Sakwa Prop-M-59/Adam Dev	MIR109203	Rochester Hills
Grand/Sakwa-Central Pk North	MIR109496	Shelby Township
Grand/Sakwa-Heritage Village	MIR108458	Warren
Grand/Sakwa-Midstream Condos	MIR105668	Farmington Hills
Grandview Site Condo-Rochester	MIR108132	Rochester Hills
Great Oaks-Great Oaks Mall Red	MIR108448	Rochester
Group 10-Pine Creek Condo	MIR109306	Belleville
Group-Cambridge Meadows #3	MIR106243	Brownstown
Grt-Adrienne Estates Sub #2	MIR105942	Clinton Township
GTR Bldrs-Parkview Estates	MIR107550	Clinton Township
GTR Builders-Glacier Club Cond	MIR108649	Washington
GTR Builders-Hampton Square	MIR107855	Clinton Township
GTR-Angelus Forest	MIR109028	Auburn Hills
Gtr-Brook Run Sub	MIR106016	Clinton Township
Gtr-Chesterfield Ind & Tech	MIR107619	Clinton Township

GTR-Glacier Club Phase VI	MIR109448	Washington
GTR-Rose Gardens Estates	MIR108938	Clinton Township
GTR-The Woodlands	MIR108176	Macomb
Gvc-Pine Creek Condo	MIR106494	Shelby Township
H & C-Rochester Maples Condo	MIR109505	Troy
H & R-Legacy Estates	MIR107993	Macomb
H & R-Legacy Estates-22 Mile	MIR108993	Macomb
Haggerty Reg Detention Basin	MIR108128	Novi
Haggerty Road Grading	MIR107661	Farmington Hills
Hall Meadows Condominiums	MIR106077	Clinton Township
Hall-Partridge Ck Commercial	MIR109168	Clinton Township
Halsted Estates Condominiums	MIR109661	Farmington Hills
Hamlin-Avon Lk Vill # 4	MIR107286	Troy
Harbours Apt Phase 2c	MIR105796	Farmington Hills
Harper Woods School	MIR109493	Harper Woods
Hartford PUD-24 Mile and Card	MIR108367	Macomb
Hauler-Oakview Estates	MIR108001	Armada
Haverbeck-Chase Lane Court	MIR107893	Ray
Hawk Woods Circle	MIR109969	Auburn Hills
Hawks-Preserve@ Boulder Pond	MIR106233	Saint Clair
Hazel Park Jr High School	MIR106184	Hazel Park
Hbf-Bay Winds Townhomes	MIR105726	Sterling Heights
HCMA-Grading & Ped Underpass	MIR105744	Brighton
Healy-Carriage Club Ph 3	MIR108120	South Lyon
Heatherwoods Dev Inc-Phase #2	MIR107580	Chesterfield
Heatherwoods Sub No 3	MIR108984	Chesterfield
HEFCO-Forest Hills	MIR109689	Springfield Township
Hemingway Estates	MIR109054	Lake Orion
Hendrie-Huron Woods Ph II	MIR107744	Grosse Pointe

Henry Ford Ambulatory Care	MIR108444	Brownstown
Henry Ford-W Bloomfield Hosptl	MIR109429	West Bloomfield
Herbeck-26 Mile & M-53	MIR107177	Appleton
Here 2 Stay-Meadowbrook Med	MIR108959	Novi
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
Heritage-N Broadmoor Sub #3	MIR106578	West Bloomfield
Heron Hills	MIR107882	West Bloomfield
Hickory Ridge Site Condo	MIR109382	Rochester Hills
Hiddenborough Condo	MIR106814	Macomb
Hillel Day School Addition	MIR108802	Farmington Hills
Hills of Bogie Lake	MIR106583	West Bloomfield
Hills of Bogie Lk Ph 2-4 Condo	MIR107964	Commerce Township
Hills of Oxford	MIR107691	West Bloomfield
Hirmaz-Kakos Estates Subd	MIR108635	Chesterfield
Hn-Preserve @ Boulder Ph 2	MIR107183	Saint Clair
Holocaust Memorial Center	MIR106156	West Bloomfield
Holtzman&Silverman-Wdland Ridg	MIR108476	Southgate
Homestead Ph 4 & 5	MIR105700	Commerce Township
Horn Brook Estates-South Lyon	MIR108266	South Lyon
Hotchkiss-Broad Oak Estates	MIR108331	Holly
Howey-Vernon Park Subdivision	MIR109779	Trenton
HPE Dvpt-Hunters Park Est	MIR108388	Livonia
Hrc-Utica Rd Blvd	MIR106924	Bloomfield Hills
Htwa-Carleton Meadows	MIR107130	West Bloomfield
Hunter Bay Estates	MIR109392	Chesterfield
Huron Estates II	MIR106382	Farmington Hills

HVT Enter-Elk Ridge Preserve	MIR108901	Holly
Icon Bldg II-Seaton Place Con	MIR108321	Chesterfield
Icon Bldg-Garwood Est Condos	MIR105985	Clinton Township
Icon Building-Stratford Plaza	MIR108129	Macomb
Icon-Lakes Professional Bldg	MIR107127	Clinton Township
IKEA-Canton	MIR108874	Canton
In-sight Resident-Millstone Pk	MIR108912	Waterford
Integra Prop-Kimberly Gardens	MIR108355	Farmington Hills
Intl Darin-Intl DeWitt	MIR109118	Canton
Intl Trans-Lenox Sta Electric	MIR109116	Lenox
Ionia Prop-Plumcreek Est	MIR106284	Birmingham
ITC-Erin Stephens 3	MIR109699	Eastpointe
It-Visteon Substation	MIR107194	Ann Arbor
Ivanhoe-Harbor Village	MIR108005	Keego Harbor
Ivanhoe-Harrison Cove Condos	MIR105694	West Bloomfield
Ivanhoe-Huntley-Crystal Crk N	MIR108656	New Hudson
Ivanhoe-Huntley-CrystalCrkCond	MIR108657	New Hudson
Ivanhoe-Huntley-Middlesboro	MIR107429	West Bloomfield
J & V-Oakwood Farms Estates	MIR108097	unknown
J B Donaldson Co-LGI/Sheffler	MIR107727	Novi
J B Donaldson-Miracle Software	MIR109085	Novi
JAC-Indianwood Est On The Lake	MIR106696	Bloomfield Hills
Jacobson Cherry-The Hamptons	MIR108069	Canton
JBD-Crooks and Auburn Dev	MIR108101	Rochester Hills
JBD-National Parts Depot	MIR109079	Canton
JC Dev-Wingate Lake Estates II	MIR108828	White Lake
Jefferson Village-Detroit	MIR108082	Detroit
JMDH Real Est-Restaurant Depot	MIR108426	unknown
Jm-Springfield Town Square	MIR106418	Fenton

JNCC-Lexington Village	MIR109588	Redford
John Carlo Dev-Clinton Twp	MIR109156	Clinton Township
Johns-Burgess Est Wetland	MIR109119	Ira
Johnson-Copperwood	MIR108225	unknown
Jones-Fed Ex Ground Facility	MIR109666	Orion
Joslyn Commerce Park	MIR106300	Southfield
K&k-Highland Professional Ctr	MIR106048	Highland
Kaftan-Preserve On Fellows Crk	MIR107650	Farmington Hills
Kallen-Brookfield Village	MIR106087	Farmington Hills
Kapousis-G&T Used Truck & Auto	MIR109650	Chesterfield
Karam-Broken Sound Sub	MIR106142	Washington
Karam-Villas-Crystal Ck Condos	MIR107861	Washington
Kassab-Old Grand River Storage	MIR106498	Wixom
Kay Fam-Manchester Knolls Ph 2	MIR107163	Lake Orion
Kayto-24 Mile Commercial	MIR109071	Shelby Township
Kemp-Romeo Corporate Park	MIR108519	Romeo
Kimberly Gardens-Farm Hills	MIR107185	Farmington Hills
Kime-Rdk Homes Office Site	MIR107917	Canton
King Commons-Bryce Commons	MIR109297	Brownstown
King/Inkster-Doves Point	MIR106337	Brownstown
Kings Pointe Res Community	MIR106248	Bingham Farms
Kirby Freewilll Bapt Church	MIR108220	unknown
Kirkland-Adams-Kings Ridge Sub	MIR108319	Columbus
Kirklands-7 Mile Rd	MIR106091	Auburn Hills
Knights of Columbus	MIR109825	Sterling Heights
Knight-Sunoco/Arbys	MIR106801	Novi
Knoll View Phase I & II	MIR106561	Waterford
Komasara-Tamarack Hills	MIR109748	Bruce Township
Kramar-Proposed 3 Lot Split	MIR109682	Farmington Hills

Kraus-Brookstone Hills Condo	MIR107842	Clarkston
Ksa-Prairie Ck Vill Sub Ph II	MIR106449	Plymouth
L & M of Lenox-Colonies	MIR107748	Washington
Labadie Park	MIR108953	Wyandotte
Lafarge-Det Cement Terminal	MIR106896	Southfield
Lakeside Budget Storage	MIR108064	Sterling Heights
Land Mgmt-River Ridge Est Ph 3	MIR107710	Washington
Landon-Novi Promenade	MIR105709	Bloomfield Hills
Landtec-Pinnacle Woods Sub	MIR108978	Macomb
Lanse Cruese-Atwood Elem	MIR107386	Harrison Township
Lbsp-Arlington Park	MIR105972	Canton
LC Custom-Valley Forge	MIR109283	Waterford
Ld Angelo-Wingate Lk Est Ph I	MIR106370	Southfield
Leader Dogs For The Blind	MIR106009	Rochester
Lear Corp-New Headquarters	MIR108311	Southfield
Lehman-Oxford Towne Center	MIR108643	Oxford
Leo Soave Bldg-Churchil Manor	MIR109434	Livonia
Leo Soave Bldg-Livonia Manor	MIR109159	Livonia
Leone-Milano Industrial Ph 3	MIR108089	Macomb
Liberty Ecorse Industrial Dev	MIR109109	Romulus
Lincoln Center/Villa Bella	MIR108017	Clinton Township
Links of Independence	MIR105699	Bloomfield Hills
Liparoto Estates Sub No 4	MIR109266	Rockwood
Living Rock Church Const	MIR105963	Romulus
Livonia Bldr-Grand Oaks Sub	MIR107414	Canton
Livonia Builders-Ashton Woods	MIR108460	unknown
Livonia Chestnut-Panera & TGIF	MIR108232	Livonia
Livonia-2004 Rehab/recon	MIR107596	Livonia
Lo Chirco-Windemere Multi	MIR106855	Shelby Township

Lochirco Homes-Aurora Park Sub	MIR107915	Rochester
Lochirco-Birchfield Condo	MIR106422	Shelby Township
Lochmoor Homes-Southfield	MIR108052	Southfield
Lombardo Ent-Amherst Ph 5	MIR107898	Washington
Lombardo Ent-Macomb Tn Ctr	MIR108565	unknown
Lombardo Roch Hills-Sheffield	MIR109537	Rochester Hills
Lombardo-Amherst 6	MIR109538	New Haven
Lombardo-Amherst Ph 4	MIR106474	Washington
Lombardo-Anthem Vill Apts	MIR107265	Washington
Lombardo-Deer Trail Manor	MIR107244	Washington
Lombardo-Edgemont Comm Condo	MIR109096	Bruce Township
Lombardo-Kensington Central Pk	MIR107052	Washington
Lombardo-The Retreat	MIR107114	Washington
Lombardo-Williamsburg	MIR107241	Washington
Long Lake Village Condominium	MIR108405	Brandon Twp
Loon Hills-Hills of Look Lake	MIR107249	Orchard Lake
Lottivue Riverside Ph 2	MIR108115	unknown
Lotus International-Canton	MIR108571	Canton
Lower Huron Family Aquatic Ctr	MIR109796	Van Buren Twp
Lower Huron Metropark Water	MIR109827	Van Buren Twp
Lowes of Madison Heights	MIR108716	Madison Heights
Lowes-Sterling Hts	MIR107371	Wilkesboro
Lyon Dev Assoc-Saddle Creek	MIR108126	unknown
Lyon Development-Twin Pines	MIR108297	New Hudson
Lyon Ridge	MIR108898	unknown
M & L Dev-Swan Creek	MIR107100	Belleville
M&F Ent-Spruce Meadows Condo	MIR108452	Port Huron
M&S Dev-Hunters Ridge	MIR108680	Ortonville
Maas-Silver Pines Vill Condos	MIR106147	Sterling Heights

Maben Woods Condo	MIR106560	Canton
Macomb Co New Public Works	MIR108619	Clinton Township
Macomb Co-Gratiot-23/24 Mile	MIR106813	Mount Clemens
Macomb Co-Gratiot-24/26 Mile	MIR108236	unknown
Macomb Co-HMA Foss Rd	MIR108148	Macomb
Macomb Co-HMA Paving	MIR108147	Macomb
Macomb Co-Jewell Road	MIR108199	Shelby Township
Macomb Community College 3	MIR109622	Clinton Township
Macomb Co-Reconstruct 32 Mile	MIR107840	Mount Clemens
Macomb Co-Youth Home	MIR105896	Mount Clemens
Macomb CRC-23 Mile/Romeo Plank	MIR109563	Macomb
Macomb CRC-McKay Road	MIR108697	Almont
Macomb CRC-Metro Pky	MIR108725	Clinton Township
Macomb CRC-Romeo Plank-M59	MIR109861	Macomb
Macomb Emergency Serv Training	MIR109561	Clinton Township
Macomb-Cass/Heydenreich-19 mi	MIR109972	Clinton Township
Macomb-N Gratiot Intercept Ph1	MIR109431	Chesterfield
Mancini-Bellagio Subdivision	MIR107571	Shelby Township
Mancini-E Mill Pond Condo	MIR105957	Utica
Manheim Auto Auction	MIR106411	Flat Rock
Maple Crossing-Commerce Twp	MIR107128	Farmington Hills
Maple Park Condo	MIR106922	Bloomfield Hills
Maplewood Site Condo	MIR107432	Auburn Hills
March-Castlewood Condos	MIR106313	Plymouth
Mariners Cove-The Bluff	MIR106859	Clarkston
Marisa Land-Marias Villa Condo	MIR109314	Chesterfield
Market Place Center	MIR108955	Sterling Heights
Marketplace of Van Buren Twp	MIR108108	unknown
Marlee Woods-Westland	MIR108583	Westland

Marseilles-Becher Estates	MIR108962	Macomb
Marshall Kallen-Brookfield Est	MIR107025	Farmington Hills
Martindales Estates	MIR105733	West Bloomfield
Marty Feldman Chevrolet	MIR107367	Novi
Marysville-Const Ethanol Facil	MIR109697	Marysville
Maxx Storage-Springfield Twp	MIR109247	Springfield Township
Maybury Park Estates-Phase 2	MIR108528	Novi
MB Commerce-Benstein Crossing	MIR108094	Commerce Township
McCall & Trainor Law Offices	MIR108531	White Lake
Mccomb-Peacock Farms	MIR105939	Troy
McInerney Air Center-Waterford	MIR109332	Waterford
MDA-S Branch Mill Creek Drain	MIR109670	unknown
MDOT-I696/M10 Interchange Mod	MIR108989	Southfield
MDOT-I-75 @ Square Lake Rd	MIR107745	Lansing
MDOT-I-75 and I-96	MIR109597	unknown
MDOT-I-75 at M-15	MIR108422	Clarkston
MDOT-I-75 Between 8 & 12 Mile	MIR107778	Lansing
MDOT-I-75 Gibraltar to Sibley	MIR109391	Taylor
MDOT-I-75 M-15 to Joslyn Rd	MIR108897	unknown
MDOT-I-75 to M-24 Connector	MIR108008	Auburn Hills
MDOT-I-94 Masonic to M-29	MIR109419	unknown
MDOT-I-94 Schaefer Ramp Recons	MIR106568	Lansing
MDOT-I-94 temp crossovers	MIR108655	unknown
MDOT-I-94/Pelham to Wyoming Rd	MIR107800	Lansing
MDOT-I94-Griswold Rd	MIR107132	Lansing
MDOT-I96 @ Beck Rd	MIR107753	Lansing
MDOT-I-96 M-39 to Schafer Hwy	MIR108009	Detroit
MDOT-I96/US-24 to M-39	MIR107049	Lansing
MDOT-M-10 Beck and Lahser	MIR108423	Southfield

MDOT-M-10/11 mi Rd to 8 mi Rd	MIR109691	Southfield
MDOT-M-10/Jefferson Ave	MIR109778	Detroit
MDOT-M-136-Kingsley/Keewahdin	MIR109608	Clyde
MDOT-M-14 Plymouth Twp	MIR108593	Plymouth
MDOT-M-14-Napier/Haggerty	MIR108835	Plymouth
MDOT-M-153	MIR109292	Dearborn
MDOT-M-19 Ashery Creek	MIR108271	Emmett
MDOT-M-1-Wide Track/M-59-Huron	MIR109752	unknown
MDOT-M29 Broadway to Francis	MIR106797	Lansing
MDOT-M-3/Gratiot Ave Rehab	MIR109878	Mount Clemens
MDOT-M-53 Armada Wetland	MIR108625	Armada
MDOT-M-53 Romeo State Airport	MIR109596	unknown
MDOT-M-59 at Adams Rd	MIR109565	Rochester Hills
MDOT-M-85 Fort Street	MIR108272	Lincoln Park
MDOT-M-I53/Ridge-Canton Ctr Rd	MIR107931	Lansing
MDOT-Old M-21/Mussey Co	MIR106570	Lansing
MDOT-Reconstruct I-94/US-24	MIR107331	Lansing
MDOT-SB I-75 Mill & Resurface	MIR107564	Lansing
MDOT-Southbound M53 exit/ramp	MIR108719	Washington
MDOT-US-12-Heywood to Howe Rd	MIR109534	Wayne
MDOT-US-12-I-94 to Livernois	MIR107607	Lansing
MDOT-US-24 Pontiac	MIR108411	Pontiac
Meadow Lands-Gilbraltar	MIR106237	Bingham Farms
MEEMIC Insurance Co HQ	MIR108579	Auburn Hills
Meijer Store # 227	MIR106908	Grand Rapids
Meijer Store #231 Southfield	MIR107624	Grand Rapids
Meijer-242	MIR109942	Lenox
Meijer-Store 222/13 Mile	MIR105757	Grand Rapids
Mela Dev Co-Clarkston Plaza	MIR109030	Clarkston

Meram-Angelina Estates	MIR106912	Shelby Township
Merchant Street Area Sewer Sep	MIR109485	Port Huron
Meridian Homes-Lochaven Woods	MIR108507	Troy
Merum-Timber Wood Condo	MIR108288	Utica
Messina-Florence Estates	MIR109243	unknown
MI Home Bldr-Briggs Park Condo	MIR109849	Troy
Mich Memorial-Garden of Angels	MIR109494	Flat Rock
Michibay West-Pembrooke Condo	MIR108023	New Haven
Michibay-Est @ Hidden Valley	MIR107211	Washington
Michigan First Credit Union	MIR108899	Lathrup Village
Middlecreek Estates	MIR106802	Sterling Heights
Middlewest-Trail Ck Blvd Condo	MIR106755	Harper Woods
Milford Knolls	MIR106952	Novi
Milford Lakes West Phase I	MIR109134	Milford
Milford Retail Center	MIR106441	Maumee
Milford Twp-SE Milford Sewer 2	MIR108638	Milford
Milford-Ten-Shoppes at Lyon	MIR109772	New Hudson
Mill River Investors	MIR108832	South Lyon
Mirage Dev-Orchard Hill W Sub	MIR108047	Novi
Mirage-Wilshire Abbey Sub	MIR107121	Novi
Misd-Ed Service Ctr Addition	MIR106024	Clinton Township
Mitigation Solutions-33 North	MIR107299	Grosse Pointe Park
Mitigation Solutions-33/30	MIR107300	Grosse Pointe Park
MJC-Ashford Crossing	MIR108853	Shelby Township
MJC-Carrington Village	MIR109043	Taylor
MJC-Cypress Garden Condo	MIR108283	Taylor
MJC-Devonshire Cove Condo	MIR109042	Taylor
Mjc-Fox Ck of Brownstown II	MIR106894	Macomb
Mjc-Golf Lake Estates	MIR105676	Macomb

MJC-On-site Wetland Mitigation	MIR109806	Taylor
MJC-Proposed Blakely Drain Imp	MIR109807	Taylor
Mjc-Terraces @ Autumn Woods	MIR106811	Macomb
MJC-Terraces at Heritage Vill	MIR109586	unknown
Mjc-Wheatland Estates Sub	MIR106171	Macomb
Mlm-Lia Industrial	MIR106833	Clinton Township
Modena-Orchard Golf Est	MIR106971	Shelby Township
Molinaro-Hidden Pine Lk II	MIR105800	Burtchville
Mondrian-Chesapeake Grove Cond	MIR109193	Troy
Montana Homes-West Park	MIR108990	Macomb
Moravian-Bella Court Condo	MIR108549	Sterling Heights
Morton Taylor Inv-The Glades	MIR109733	Belleville
MRH Office Building-Macomb Twp	MIR108582	Macomb
MS Dev-Pheasant Ridge Est	MIR109462	Ortonville
MSC Land-Bridgewater Estates	MIR109291	Macomb
Mt Elliot-New Mansoleum	MIR106399	Clinton Township
Mt Zion Temple	MIR108944	Clarkston
Mullins-Mill Creek Village	MIR105991	Orion
Multi-Bldg-Central Park Estate	MIR106193	Plymouth
Munaco-Sheldon Court Est	MIR105831	Shelby Township
N & L-Soil Removal Operation	MIR107411	Yale
N Oakland Family YMCA	MIR105780	Detroit
N Pointe Group-River Valley	MIR106549	Clinton Township
Neg-Lewis Tech Center	MIR106415	Farmington Hills
Neumaier-Great Lks Athletic	MIR106717	Lake Orion
Neumann Homes-Sheldon Est Sub	MIR109870	Canton
Neumann Homes-Sterling Woods	MIR109105	Sterling Heights
New Lenox Twp Hall	MIR109883	Lenox
New Little Turtle Macomb Ctr	MIR109039	Macomb

Ngp-Chesterfield Pointe	MIR105732	Detroit
Nine Mile Road Farm	MIR108867	South Lyon
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
Nissan North-Parking Lot Exp	MIR106464	Farmington Hills
Normandy-Ashby Preserve Condos	MIR108396	Harrison Township
North Orchard Place Ph I B	MIR106769	Farmington Hills
North Pointe Condominiums 3	MIR108650	Sterling Heights
North River Co-Brigantine Est	MIR107825	Bloomfield Hills
Northampton Community	MIR107297	Southfield
Northern Equities-LaSalle Tech	MIR108591	Novi
Northern Macomb Dev-PineValley	MIR108822	Macomb
Northpointe Townhomes	MIR106745	Bingham Farms
Northpointe Townhouse	MIR106219	Bingham Farms
Northstone Village	MIR108919	Taylor
Northville to Newburgh Rd Pipe	MIR109645	Livonia
Northwood-Pinewood Est Sub #3	MIR106187	Shelby Township
Novi Corporate Campus	MIR109073	Novi
Novi Group-Bristol Corners N	MIR106190	Bingham Farms
Novi Group-Bristol Corners S	MIR106189	Bingham Farms
Novi-2004 Neighborhood Roadway	MIR107783	Novi
Novi-2005 Streets Rehab Proj	MIR109001	Novi
Novi-Meadowbrook Lk Dredging	MIR108569	Novi
Novi-Pioneer Meadows #162/163	MIR106857	Novi
Novi-Sec 1&12 Sanitary Sewer	MIR106271	Novi
Novi-Sec 10 Site Remediation	MIR106165	Novi
Novi-Singh Trail	MIR108926	Novi

Novi-Taft Rd Reconstruction	MIR107788	Novi
Oak Leaf	MIR109845	Brownstown
Oak Pointe Church	MIR108702	Novi
Oakland Chinese Church	MIR106356	Auburn Hills
Oakland Co Int Airport-T Hang	MIR108882	Waterford
Oakland Co-47051-Rochester Rd	MIR108362	Rochester Hills
Oakland Co-Glass Road at M-15	MIR108036	unknown
Oakland Co-Nine Mile Rd	MIR106011	Beverly Hills
Oakland Co-Rochester Road	MIR109304	unknown
Oakland Co-Walton Blvd	MIR106012	Beverly Hills
Oakland CRC-Adams Rd	MIR109615	Rochester Hills
Oakland CRC-Belford Rd Paving	MIR109541	unknown
Oakland CRC-Groveland Rd Pav	MIR109542	unknown
Oakland Hills C Club-Spec Proj	MIR108318	Bloomfield Hills
Oakland Mall-Lord and Taylor	MIR107575	Troy
Oakland-52nd/3rd Court/Sheriff	MIR106331	Waterford
Oakland-Cooley Lk Rd Widening	MIR109543	unknown
Oakmonte-Silverbell Rd	MIR106071	Auburn Hills
Oakridge Est-Clinton Twp	MIR107159	Bloomfield Hills
Oakwood Condominums	MIR109027	unknown
Oakwood-S Shore Medical Office	MIR107627	Dearborn
Oakwood-Southshore Hospital	MIR109970	Trenton
Occidental Dev-Harbours Bldg	MIR107704	Farmington Hills
Occidental-Westlake Apts	MIR106978	Farmington Hills
OCRC-Crooks Rd Reconstruction	MIR109278	Rochester Hills
Ohst-Visteon Village	MIR106455	Dearborn
Old Orchard-Windsong W Condo	MIR106566	Beverly Hills
Older Person New Facility	MIR106183	Rochester
Olei Investments-Sunset Bluffs	MIR108347	Clarkston

Oliver-Cranberry Meadows Sub	MIR106550	Sterling Heights
Orchard Meadows Sub Ph III	MIR107398	New Haven
Orchards Golf-Estate	MIR107022	Detroit
Orco-Birchcrest Condos	MIR106282	Troy
Orco-Brookside Estates Condos	MIR109906	Brownstown
Orco-Superior Estates	MIR109717	Romulus
Orecchio Barn	MIR108827	Fair Haven
Orion Village Crossing	MIR107278	Roseville
Orion Village Crossing 2	MIR107279	Roseville
Orion-Brown Rd Sanitary Sewer	MIR108432	Lake Orion
Outer Dr39-Independence Mkt Pl	MIR108019	Allen Park
Oxbow Opening to Rouge River	MIR109181	Dearborn
Oxbow Opening to Rouge River 2	MIR109224	Dearborn
P & D-Tall Oaks Condo	MIR108746	Clinton Township
Palushaj-Malsia Court	MIR107448	Novi
Pama Inv-Arbuzzi Farms Condos	MIR107729	Plymouth
Par Res Dev-North Creek Estate	MIR106572	Livonia
Paragon-Woodfield Club #2	MIR105913	Grand Blanc
Park Place of Oak Park Condo	MIR109435	Oak Park
Partridge Creek Fashion Pk	MIR109307	Clinton Township
Partridge Creek Golf-M-59 Conn	MIR108436	Clinton Township
Pathway Blders-West End Ind Pk	MIR108501	South Lyon
Pattyn Prop-Weathervane Farms	MIR107612	Chesterfield
PCCS Service Facility	MIR109868	Canton
Peen Rd-Woodridge Estates	MIR106683	Brownstown
Peg-Hadsell/Bloomfield H-Lands	MIR106380	Rochester Hills
Peoples Comm-Trinity Estates	MIR109927	Inkster
Perralta-Willow Creek Sub 2	MIR108546	New Baltimore
Petros-Falcon Est Subdivision	MIR107725	Mount Clemens

Pettipren-Stoney Creek Est 2	MIR109474	Fort Gratiot
Phase IIa Sanitary Sewer Exten	MIR108556	Belleville
Phoenix Land Dev-Pinehurst	MIR109241	New Hudson
Phoenix Land Dev-Ridge Hills	MIR108030	Northville
Phoenix Land-Green Briar Condo	MIR108949	Commerce Township
Pilot Drive-Metro West Indus	MIR108384	Plymouth
Pine Ridge Senior Village	MIR109319	Clinton Township
Pine Ridge-Timber Ck Sub	MIR106466	Farmington Hills
Pineview LLC-The Evergreens	MIR108098	New Boston
Pinewood Condo	MIR106941	Madison Heights
Pinewood Plaza	MIR107680	Shelby Township
Pio-Chesterfield Square Villas	MIR107591	Shelby Township
Pizzo Const-Pizzo Est Subdiv	MIR107780	Lincoln Park
Pk Place-Mystic Forest II	MIR106970	Wixom
Plastech of Romulus	MIR109261	Romulus
Plute-Bridgewater by Del Webb	MIR109946	Brownstown
Plute-Strathmore Sub	MIR107169	Royal Oak
Plymouth Charter Twp Hall	MIR108353	Plymouth
Plymouth-Daisy Square Condos	MIR107362	Palatine
Pointe @ Treyborne Cove	MIR106146	West Bloomfield
Polaris-Lone Oak Estates	MIR109630	Macomb
Polaris-Macomb Town Ctr South	MIR108615	Macomb
Pontiac Holdings-Tez Mar	MIR106551	Bloomfield Hills
Pontiac-University Dr Widen	MIR109371	Pontiac
Port Huron-16th Ave Sewer Ph 2	MIR108621	Port Huron
Port Huron-4th St Sewer Sepr	MIR106639	Port Huron
Preston Pointe-Brownstown Twp	MIR108151	Trenton
Princeton Prop-Timberline Mdws	MIR108767	Taylor
Professional Med Prop-Sterling	MIR108161	Sterling Heights

Provencher-Sherwood Forest	MIR106162	Washington
Providence Hosp-Novi Ortho Ctr	MIR109940	Novi
Providence Park-24 Mile Rd	MIR108003	Shelby Township
Providence Parkway-Wixom	MIR108781	Wixom
Providence-Parking Lot Recon	MIR109047	Novi
Provincial Glades-Novi	MIR108630	Novi
Pt Commerce-Deeridge Vlg Condo	MIR107859	Farmington Hills
Pt Huron-11th Ave Sewer Sep	MIR106737	Port Huron
Pt Huron-Tunnel St Sep Sewer	MIR107246	Port Huron
Pulte Homes-Strathmore Condo 1	MIR107663	Farmington Hills
Pulte Homes-Strathmore Condo 2	MIR108554	Macomb
Pulte Land-Hills at Indianwood	MIR107728	Royal Oak
Pulte Land-The Hamlet Ph 2	MIR108754	Canton
Pulte Ld Dev-Antique Frst Sub	MIR107023	Royal Oak
Pulte-Antique Forest Sub No 2	MIR107955	Canton
Pulte-Arcadia Park	MIR106225	Royal Oak
Pulte-Arcadia Ridge Ph 2	MIR108772	Northville
Pulte-Arcadia Ridge Ph I	MIR108497	Northville
Pulte-Bridgewater by Del Webb	MIR109003	Brownstown
Pulte-Canterbury Woods	MIR106685	Royal Oak
Pulte-Carrington Garden	MIR106452	Royal Oak
Pulte-Hampton Ridge North	MIR107758	Farmington Hills
Pulte-Liberty Park Collector	MIR107997	Novi
Pulte-Liberty Park Ph 2	MIR108972	Novi
Pulte-Liberty Park Ph I	MIR108070	Novi
Pulte-Liberty Park Ph III	MIR108971	Novi
Pulte-Silvercreek/belmonte	MIR106440	Royal Oak
Pulte-Wyngate of Troy	MIR108035	Troy
Pvof-Lake Huron Woods	MIR106433	Redford

Q Ind LLC-Kawasaki Robotics	MIR108836	Wixom
Quadrants Ind Research Ctr	MIR106375	Wixom
Quadrate Corporate Park Condo	MIR109620	Macomb
Quain-Ravenswood Farms #3	MIR106711	Marysville
R & D-King of The Wld Frms	MIR107421	Clinton Township
R & N Dev-Heritage Place Condo	MIR108658	Harrison Township
R Burgess-Quail Woods	MIR106522	Marysville
R&r-Columbia Square	MIR106320	Milford
Rali-Winding Ck Sub Ph II	MIR105794	Harper Woods
Rali-Winding Creek Ph III	MIR106757	Harper Woods
Rau-Rauhorn Electric Company	MIR107521	Shelby Township
RB-Corp Office & Proto Lab	MIR109056	Plymouth
Rcm-Decora Park Pud 3 & 4	MIR107759	Washington
Real Est Interest Gp-Island Lk	MIR108904	Taylor
Realistic Builders-Prescot Wds	MIR108494	Sterling Heights
Regency Commerce Ctr #2	MIR105864	Sterling Heights
Regency Commerce Ctr No 2	MIR105840	Sterling Heights
Regency-Independence Center	MIR107086	Cincinnati
Remco-Villas of Black Forest	MIR106383	Port Huron
Reserve at Tull Lake	MIR106102	Southfield
Rfb-Royal Park Hotel	MIR106870	Rochester
RHV LLC-The Summit	MIR107382	Bloomfield Hills
Richmond Meadows	MIR109659	Richmond
Richmond-Main Street Office	MIR109044	Richmond
Ridge Nine-Kirkway Estates	MIR108134	Northville
Ridge Rd-Waterstone Est	MIR106887	West Bloomfield
Ridgeview Center	MIR106891	Novi
Riley-Parkway Chrysler/Jeep	MIR108976	Clinton Township
Riv Edge at Cherry Hill Ph 1	MIR109692	Canton

River Homes-Hickory Ridge	MIR105830	Saint Clair Shores
Riverwalk Condo-Farmington Hil	MIR108474	Farmington Hills
Riviera Ridge Estates	MIR109125	Macomb
Robertson-Brookdal-Saddlebrook	MIR108774	Plymouth
Robertson-Cressbrook Condo	MIR106138	Bloomfield Hills
Robertson-Links of Fellows Crk	MIR106324	Bloomfield Hills
Robertson-Northwyck Condo	MIR106545	Bloomfield Hills
Robinson Co-Farms of Lenox	MIR108256	Lenox
Robinson-Riverside Ph 3 & 4	MIR107284	Bingham Farms
Robinson-Riverside Phase #3	MIR107557	Bingham Farms
Robinson-Riverside Phase 1c	MIR107556	Bingham Farms
Rochester Hill-Hitchmans Haven	MIR106779	Rochester Hills
Rochester Hill-Rochdale Water	MIR106780	Rochester Hills
Rochester Hills Congregate	MIR106715	Farmington Hills
Rochester Hills Pblc Serv Bldg	MIR109944	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
Rochester-Van Hoosen MiddleSch	MIR108893	Rochester Hills
Romel Casab-Commerce Lk Prop	MIR109374	Commerce Township
Romulus Recreation Center	MIR109824	Romulus
Romulus-Wahrman Rd Improvement	MIR107041	Romulus
Romulus-Water Main Improvement	MIR108878	Romulus
Roncelli Inv-J H Hart Facility	MIR108137	Sterling Heights
Rosati Industrial Park	MIR105696	Livonia
Roscommon-Butler Ridge Ph II	MIR106897	Troy
Rosenhaus-Pinehurst Condo	MIR106110	Farmington Hills
Rouge Steel Prop Urban Renew	MIR106101	Dearborn

Rpl-Bridge Valley of Milford	MIR106698	West Bloomfield
RS Contracting-Marine City Hwy	MIR108430	Casco
Ruby Tuesday-Plymouth Twp	MIR109387	Plymouth
Rwt Bldg-Crestwood Site Condos	MIR107947	Troy
Rwt-Crestwood Condo	MIR107096	Troy
Ryan Rd Shelby-Glen Arbor Cond	MIR108850	Shelby Township
Ryan Woods-Northpointe Condo	MIR107374	Utica
S Frankel-Plymouth Tech Park	MIR105724	Southfield
S Huron Valley UA-WWTP Flow	MIR107969	Rockwood
S Lyon-Griswold Transportation	MIR109727	unknown
S Redford-Thurston High School	MIR109671	Redford
S S Wayne-OB Storage Facility	MIR108248	Wayne
S&s-Parkview Heights Sub #2	MIR105964	Walled Lake
Sa Mar-Gateway Village Est	MIR107768	Utica
Saberan-Redwood Estates	MIR108939	New Baltimore
Sable Realty-Central Pk Ph II	MIR109488	Shelby Township
Sable-Manors @ Central Park	MIR107001	Sterling Heights
Salamey-Autumn Court Estates	MIR109025	Canton
Sal-Mar Farm-Rivers Est	MIR107031	Utica
Sal-Mar-Macomb Towne Square	MIR108861	Macomb
Samohin-Lakeside Industrial	MIR106907	Sterling Heights
Sandstone-12 Mile	MIR106975	Bingham Farms
Sandstone-Dixon & 12 Mile Rds	MIR107262	Bingham Farms
Sandy Shores-Oxford	MIR107769	Oxford
Sarah Estates Condos-Livonia	MIR108910	Livonia
Sashabaw Crossings-Phase I	MIR108175	Clarkston
Saturnia-Smith Ck Grove	MIR106062	Southfield
Sb-Northville Green Office Pk	MIR106726	Bingham Farms
Scalabrino-Hidden Woods Condos	MIR107880	Shelby Township

Schafer Dev-Quail Chase	MIR109791	Livonia
Schmidt-Lot 18 23 Square Ind	MIR109242	Chesterfield
Schoolcraft Biomedical Center	MIR109907	Livonia
Schoolcraft-College Park Ph 1	MIR107454	Livonia
Schoolcraft-College Park Ph 2	MIR108208	Livonia
Schoolcraft-College Park Ph 4	MIR109850	Livonia
Schoolhouse Montessori-Macomb	MIR108407	Macomb
Sd-Country Club Vill of RH	MIR107765	Southfield
Sd-Golf Highlands 2-5	MIR106929	Southfield
Secure Prop-Novi Family Fun Pk	MIR107740	Plymouth
Seguin-Hertiage Sq Site Condo	MIR107712	Harrison Township
Selective Delaware-Brookstone	MIR105736	Southfield
Selfridge ANGB Visitor Center	MIR109602	Selfridge ANGB
Serra Buick Pontiac GMC	MIR108607	Washington
Severstal N Amer-Coke Plt Demo	MIR107939	Dearborn
Seville Homes-Hawthorne Woods	MIR107073	Clinton Township
Seville-Whispering Pines #2	MIR106408	Clinton Township
Shall-Pheasant Ridge Est	MIR107145	Washington
Shannon-Stoneridge Office Park	MIR109530	Novi
Shaya-J & B Medical Supply	MIR109031	Wixom
Shaya-Tao Condominiums	MIR108848	Washington
Shelby Prop Invest-Willow Ck	MIR108889	Shelby Township
Shelby Ridge Estates	MIR108102	Shelby Township
Shelby Twp-Soccer City	MIR109385	Shelby Township
Shelby-23 Mile Rd San Sewer	MIR108727	Shelby Township
Sherwood Development	MIR109204	Ortonville
Shorepointe Village Homes	MIR105814	Royal Oak
S-Hqz-Riverside Ph 1b	MIR107020	Bingham Farms
S-Hqz-Riverside Ph 2	MIR107166	Bingham Farms

Sierra Dev-Silver Fox	MIR107392	Walled Lake
Silver Pines Village Condo II	MIR106697	Sterling Heights
Silverman-Deer Lake Village	MIR105799	Bingham Farms
Silverman-Riverside N Ph 5A-5B	MIR109022	Holly
Silverstone-Stone Meadows	MIR108323	Commerce Township
Singh Dev-Charing Cross Ph 1	MIR107024	West Bloomfield
Singh Development-Greystone	MIR107474	West Bloomfield
Singh Dev-N Oaks #3	MIR107419	West Bloomfield
Singh Dev-Riverstone	MIR108073	West Bloomfield
Singh Dev-Seely Sanctuary	MIR107441	West Bloomfield
Singh Dev-Waltonwood Lakeside	MIR108845	Sterling Heights
Singh Dev-Westchester	MIR106045	West Bloomfield
Singh Sabha Temple	MIR109932	Canton
Singh-Bolingbroke Site Condo	MIR108530	Novi
Singh-Churchill Crossing #2 3	MIR106458	West Bloomfield
Singh-Trails of Loon Lake	MIR106483	West Bloomfield
Singh-Waltonwood @ Main	MIR107752	West Bloomfield
Singh-Willowbrook Farm 4	MIR108481	Novi
Sinhg Dev-Charing Cross Ph 2	MIR107349	West Bloomfield
Slcs New High School	MIR107245	South Lyon
Sl-Sharon Hardy Elem School	MIR106834	South Lyon
SMJ-Normandy Hills Estates	MIR109926	Novi
Sokoll-Crystal Ponds	MIR106247	Clarkston
Sole Dev-The Coves Condo	MIR109730	Romulus
Sorrentino-Lexus Med Off Bdg	MIR108760	Pontiac
Soulliere-Elk Horn Est Condos	MIR105834	Oak Park
South Blvd Properties	MIR107213	Troy
South Lyon School-2nd High Sch	MIR107798	South Lyon
Southampton Est Condos	MIR109718	Sterling Heights

Southfield Gateway-Corp Exp	MIR109774	Southfield
Southtown Village-Southgate	MIR108016	Southgate
Southview Inc-Southview	MIR107033	Romulus
SPA-Regional Storm Water Basin	MIR108194	Canton
Spartan-Westbrooke Site Condo	MIR109794	Sterling Heights
Springwater Park	MIR105759	Bingham Farms
St Clair Co Sheriffs Office	MIR106838	Port Huron
St Clair Highlands No 6	MIR108428	Saint Clair
St Dennis-Caribou Creek Est	MIR106008	Clarkston
St Isidore Catholic Church	MIR106784	Detroit
St John Health-HarrisonVillCon	MIR108600	Harrison Township
St John Macomb Ambulatory Care	MIR109362	Macomb
St Martins Commons-Livonia	MIR109161	Livonia
St Peter Lutheran	MIR107356	Macomb
St Roch Catholic Church	MIR109072	Flat Rock
Stanaj Inv-Ridgewood Plaza	MIR109455	Northville
Steel Industries	MIR109627	Redford
Steeple Chase	MIR109217	unknown
Sterling Creek Condo	MIR106671	Sterling Heights
Sterling Hghts-19 Mile Rd Blvd	MIR109499	Sterling Heights
Sterling Hgts Wal-Mart 4424-00	MIR109636	Sterling Heights
Stock Bldg Supply-Commerce	MIR108642	Commerce Township
Stonegate North-Boulder Pointe	MIR107302	Utica
Stonehenge Condominiums	MIR105750	New Baltimore
Stoneridge Subdivision	MIR109008	Macomb
Stones Bay Dev-Lenox	MIR108599	Lenox
Stones Bay-Kluck Property	MIR108647	Lenox
Stoney Creek-Pointe Subdiv	MIR108051	Auburn Hills
Stoney Lake Village	MIR106949	West Bloomfield

Stramaglia-Louis Lake Estates	MIR105973	Utica
Stratford Vlg North-Ph 2 East	MIR107927	Novi
Stulberg-Willow Lk Est Sub	MIR107311	Farmington Hills
Styl Rite-Lynn Corp Pk Ph II	MIR107248	Pontiac
Styl-Rite/Lynn Corp Park	MIR106278	Pontiac
Suburban Dev-Legacy Site Condo	MIR108443	West Bloomfield
Suburban Ice-Macomb	MIR108107	Macomb
Summer Park Assoc-The Hamlet	MIR108054	Canton
Summer Park-Proctor Rd Project	MIR108703	Canton
Summit Prop-Bridlewood Condo	MIR108940	Brandon Twp
Sunflower 7-Coachlight Sq #2	MIR107447	Oak Park
Swan Creek Condos-Richmond	MIR106552	Chesterfield
T&P-Coon Ck Golf Course	MIR107404	Ray
Taft Knolls	MIR107847	Novi
Taft Knolls II	MIR109465	Novi
Talon-American House Indp	MIR105669	Bloomfield Hills
Tandeski-Irwin Rd Mitigation	MIR109646	Richmond
Target at Shops of Wonderland	MIR109928	Livonia
Target Store T-2207	MIR109471	Southfield
Taubman-Twelve Oaks Mall Exp	MIR109370	Novi
Taylor Classic-Timbers Edge	MIR108425	Taylor
Taylor Exemplar Charter Acad	MIR109504	Taylor
Taylor Meadows Condominiums	MIR108385	Troy
Taylor Meadows Condominiums	MIR108385	Troy
Taylor-Commons at the Villages	MIR108060	Taylor
Tbon/Boco-Expo Conf & Conv Ctr	MIR107632	Novi
Ten/Ten Southfield-Mixed Use	MIR109403	Southfield
Terraces at Rose Gardens Est	MIR109348	Clinton Township
Terrance Les-Les Site	MIR108354	Clinton Township

The Alan Group-Superior Ford	MIR107532	Berkley
The Boulevard Shoppes	MIR109693	Rochester Hills
The Express Group	MIR107895	Walled Lake
The Promenade at Waterstone	MIR109604	Oxford
The Sanctuary Condominiums	MIR108056	Farmington Hills
The Vineyards of Plymouth Twp	MIR109396	Plymouth
Tienken-City Walk	MIR109223	Rochester Hills
Tigand Land-Huron Park	MIR106058	Farmington Hills
Timber Trace Estates	MIR109568	Commerce Township
Timbers Sub-Van Buren Twp	MIR107987	Farmington
Timbers Summit-Timbers Subdiv	MIR107072	Ann Arbor
Ti-Milford Process & Pipeline	MIR105998	Milford
TJ Realvest-Deer Ridge Condos	MIR109686	Rochester
TLB-Boulder Creek Phase III	MIR109823	East China
Toll Bro-Island Lk Novi Ph 5b	MIR107742	Farmington Hills
Toll Bro-Island Lk Novi-Ph 4b1	MIR107354	Farmington Hills
Toll Bro-Northville Hills Golf	MIR109835	Northville
Toll Bros-Island Lk Novi-Ph 3d	MIR107353	Farmington Hills
Toll Bros-Steeplechase Sub 2-4	MIR107789	Farmington Hills
Toll Brothers-Island Lk 4a/5a	MIR106185	Farmington Hills
Toll MI III-Maple Lake Farms	MIR109836	Milford
Toll MI IV-Wynstone Condo	MIR108529	Oakland
Toll MI LP-Century Oaks No 4	MIR107372	Bingham Farms
Toll-Island Lk of Novi	MIR106453	Farmington Hills
Toll-Island Lk of Novi Ph 4B-2	MIR108584	Novi
Toll-Island Lk of Novi-Ph 5C	MIR109790	Novi
Tolliver-Woodlands/Groveland	MIR105951	Ortonville
Toll-Lk of Milford 3 4 5	MIR106459	Farmington Hills
Toll-N-Ville Golf Club Sub #3	MIR107942	Farmington Hills

Torca Inc-Auburn Hills	MIR106621	Auburn Hills
Towncenter Shoppes-Shelby Twp	MIR108480	Shelby Township
Towne Home-Avalon Meadows	MIR109810	Chesterfield
Townes of Liberty Park Ph II	MIR109288	Novi
Towns at Liberty Park Phase I	MIR108463	Novi
Trenton Grande Condo	MIR108381	Trenton
Trident Crest-Tullamore Subdiv	MIR108693	Oxford
Trillium Village	MIR107485	Auburn Hills
Trimarr-Bradbury Park Phase 2	MIR108520	Flat Rock
Trimarr-Bradbury Park Phase I	MIR108192	Flat Rock
Trimarr-Fox River	MIR108149	New Boston
Trinity Inv-Nelson Scott Farms	MIR107216	Pontiac
Trinity Territory	MIR106917	Clinton Township
Triple E Dev-Lost Deer Acres	MIR109510	Saint Clair
Troy-Baker New Middle School	MIR109250	Troy
Troy-Charnwood Sewers Ph 1	MIR109599	Troy
Troy-Golf Course	MIR106328	Troy
Troy-Meijer Dr/Industrial Row	MIR109922	Troy
Tsatsanifos-Olympia Park	MIR108679	Farmington Hills
Turnberry Place	MIR109260	unknown
Turnkey Self Storage Exp	MIR109792	Washington
Turnkey-Clay Twp Retail Ctr	MIR105850	Washington
Twp of Grosse Ile-Retent Basin	MIR107038	Grosse Ile
UAW/Ford Fam Serv & Lrn Ctr	MIR106521	Dearborn
Ulgc-Charlton Estates	MIR106350	Oakland
Uniland-Hidden Oaks Condo	MIR106883	Farmington
Unity Properties-Chelsea Court	MIR107522	Sterling Heights
Uptown Investors-Phase #1	MIR107625	Farmington Hills
Utica Comm-Elementary School	MIR107924	Sterling Heights

Utica Schools-Aux Serv Complex	MIR107963	Sterling Heights
V & M-Tesner Park Sub	MIR106203	Shelby Township
V A Great Lakes Nat Cemetery	MIR109061	Holly
Van Buren Business Park	MIR109239	Belleville
Van Buren Dev-Victoria Park	MIR109734	Van Buren Twp
Van Haverbeck-Harmony Acres	MIR107146	Ray
Vanderbilt @ Williamsburg	MIR106542	Bingham Farms
Vanguard Industrial Ctr	MIR105776	Wixom
Vanhaverbeck-Richwood Forest 2	MIR107136	Ray
Varnchrist-Fyke Dr Proj C&D	MIR105804	Milford
Vector Compression Exp-Romeo	MIR109938	Washington
Ventimiglia Retail Center	MIR109346	Shelby Township
Ventimiglia-Gloede Park Subdiv	MIR107581	Warren
Vesper Const-Creekside Manor	MIR107843	Clinton Township
Vgw Development-Village Manor	MIR107540	East Lansing
Vgw-Village Manor	MIR106519	East Lansing
Victory Toyota-Canton	MIR109427	Canton
Village Shops of Wonderland	MIR109919	Livonia
Vinstra-Windstone Park II	MIR106682	Clarkston
Vistal-Meadowbrook 8	MIR108111	Novi
Vistas-Condominium	MIR106465	Farmington Hills
Vitale-Margherita Est Subdiv	MIR107865	Macomb
Vitale-Vitale Plaza	MIR108465	Shelby Township
Vlhd-Hidden Ck Pines Condo	MIR107247	Northville
W Beaumont Hospital-N Macomb	MIR108062	Macomb
W&A-St Annes Gate-Detroit	MIR106515	Bingham Farms
Wade-Hidden Falls Wellness Ctr	MIR105943	Livonia
Wake Pratt-Cedar Pines Est	MIR108116	Troy
Walden Woods #4	MIR106695	Farmington Hills

Waldon Bluffs-Cambridge Comm	MIR109669	Clarkston
Waldon Village Town Center	MIR107271	Bloomfield Hills
Walled Lk-Mini Storage Depot	MIR107259	Mishawaka
Wal-Mart 5048-01 Expansion	MIR109643	New Hudson
Wal-Mart SC 1611-04	MIR109107	Fort Gratiot
Wal-Mart SC Expansion 2618-01	MIR109787	Commerce Township
Wal-Mart SC Expansion 3487-01	MIR109656	Shelby Township
Wal-Mart Store 2631-03 SC	MIR109843	Livonia
Wal-Mart Store 2692-01	MIR109635	Chesterfield
Wal-Mart Store 4383-00	MIR109875	Dearborn
Wal-Mart-Sams Club 6657-01	MIR108482	Novi
Walsh College Addition	MIR109892	Troy
Waltz-Huron Village	MIR106148	Canton
Warren-City Ctr Infrastructure	MIR107811	Warren
Warren-Detroit Testing Labs	MIR109367	Warren
Wash Mac Prop-Greystone EstSub	MIR108410	Washington
Washington Lakeview Subdiv	MIR108742	Washington
Washington Storage	MIR107238	Washington
Washington Twp-Bradbury Condo	MIR107813	Troy
Waterford-Towne Cntr Commons	MIR107517	West Bloomfield
Waterside Marketplace	MIR109761	Chesterfield
Waterstone-Shelby Woods North	MIR109152	Shelby Township
Wayne Co DPS-Seven Mile Road	MIR109347	Livonia
Wayne Co-Ecorse Road/I-275	MIR108169	Romulus
Wayne Co-Warren Rd	MIR109101	Canton
Wayne Mem Hs-Field Renovation	MIR106622	Westland
Wayne-Rehab of Runway 3R-21L	MIR109889	Detroit
Wayne-Western Campus Addition	MIR109908	Belleville
WCCC-Emergency Training Comp	MIR108067	Taylor

Weathervane Prop-Woods Subdiv	MIR107817	Chesterfield
Weaver-Millenium Park	MIR107111	Northville
Webber Dev-Parcel B	MIR106674	Clinton Township
Weber-Bluffs of Beaufait 2	MIR106616	Clinton Township
Weinberg-White Lake Retail Ctr	MIR109781	White Lake
Welhelm-Hatchery Farms	MIR108611	unknown
Welsh-Tumbling Waters Condo	MIR109357	Milford
West Park Place Condominiums	MIR107595	Farmington Hills
West Tel-West Lake Vill Condos	MIR105723	Livonia
Western Const-Fairway Commons	MIR108441	Macomb
Westhuron Dvpt-Pinegroves Cond	MIR108437	New Boston
Westminster-Drake Shire	MIR108038	Southgate
Whispering Ck-Brookside	MIR107281	Farmington Hills
Whispering Woods Est	MIR106425	Ypsilanti
White Lk Vent-Williams Lk Cros	MIR107036	West Bloomfield
Whiteacre-Riverwoods Farms Sub	MIR108492	Macomb
Willow Run Airport Runway 2	MIR109200	Ypsilanti
Windham Dev-Woodland Ridge	MIR106582	West Bloomfield
Windham-Preserves of Meadowbrk	MIR107323	West Bloomfield
Winkle-Swan Creel Estates	MIR109038	Richmond
Winnick-Echo Park Sub	MIR108998	Southgate
Winter-Beaumont Medical Center	MIR107488	Bloomfield Hills
WLC-Willow Ridge Farms	MIR106118	Clinton Township
Woodhaven-Brownstown HS	MIR107579	Brownstown
Woodhaven-Patrick Henry Mid Sc	MIR107458	Brownstown
Woodside Bible Church-Troy	MIR107482	Troy
Woodside Vill-Rose Meadow Apt	MIR106831	Shelby Township
Woodwind Estates-South Lyon	MIR108238	South Lyon
Woodwind Glen	MIR106317	South Lyon

Woodwind Village	MIR105984	South Lyon
Woolf Aircraft	MIR109311	Romulus

APPENDIX N

CSO AND SSO DISCHARGE
AND
E. COLI LEVELS

Figure N-1

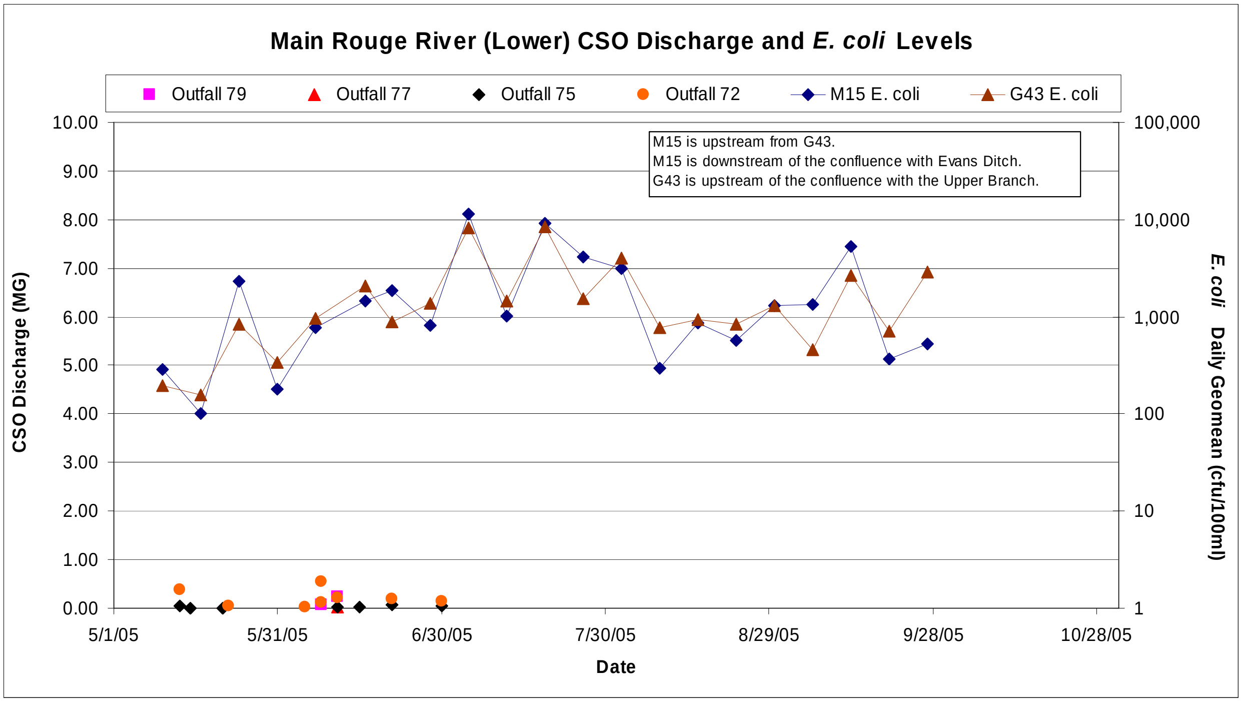


Figure N-2

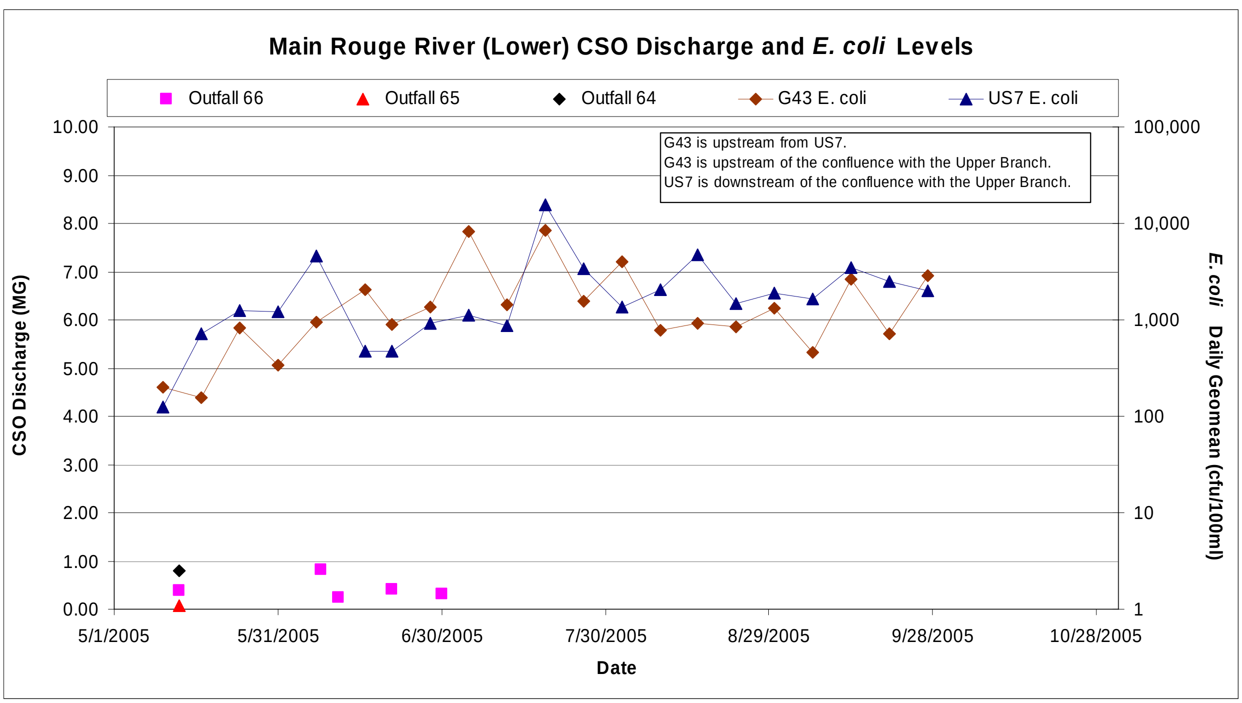


Figure N-3

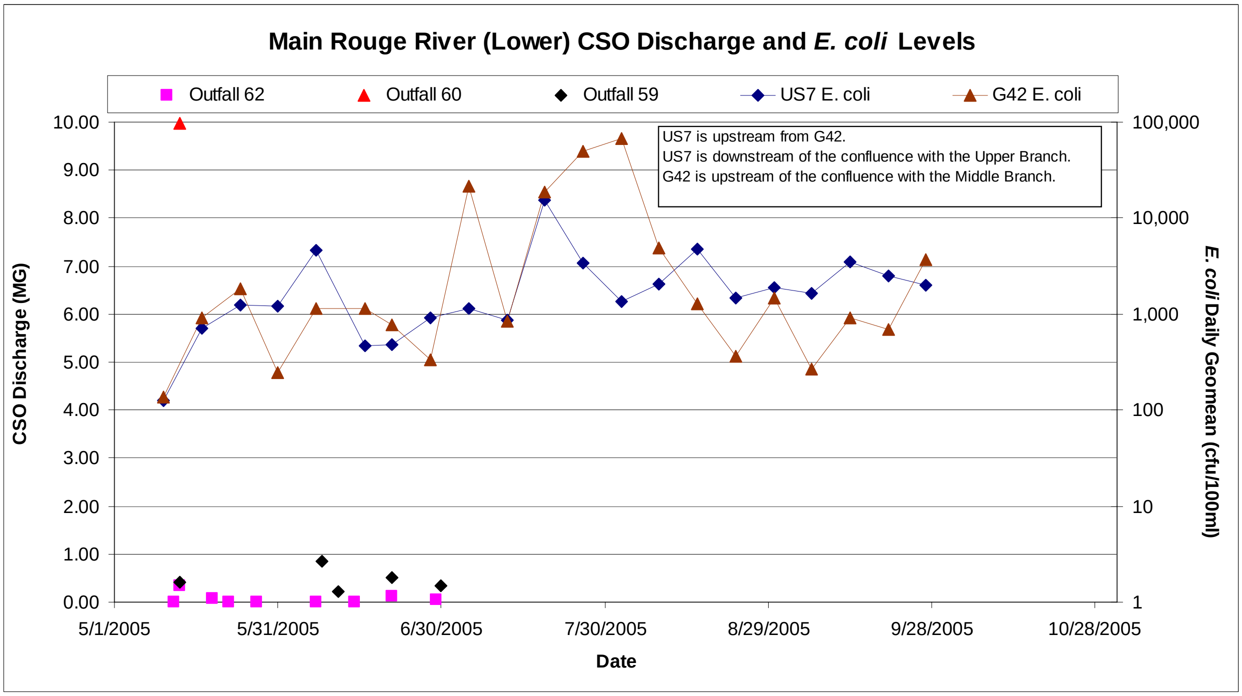


Figure N-4

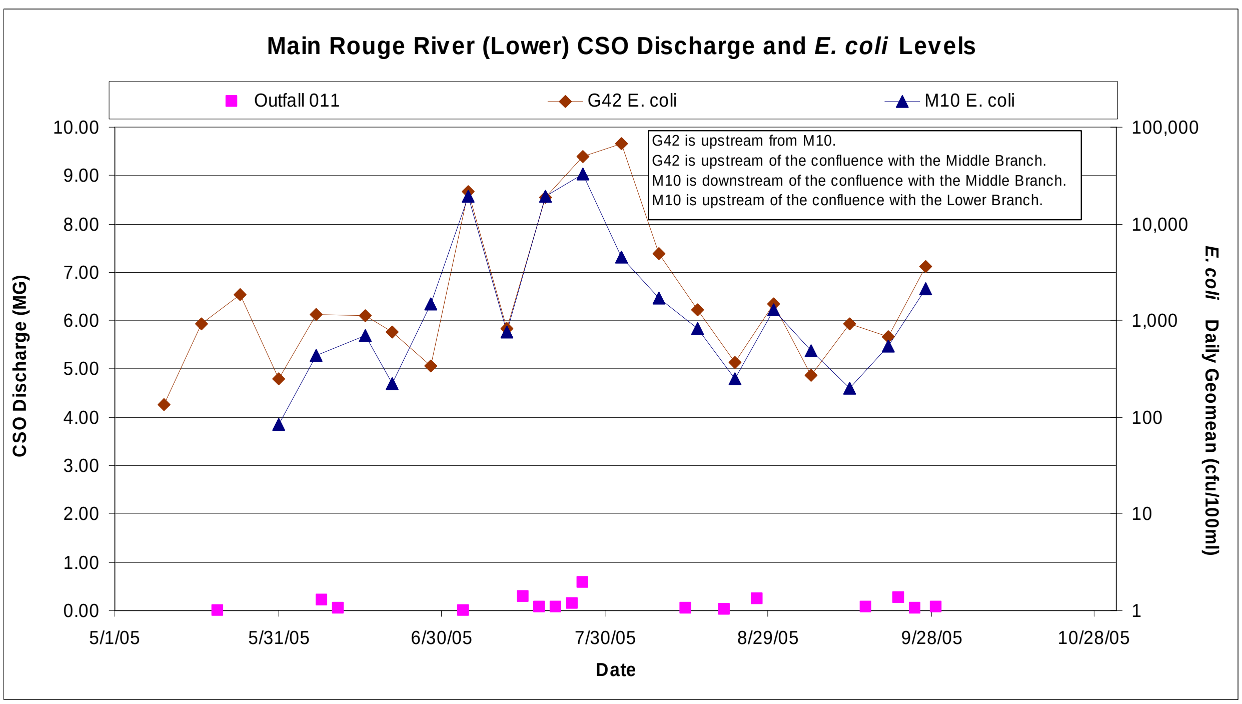


Figure N-5

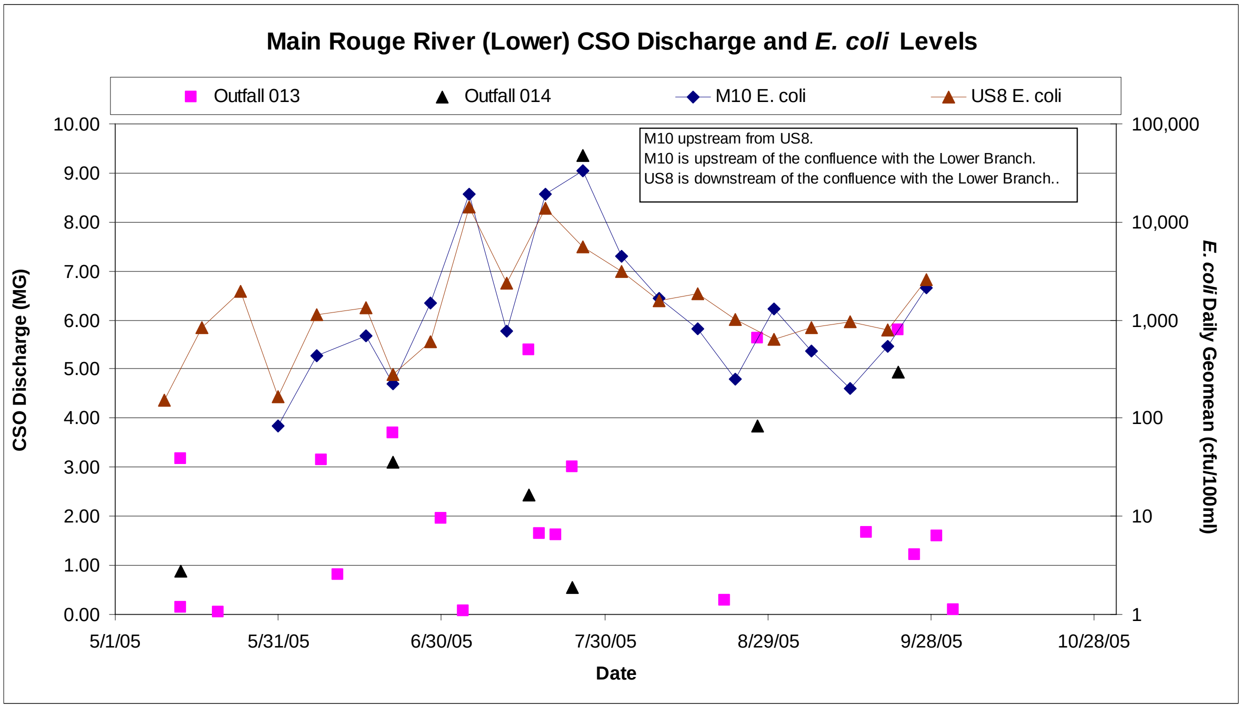


Figure N-6

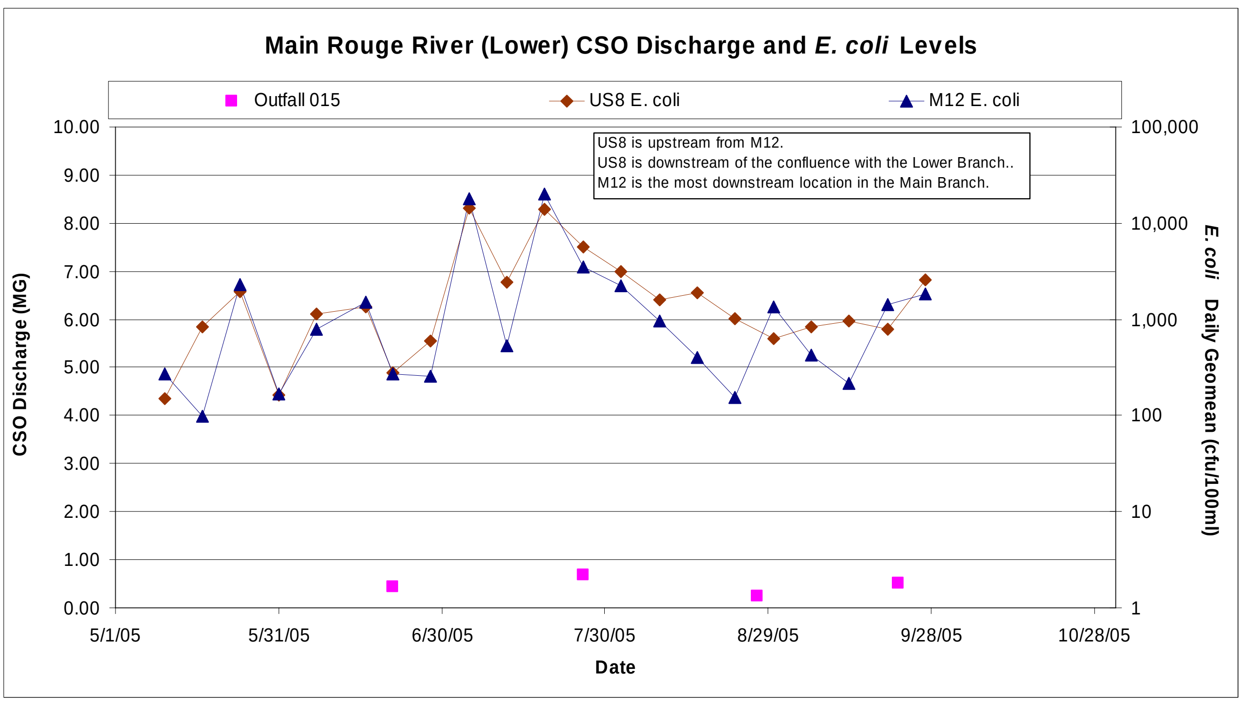


Figure N-7

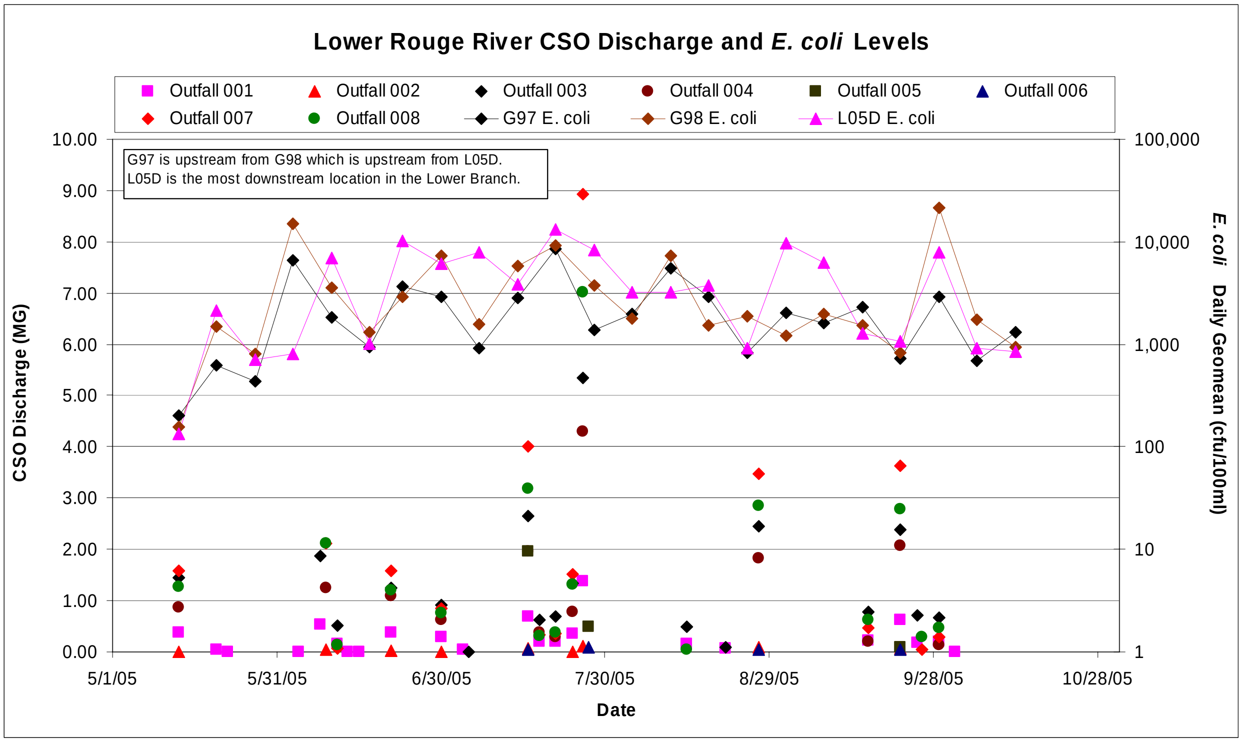


Figure N-8

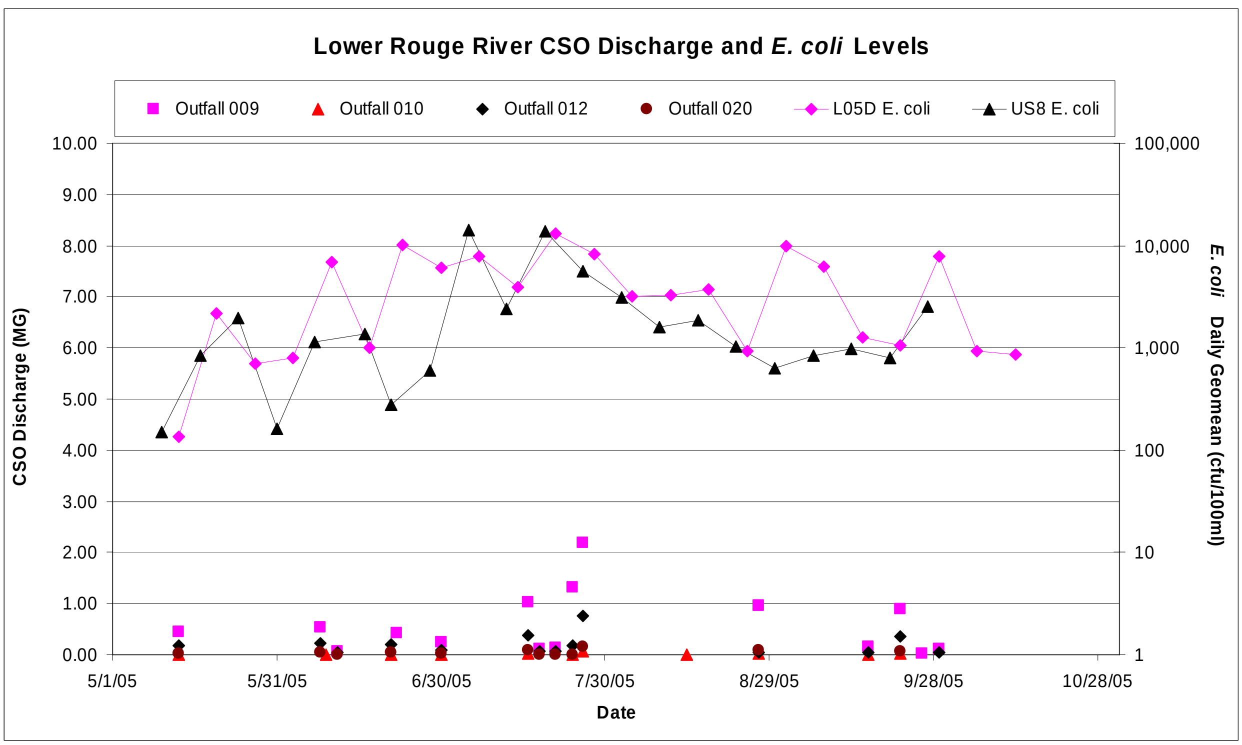
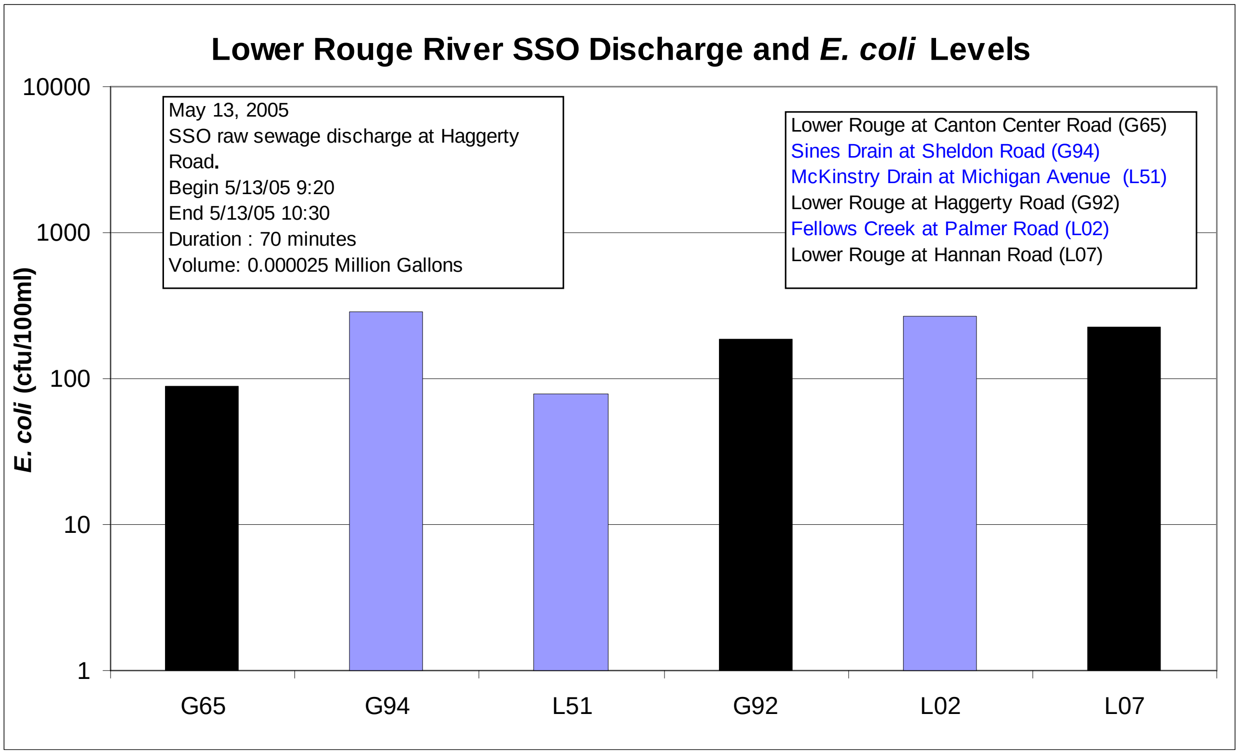


Figure N-9


Lower Rouge River SSO Discharge and E. coli Levels
10000
1000
100
10
1
E. coli (cfu/100ml)
May 13, 2005
SSO raw sewage discharge at Haggerty Road.
Begin 5/13/05 9:20
End 5/13/05 10:30
Duration : 70 minutes
Volume: 0.000025 Million Gallons
Lower Rouge at Canton Center Road (G65)
Sines Drain at Sheldon Road (G94)
McKinstry Drain at Michigan Avenue (L51)
Lower Rouge at Haggerty Road (G92)
Fellows Creek at Palmer Road (L02)
Lower Rouge at Hannan Road (L07)
G65
G94
L51
G92
L02
L07

APPENDIX O

GAUGE INFORMATION AND ASSUMPTIONS

Branch	USGS Gauge	Gauge Description	Gauge Drainage Area (square miles)	Watershed Drainage Area (square miles)*	Gauge Flow Dates**	Rationale
Main	4166500	River Rouge at Detroit	187	403	10/1997 - 8/2006	Main branch flows were calculated by adding flows from gauges 4166500 + 4167000 + 4168400. Gauge 4166500 was used in order to capture flow from the Upper branch, and upper reaches of the Main branch. The periods of record for the Upper and Middle branch gauges have been truncated to match the period of record for the Lower branch gauge.
	4167000	Middle River Rouge Near Garden City	99.9		10/1997 - 8/2006	
	4168400	Lower River Rouge at Dearborn	91.0		10/1997 - 8/2006	
Upper	4166470	Upper Rouge at Detroit	67.3	69.3	10/1997 - 9/2005	Gauge went off-line end of 2005. Gauge period of record is 10-97-12-05.
Middle	4167000	Middle River Rouge Near Garden City	99.9	109.3	10/1930 - 8/2006	Entire period of record used.
Lower	4168400	Lower River Rouge at Dearborn	91.0	91.0	10/1997 - 8/2006	Gauge period of record truncated to reflect YUCA WWTP influence starting from 1997.

* Drainage Area corrections were used to account for inputs of flow occurring downstream of gauge locations.
** Gauge flow dates do not reflect complete period of record for USGS Gauges.