Michigan Department of Environmental Quality
Water Bureau
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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.

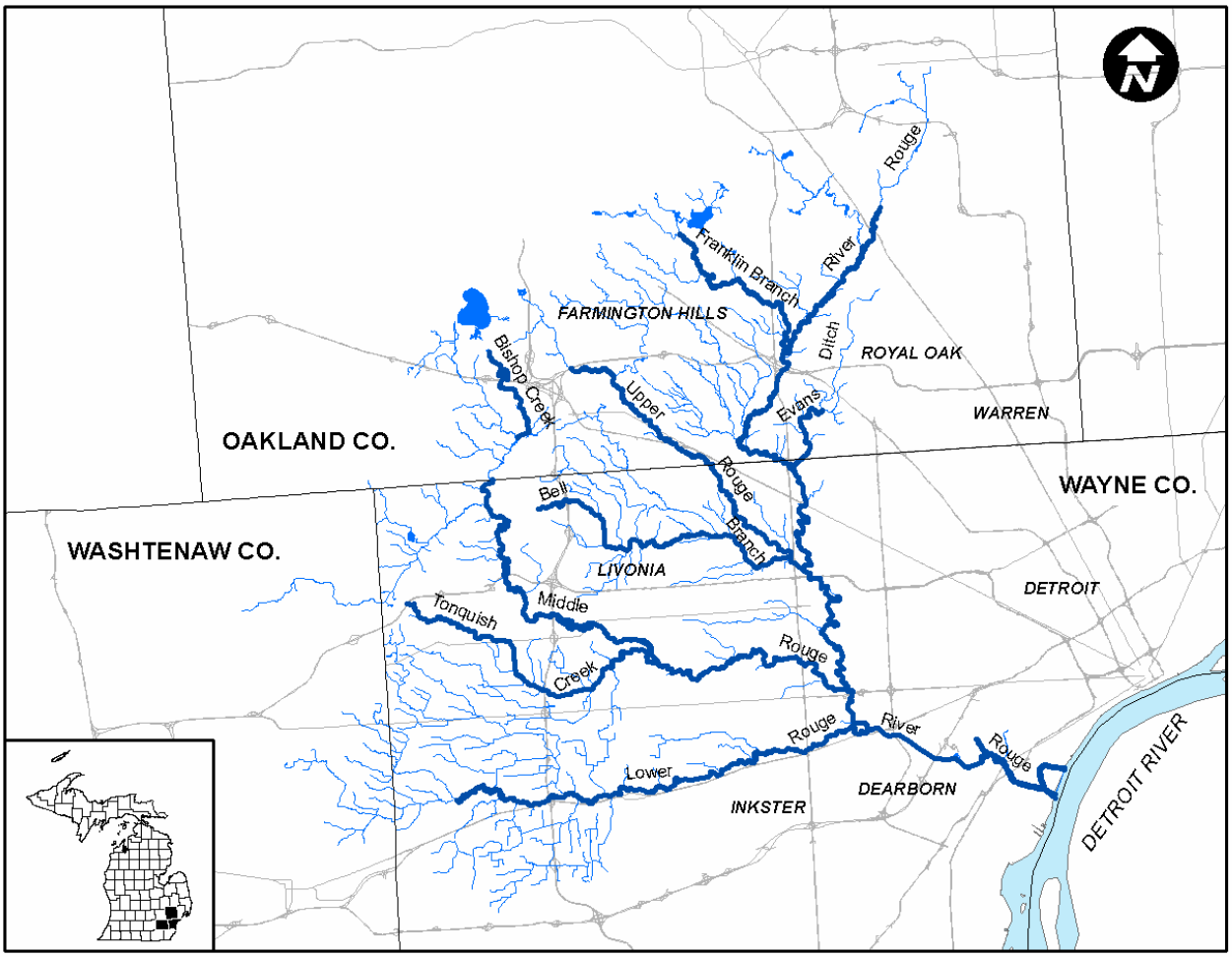

Figure 1. Rouge River Watershed 303(d) listed biota TMDL reaches (in bold).

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	=	$\leq$ 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.

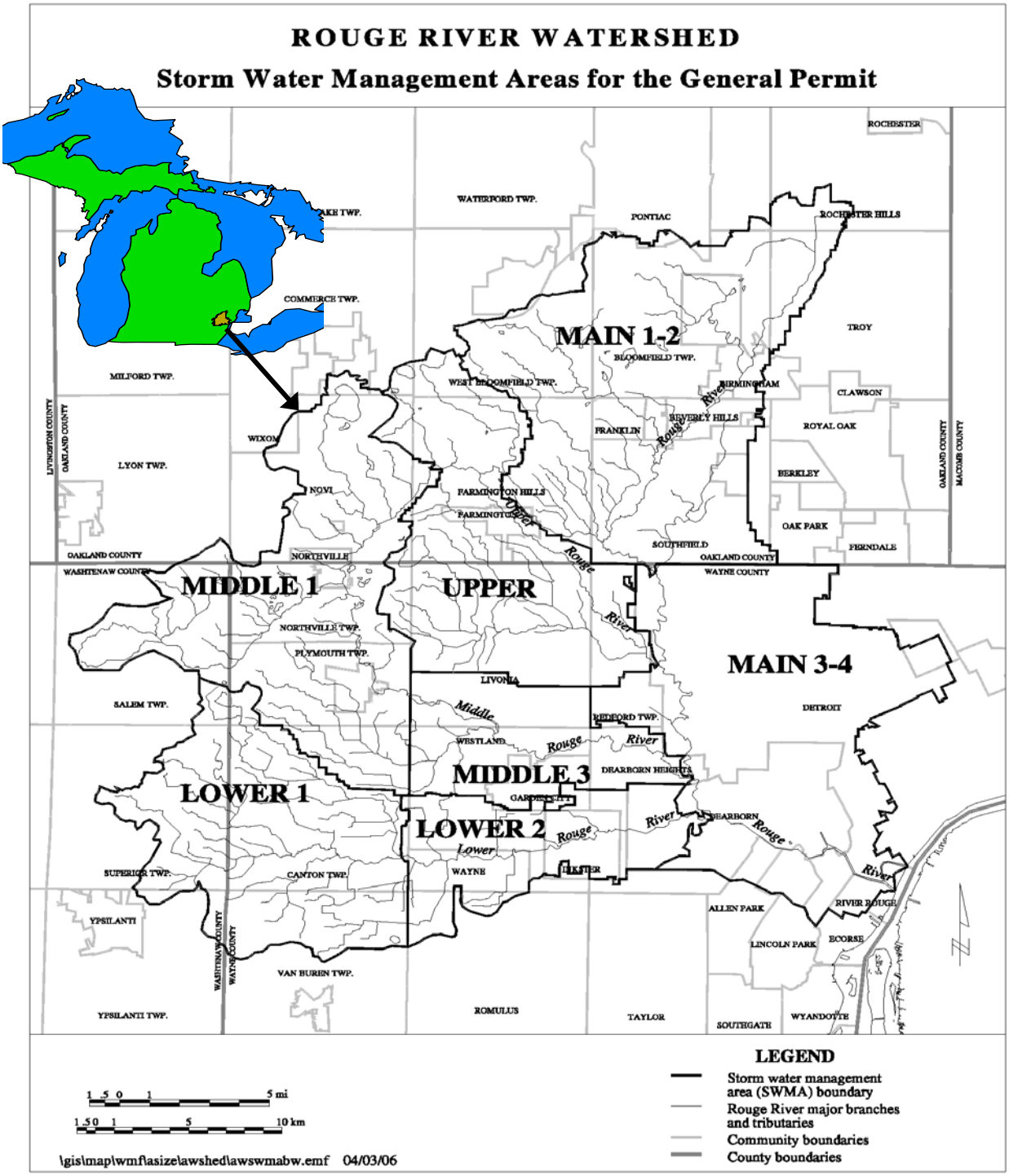

Figure 2. Rouge River Watershed SWMAs.

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

Land Use Category	Storm Water Management Areas (SWMA) as Percentages of Total Drainage Area							
	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 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.

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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)

Facility	Number	County	MAIN BRANCH 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				
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			
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