Detroit Water and Sewerage Department

Wastewater Master Plan

Project No. CS-1314

Field Data Collection and Water Quality Issues for SSO Controls

Technical Memorandum
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Field Data Collection and Water Quality Issues for SSO Control

1. Introduction

The objective of this memorandum is to broadly characterize pollutant loading and the impact attributed to Sanitary Sewer Overflows (SSOs) within the Detroit Water and Sewerage Department (DWSD) Service Area. A comparison is made to other point sources, including the Detroit WWTP and Combined Sewer Overflows (CSOs). The locations of these CSO and WWTP point pollution sources are shown in Figure 1.

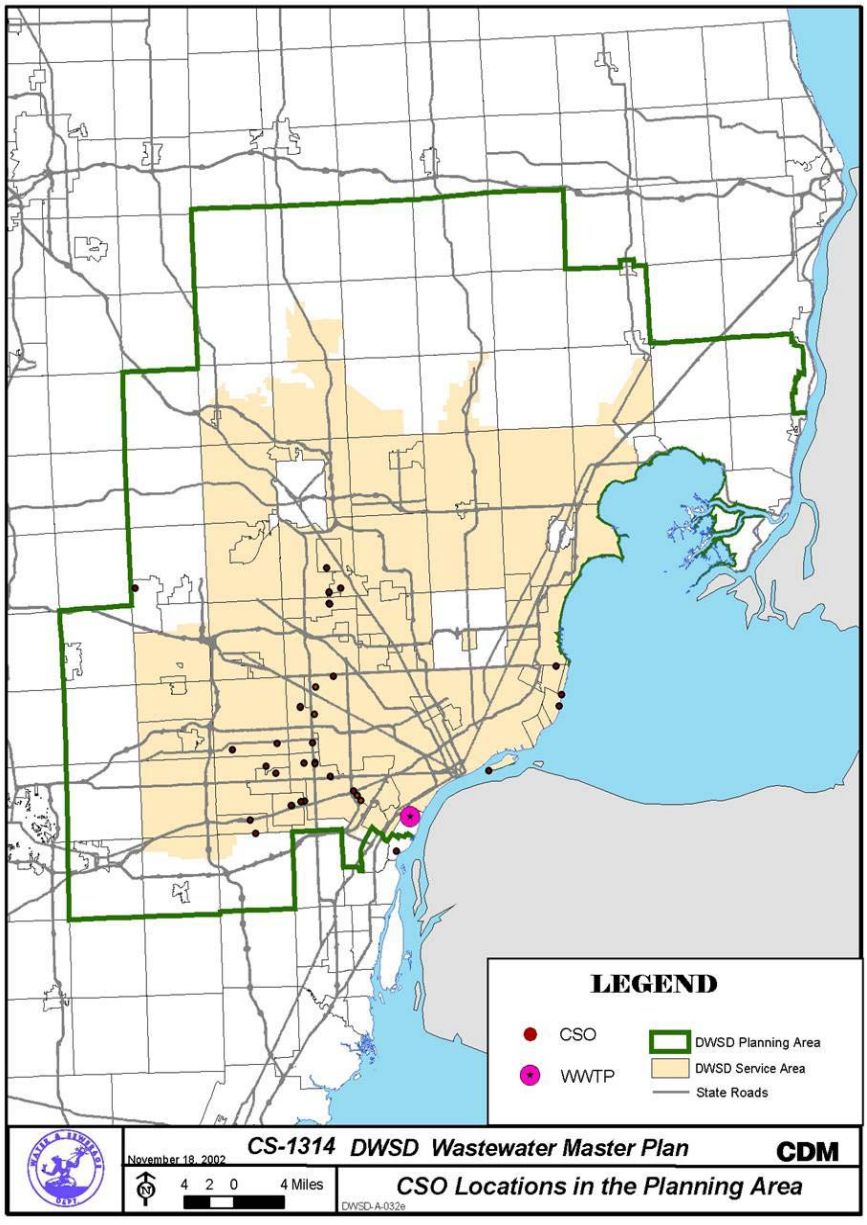


Figure 1. Point Pollution Sources Within DWSD Service Area

This report contains a brief summary of local water quality studies relating to SSO and CSO discharges, a discussion of pollutant loadings to local watersheds, and a list of local water quality references. Details with respect to the Wastewater Master Plan (WWMP) water quality-sampling program are included in the study review section.

2. Water Quality Studies

The findings of several local water quality studies are summarized below. The goal of this analysis is to provide insight regarding the impact of SSOs relative to other point source discharge sources related to wastewater collection systems within the DWSD service area. The key studies that are summarized include:

- WWMP/ Case Study Communities SSO Sampling Program.
- Macomb Count Health Unit Surface Water Sampling Program
- DWSD Long Term CSO Program
- Dearborn Heights Corrective Action Plan

A brief discussion of these studies and a few supplemental sources of information follows.

2.1. WWMP / Case Study Communities SSO Sampling Program

A field-sampling program was established under the WWMP in order to collect grab samples from SSOs occurring within the DWSD service area. The objective of this task was to characterize pollutants in SSOs using actual samples collected within the DWSD service area. Arrangements were made to collect up to a total of six wet weather grab samples from case study community discharge points.

The sampling program was not intended to provide the data needed for a comprehensive assessment of the impact of SSOs on the environment, but rather used to characterize the case study SSOs. The water quality samples provide data for use in planning level design of SSO control solutions and to assess the impact of SSOs on the quality of receiving waters. Analysis was completed for five parameters: Biochemical oxygen demand (BOD), total suspended solids (TSS), total phosphorous (TP), ammonia (NH_3), and *Escherichia Coli (E. Coli.)*. These parameters are commonly used to characterize wastewater.

The sampling program focused on four of the case study communities that have active SSO points. Center Line, Fraser, and Clinton Township had either conducted water quality sampling and/or planned to perform water quality sampling with the assistance of local consultants, independently of the WWMP. For these communities, sampling procedures and collection were coordinated with existing or planned work. In addition, Melvindale participated in the sampling program.

Sampling work was coordinated with municipal and local consultant field personnel

in each of the communities. Garden city is planning an independent study and did not participate in the sample program coordinated under the WWMP. The sampling locations that were established for the program are shown in Figure 2 relative to the current DWSD Service area. Greater detail of there exact location is given later in Table 1 and Figures 5-7.

This sampling program was intended to provide some qualitative information as to the impact of SSOs on the water quality in this region. Hence, it was limited to one or two events per community.



Figure 2. SSO Case Study Sampling Locations

To coordinate sample collection, a meeting with each community was held to discuss

the standard procedures, sampling locations and personnel requirements. For two reasons, municipal employees were assigned to collect the samples. First, municipal employees would likely be on-site during wet weather events. Second, municipal employees are more familiar with the local wastewater collection systems.

Where it was feasible, sampling locations were selected to include the sanitary sewer overflow prior to mixing with receiving waters or storm drainage, and sampling locations immediately upstream and downstream of the SSO. In some cases, suitable sampling locations, which could be accessed during rainstorms without risk to the personnel conducting the sampling, were not available.

Ammonia and phosphorus samples were collected in one sample bottle. TSS and BOD were collected in a second. *E. Coli.* Samples were taken in their own sample bottle.

2.2.1 Locations

Table 1 lists the potential sampling locations that were established for four of the case study communities. These locations were selected, in consultation with the participating municipalities, based on historic overflow locations, and historical sampling.

Table 1. Sampling Locations

Community	Sampling Location(s)
Melvindale	• Bypass chamber between the Pumping Station and discharge to the Northwest Interceptor
Center Line	• Parshall flume in bypass meter pit chamber located in Stephens Road, near Van Dyke • Center Line Storm Sewer at connection to the Loraine Drain.
Fraser	• Bypass manhole to storm sewer along Davidson Road, near Beacon. (S0) • Outlet of twin 24" force mains just north of Masonic Road, along the Sweeney Drain (S1). • Approximately 600 feet downstream of S1 in the Sweeney Drain. (S2) • Approximately 600 feet upstream of S1, just south of Masonic Road, in the Sweeney Drain
Clinton Township	• Seven (7) potential sampling locations have been identified in Clinton Township, at each of the operating bypass pumping stations. Sampling will be conducted at only one of the pumping stations for each event. The station to be sampled can be randomly selected by Township personnel. In addition, sampling locations will be selected upstream and downstream of one of the outfalls to the Clinton River.

2.1.2 Procedure

An SSO Sampling Procedure was provided to each of the four case study communities participating in the program. The sampling procedure for the City of Center Line has been included as Attachment 1. The sampling instructions for each of the other communities are similar with the exception of sampling locations that are specific to each community.

2.1.3 Sampling Results

In total, sampling results from four events in Center Line and two events in Fraser were collected. Some of the samples were collected by the communities' local consultants who subsequently provided the results for inclusion in this report. No samples were taken from Melvindale or Clinton Township. Melvindale has not experienced an SSO since the sampling program was initiated.

For both Center Line and Fraser, a sample was collected directly from the overflow as well as a point after mixing with storm water had occurred during at least one event. In the case of Fraser, sanitary overflows from the Beacon Lift Station discharge into a storm water detention pond. Water from the pond is pumped into the Sweeney Drain. The detention pond effluent was sampled at the discharge point into the Sweeney Drain.

Fraser's sampling events occurred on February 9, 2001 and October 16, 2001. The sample results are presented in Table 2 and include a number of additional wastewater parameters not included in the sample program outlined above.

Table 2. Sampling Results - Fraser

Test Parameter (all values in mg/L unless otherwise noted)	Feb. 9, 2001	Oct. 16, 2001	
	Pump Station Effluent	Pump Station Effluent	Detention Pond Effluent
BOD_5	70	26	5
$CBOD_5$	57	25	4
Oil & Grease	11	6	< 5
Nitrogen - Ammonia	0.74	0.63	< 0.3
Nitrogen - Nitrate	4.62	3.49	0.58
Nitrogen - Nitrate & Nitrite	4.79	4.39	0.60
Nitrogen - Nitrite	0.17	0.90	0.02
DO	9.47	6.68	10.55
pH (unitless)	6.84	7.12	6.62
TP	1	0.59	0.05
TDS	490	278	110
TSS	70	62	41
E coli (MPN / 100 ml)	250000	>100000	7000

The City of Center Line collected wastewater samples during five SSO events. During four of the events, analysis was completed for all five parameters being examined in this study. Additional parameters were examined during of the SSO events in some cases as part of Center Line's abatement work.

Two sampling locations were used in Center Line. The first is the Parshall flume that is located in their bypass chamber, which contains wastewater bypassed from the pumping station. A second sampling location, which was used during several events, is the manhole directly upstream of the connection between Center Line's storm sewer and the enclosed Loraine Drain, which is under the authority of Macomb County. The results of multi-parameter sampling are shown in Table 3 and results of sequential *E-coli* samples are shown in Table 4.

Table 3. Sampling Results – Center Line, Multi-Paramater

Test Parameter (all values in mg/L unless otherwise noted	Feb. 9, 2001	Oct. 16, 2001		Nov. 30, 2001		Nov. 10 2002
	Pump Station Effluent	Pump Station Effluent	Lorraine Drain Sample	Pump Station Effluent	Lorraine Drain Sample	Pump Station Effluent
BOD_5	100	53	18	37	11	110
$CBOD_5$	99	49	17	56	10	---
Oil & Grease	56	12	6	102	6	---
Nitrogen - Ammonia	1.9	1.43	0.69	1.41	0.48	5.6
Nitrogen - Nitrate	5.98	5.57	2.50	6.76	1.87	---
Nitrogen - Nitrate & Nitrite	6.21	7.04	2.68	6.94	1.92	---
Nitrogen - Nitrite	0.23	1.47	0.18	0.18	0.05	---
DO	7.84	4.70	9.10	6.81	9.97	---
pH (unitless)	7.3	6.85	7.00	7.17	7.27	---
TP	1.2	1.40	0.11	0.85	0.25	2.3
TDS	520	360	238	370	180	---
TSS	130	89	87	75	40	260
E coli (MPN / 100 ml)	640,000	>100000	>100000	710,000	126,000	50,000

The Macomb County Health Department has instructed Center Line to sample for E-coli, every two hours during SSO events. The results of these samples are shown in Table 4 for two SSO events. During the May 2, 2002 event, no multi-parameter samples were collected. For comparison, the multi-parameter sample for the Nov. 30, 2001 event was collected between the first two *E-coli* samples, at approximately 10:15.

Table 4. Sampling Results – Center Line, *E-coli*

May 2, 2002		Nov. 30, 2001	
Time	E-Coli MPN / 100 ml	Time	E-Coli MPN / 100 ml
8:30	450,000	9:50	760,000
10:30	200,000	11:50	740,000
-	-	13:50	280,000
-	-	15:50	266,667
-	-	17:50	266,667
-	-	20:00	250,000
-	-	22:00	266,667

To assess the relative impact of SSOs on regional waters, a comparison was made by AEW, the local consultant for both Center Line and Fraser, between the SSO sample data and CSO data from Macomb Township as well as typical values found in raw

sewage. The results are presented in Table 5.

Data for the five wastewater parameters was extracted from Table 5 and is shown in Figure 3. Based on the information collected from Center Line and Fraser, SSOs contained lower concentrations of key pollutants than CSOs, and considerably less that raw wastewater.

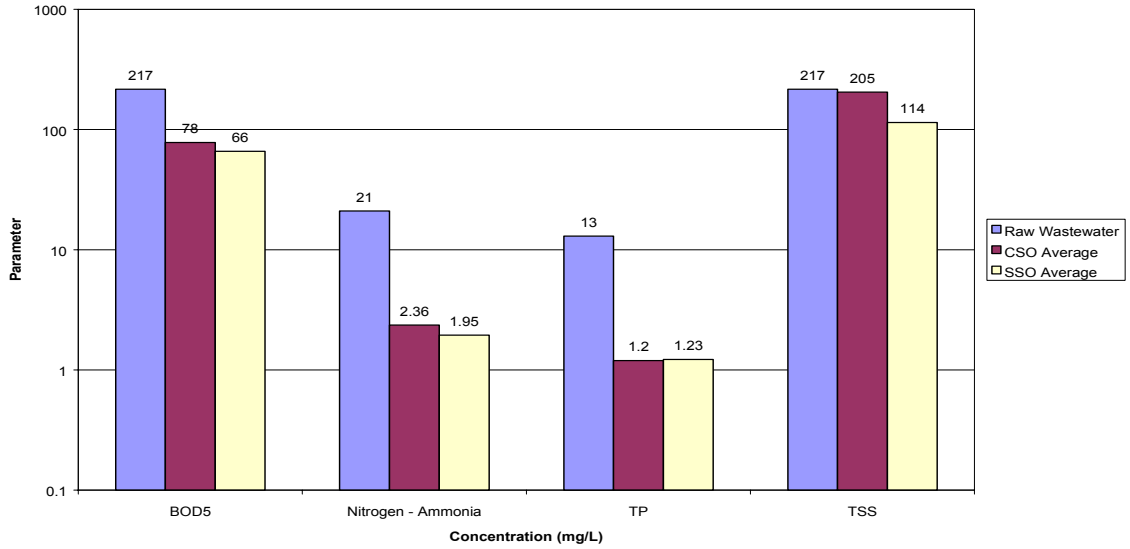


Figure 5. Water Quality Comparison – Raw Wastewater, SSO, CSO

2.1.4 Aesthetics

In addition to quantitative sampling it was intended that the Rouge River Aesthetic Index (RRAI) be used to provide a qualitative characterization of the impact of overflows on receiving waters. The case study communities participating in the sampling program were instructed as to how to use the RRAI but no receiving water samples were collected from natural water bodies during the program. Therefore, no RRAI numbers were generated.

2.2. Macomb Health Department Surface Water Sampling Program

The Macomb County Health Department has been operating a surface water quality sampling program since 1998. A series of 57 sampling sites, shown in Figure 4, have been established where *E. coli* samples are collected once per week. Additional samples are also collected at selected sites in response to rainfall events. The additional sites are typically surface water areas that receive discharges from CSOs or SSOs.

Table 5. SSO and CSO Water Quality Data (Macomb County)

Parameter (mg/L unless noted)	Raw Sewage Avg.	SSO Sample Data							CSO Data		
		Fraser 02/9/01	Fraser 10/16/01	Center Line 02/9/01	Center Line 10/16/01	Center Line 10/30/01	Center Line 10/10/02	Avg.	Avg.	*Min*	*Max*
BOD_5	**217**	**70**	**26**	**100**	**53**	**37**	**110**	**62**	**78**	**21**	**376**
$CBOD_5$	---	57	25	99	49	56	---	58	---	---	---
Oil & Grease	100	11	6	56	12	102	---	21	---	---	---
Nitrogen – Ammonia	**21**	**0.74**	**0.63**	**1.9**	**1.43**	**1.41**	**5.60**	**1.18**	**2.36**	**0.44**	**7.25**
N - Nitrate	---	4.62	3.49	5.98	5.57	6.76	---	4.92	---	---	---
N - Nitrate & Nitrite	22	4.79	4.39	6.21	7.04	6.94	---	5.61	---	---	---
N – Nitrite	---	0.17	0.90	0.23	1.47	0.18	---	0.69	---	---	---
DO	---	9.47	6.68	7.84	4.70	6.81	---	7.17	---	---	---
pH (unitless)	---	6.84	7.12	7.3	6.85	7.17	---	7.03	---	---	---
TP	**13**	**1**	**0.6**	**1.2**	**1.4**	**0.85**	**2.30**	**1.0**	**1.20**	**0.30**	**3.70**
TDS	627	490	278	520	360	370	---	412	---	---	---
TSS	**217**	**70**	**62**	**130**	**89**	**75**	**260**	**88**	**205**	**26**	**766**
E coli (MPN/100 ml)	**8600000**	**250000**	**>100000**	**640000**	**>100000**	**710,000**	**50000**	**445000**	**---**	**---**	---

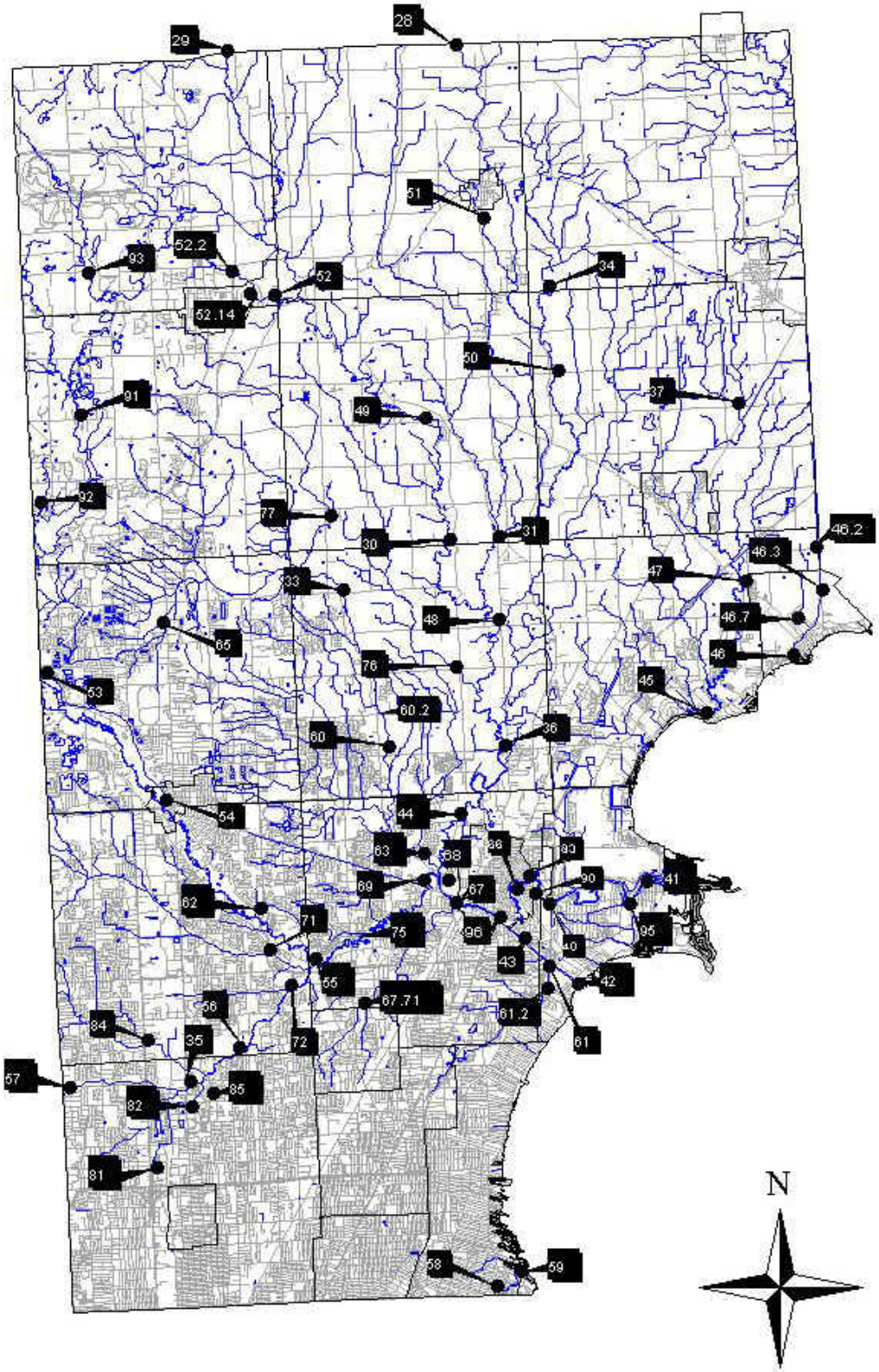


Figure 4. Macomb Health Department Sampling Locations

The sampling program is directed by the Surface Water Improvement and Monitoring (SWIM) Team, which was created in the latter part of 1997 with funds committed by the Macomb County Board of Commissioners. One component of its mission is the monitoring of surface water quality throughout the County. This mission is accomplished through systematic sampling of County watersheds. The results of the sampling program are posted to the Macomb Health Department Web Site.

Data reported by the Macomb County Health Department was plotted along with SSO discharge volumes and rainfall in order to determine if a correlation existed between wet weather overflows and adverse water quality. Figures 6, 7 and 8 show the relative location of Health Department sampling stations and the discharge locations for Center Line, Fraser and Clinton Township, respectively.

Surface water quality is monitored for compliance with the Total Body Contact Standard (Head Immersion) of 300 *E. coli* colonies per 100ml. of water and the Partial Body Contact Standard (Fishing, Bathing) of 1000 *E. coli* colonies per 100ml. of water. Regulatory compliance is based on geometric mean of three or more samples within a defined sampling area.

Sampling results for locations downstream from SSO discharge points in Macomb County were extracted from an online database maintained by the Health Department. These results were compared with SSO discharge events and storm events to obtain an indication of the impact of SSOs on water quality. Plots showing *E. Coli* results and SSO events are shown in Figures 5 and 9 for Center Line and Fraser, respectively.

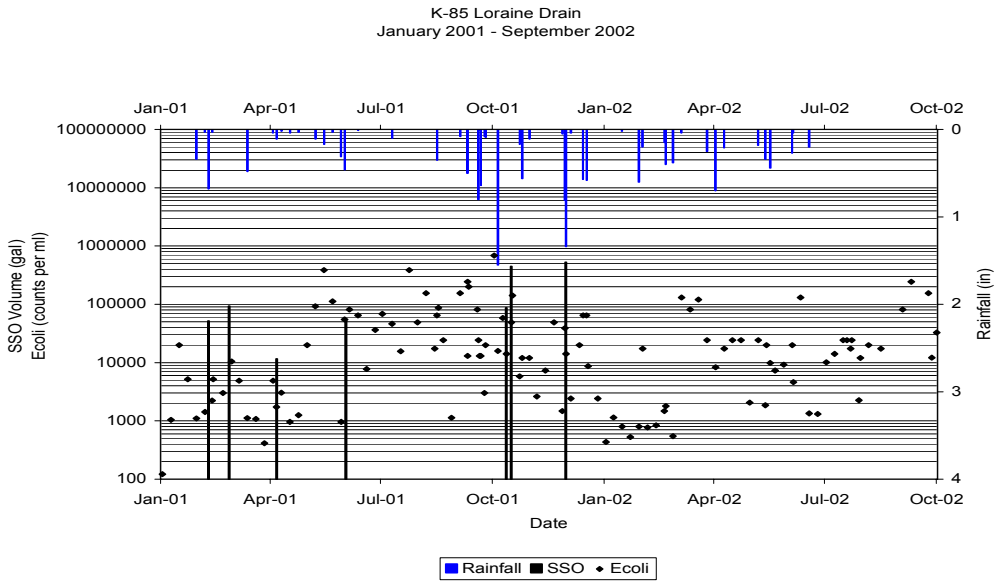


Figure 5. Center Line E. Coli Monitoring

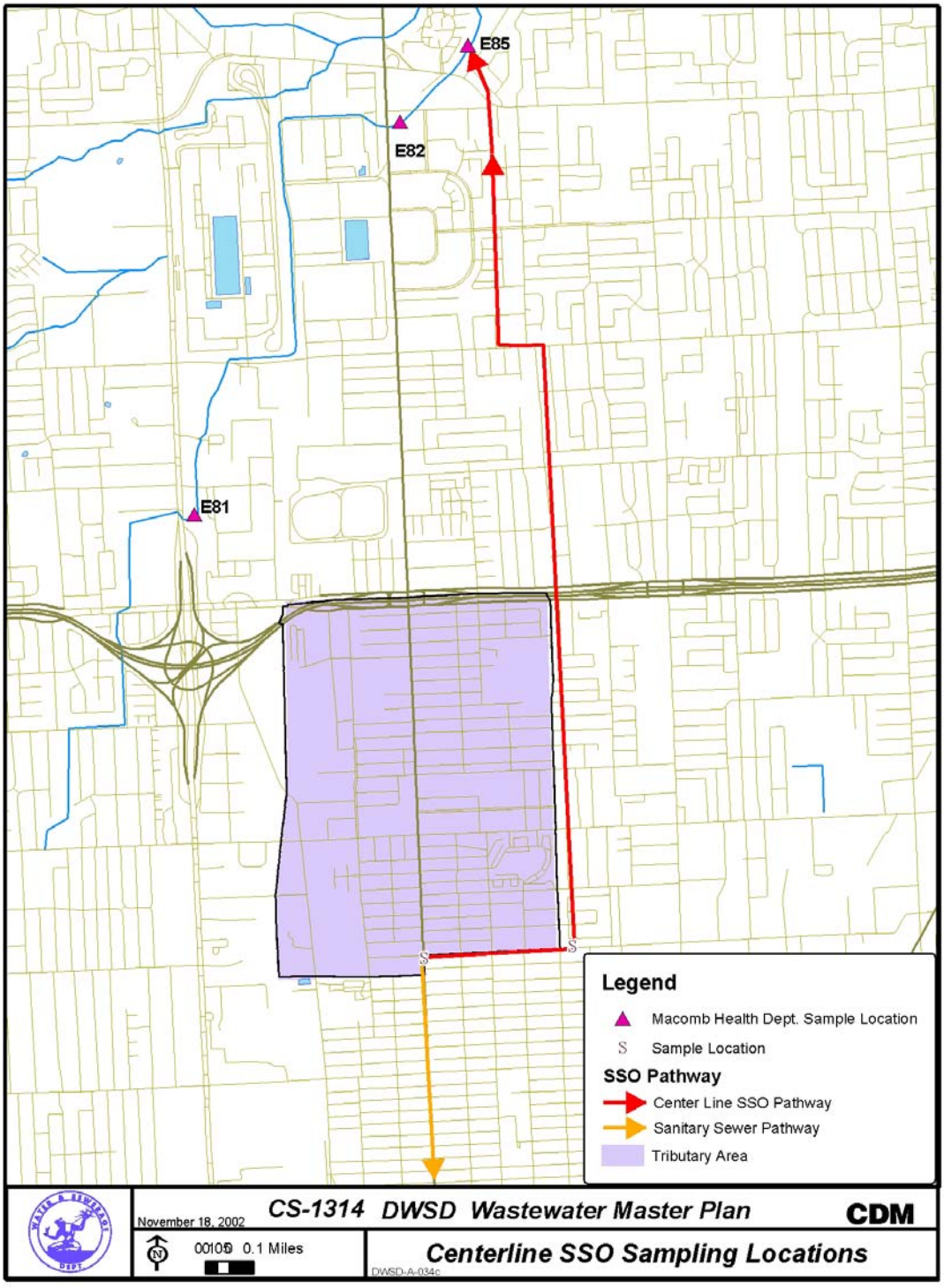


Figure 6. Sampling Stations near Center Line

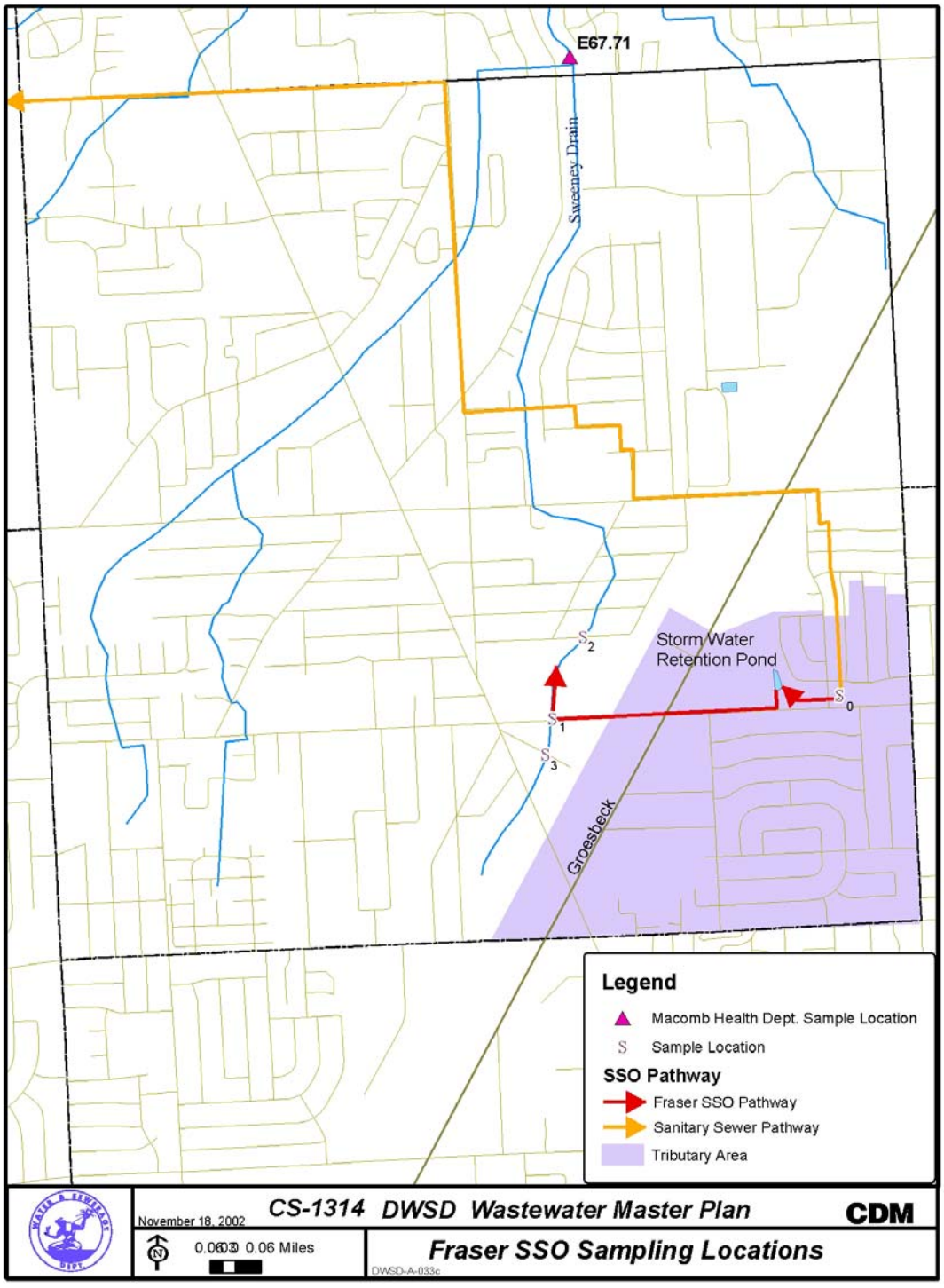
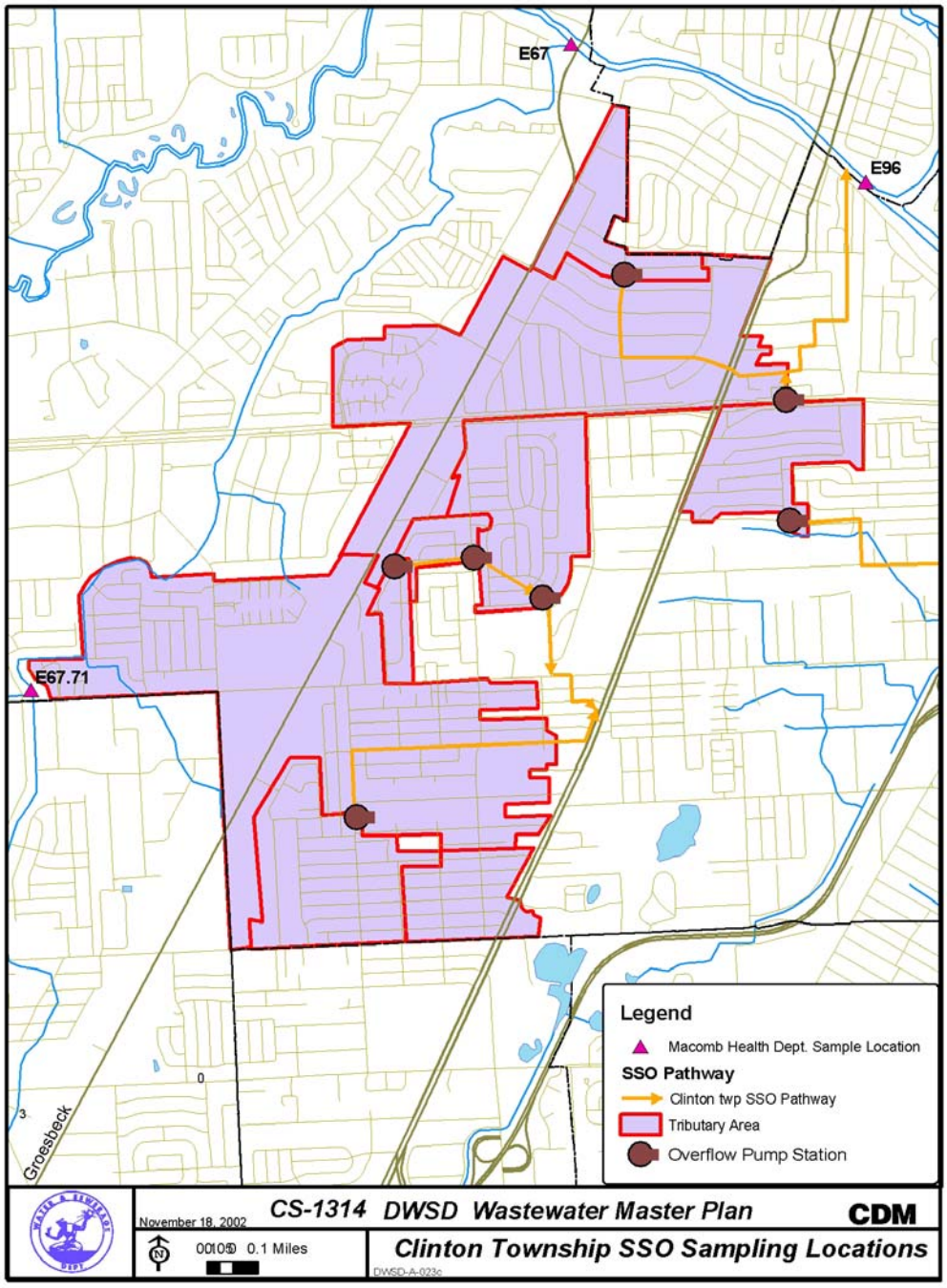


Figure 7. Sampling Stations Near Fraser


E67
E96
E67.71
Groesbeck
Legend
Macomb Health Dept. Sample Location
SSO Pathway
Clinton twp SSO Pathway
Tributary Area
Overflow Pump Station
November 18, 2002
0 0.1 Miles
CS-1314 DWSD Wastewater Master Plan
CDM
Clinton Township SSO Sampling Locations
DWSD-A-023c

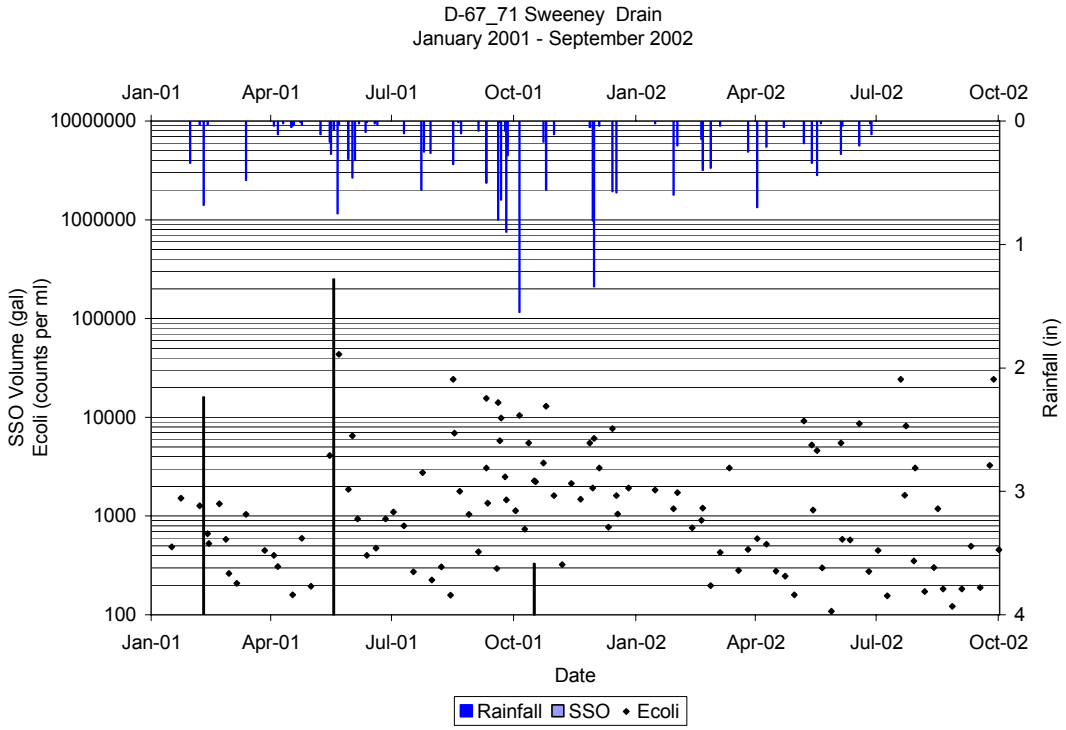


Figure 9. Fraser E. Coli Monitoring

2.3. Long Term CSO Control Plan

Two of the workgroups under the DWSD Long Term CSO Control Plan have extensively studied water quality issues related to CSOs. The Water Quality Workgroup has compiled a large amount of data regarding pollutant concentrations in both the Detroit and Rouge Rivers. The Treatment Efficiency Workgroup has focused on pollutant concentrations entering CSO basins and the removal efficiency under various conditions.

A detailed analysis of the data compiled by the Long Term CSO workgroups is beyond the scope of this report. To illustrate the complexity involved in characterizing the water quality impact of sewer overflows, influent and effluent TSS profiles for the Puritan-Fenkell CSO basin are shown in Figure 10. Both the influent and effluent TSS concentrations change with time. Other factors that can effect the profiles include storm intensity and antecedent conditions.

While average pollutant concentrations may be applicable during high level planning efforts it is clear that a full characterization of SSO water quality would require an extensive effort.

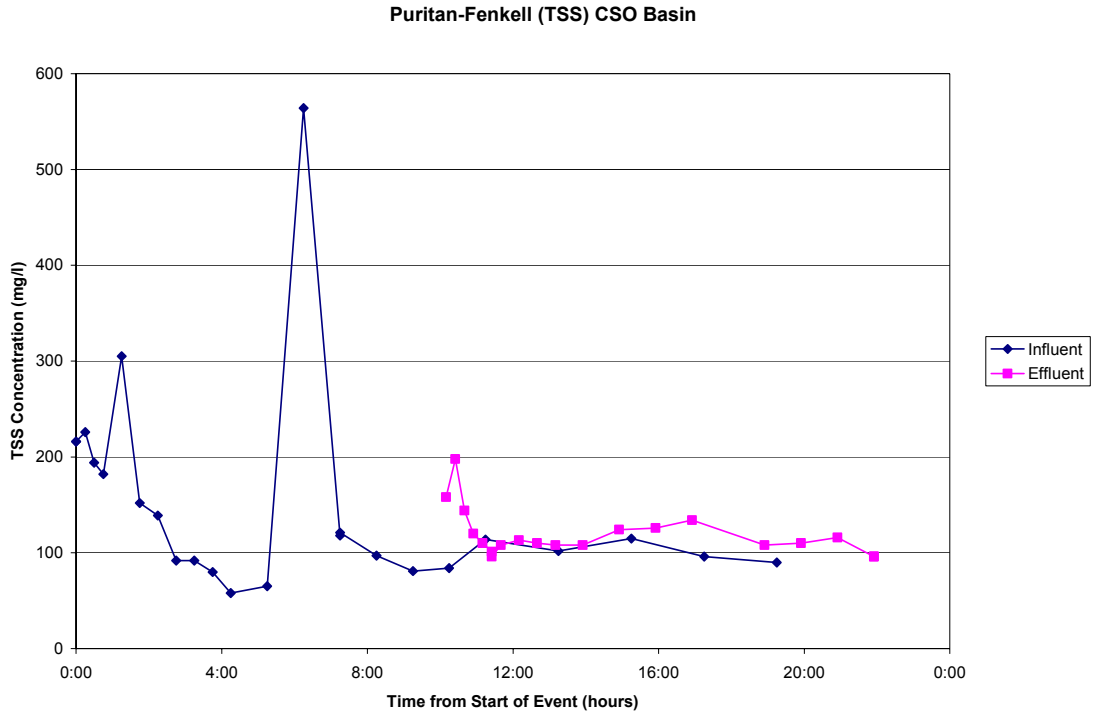


Figure 10. Example CSO Basin TSS Influent / Effluent Profile

2.4. Dearborn Heights Corrective Action Plan

Dearborn Heights collected a series of water quality samples between June 1999 and September 1999. This sampling program was conducted in order to evaluate the impact of diverting potential SSO flows to an existing CSO basin. Samples were collected directly from a sewer line during six storm events. During one of the events, additional samples were collected at the Dearborn Heights CSO basin to provide a direct comparison. The results of the sampling program, including the impact on the basin performance, were summarized in a letter report from Wade-Trim to the MDEQ, dated June 28, 2000.

The average concentrations of key pollutants were extracted from the report for the June 28, 1999 event where sampling was conducted of both the sanitary flows and the influent to the Dearborn Heights CSO basin. The results are shown in Table 6.

Table 6. Dearborn Heights Water Quality Samples

	TSS (mg/l)	TP (mg/l)	NH_3 (mg/l)	$CBOD_5$ (mg/l)
SSO (Lefler Ready Sewer)	117	1.1	0.3	13
CSO (Dearborn Heights Basin)	209	0.7	0.7	15

Generally pollutant loading in the SSO samples is lower than seen in the CSO samples with the exception of phosphorous which is slightly higher. These findings are consistent with values reported from Macomb County.

2.5 Summary

The information presented in the chapter has been summarized in Table 7 along with other information available. This is not a comprehensive listing of water quality information, but does provide the level of detail needed for planning level assessments of the relative water quality impact attributable to SSOs.

Generally, the concentrations found in both CSOs and SSOs are less than typically found in wastewater. Neither type of overflow has obviously higher concentrations.

3. Pollutant Loadings

The relative impacts of pollutant loading to the environment due to SSOs, the Detroit Wastewater Treatment Plant (WWTP) and CSOs was investigated by comparing volumes and reported pollutant concentrations in each of the three. Using the water quality information, detailed in Section 2, a comparison of pollutant loadings from SSOs, CSOs and the Detroit WWTP has been made. The reported concentrations for a number of common pollutants found in wastewater were obtained from a variety of sources and are presented in Table 7. Wastewater discharge volumes were collected in addition to the water quality information, in order to calculate pollutant loadings. The key pollutants examined were TSS, CBOD, Total Phosphorus (TP) and Ammonia. A loading was not calculated for E-coli since that parameter is not reported as a concentration, but rather used as an indicator.

Loadings were calculated for two periods that parallel the analysis of SSO flows conducted as part of the WWMP. These two periods are July 10, 2000 through July 9, 2001 (2000/2001) and July 10, 2001 through July 9, 2002 (2001/2002). Figure 11 shows the comparative discharge volume from the three sources for both periods. A notable difference can be seen in the SSO flows between the two periods. This is attributable to the variation in precipitation during those two periods. CSOs were further divided into controlled and uncontrolled. Controlled CSO discharges from CSO basins while uncontrolled CSOs are untreated overflows directly from collection systems.

Table 7. Water Quality Summary

	Parameter		BOD_5	$CBOD_5$	DO	TSS	E Coli	Oil & Grease	Nitrogen - Ammonia	Nitrogen - Nitrate	Nitrogen - Nitrate & Nitrite	Nitrogen - Nitrite	PH	TP	TDS	Phosphorus
Wastewater	CL & Fraser Study[1]	Min														
		Avg	215	454		217	8.6	100	21		22			13	627	
		Max														
	WW Engineering Text Book[4]	Min	110			100	1.00E+07									4
		Avg														
		Max	400			350	1.00E+08			0						15
	Detroit WWTP	Min	110			100	1.00E+07									4
		Avg														
		Max	400			350	1.00E+08			0						15
CSO or CSO Basin Influent	CL & Fraser Study[1]	Min														
		Avg	78			205			2.36					1.2		
		Max														
	DBHCAP Study[2]	Min		10		10					0.1					0.1
		Comp														
		Max		175		300					6.5					4.1
	RRNWWPD[3] Up to June 1998	Min	51	10		14			0.03	0.25						
		Avg														
		Max	257	130		778			11.6	3.75						
	WW Engineering Text Book[4]	Min	60			270	200000									1.2
		Avg														
		Max	220			550	1100000									2.8
	Cleveland[6]	Min														
		Avg	51			360	312000									
		Max														
	AMSA[7]	Min														
		Avg	63			275	0e5 to 10e7									
		Max														
SSO	CL & Fraser Study[1]	Min														
		Avg	85	78	8.7	100	0.4	34.5	1.32	5.3	5.5	0.2	7.07	1.1	505	
		Max														
	DBHCAP Study[2]	Min	60	19		19					0.19					0.6
		Comp	110	274		274					4.5					3.3
		Avg	243	213		213					4.7					4.7
		Max	360	1130		1130					15					13
	EPA[5]	Min														
		Avg				44-170										
		Max														
	Cleavland[6]	Min														
		Avg	45			55										
		Max														
	AMSA[7]	Min														
		Avg	70			95	0e5 to 10e7									
		Max														

(1) Results presented to DWSD SSO Work Group from AEW SSO WQ study: Raw sewage from Macomb County Communities 2/9/01, CSO from Milk River, Mt. Clemens & Chapaton influent, S

(2) Dearborn Hieghts wet sanitary sampling June 2000 report W.C. report, CSO values roughly estimated from graphs

(3) RRNWWDP CSO Objective Managers Report (through June 1998) RPO-OBJMGR-CSO1.03: Inkster, Redord, Dearborn Hieghts, Acacia Park, and Bloomfield Villiage CSO basins

(4) WW Engineering Treatment, Disposal, and Reuse - Metcalf & Eddy, INC. Third edition

(5) Correcting Sanitary Sewer overflows: An Evaluation of the East Bay I/I Correction Program: from the 1995 EPA SSO workshop (web page)

(6) Mill Creek Watershed Management…. Cleveland study from 1995 EPA SSO WS

(7) AMSA data found in the paper from (6)

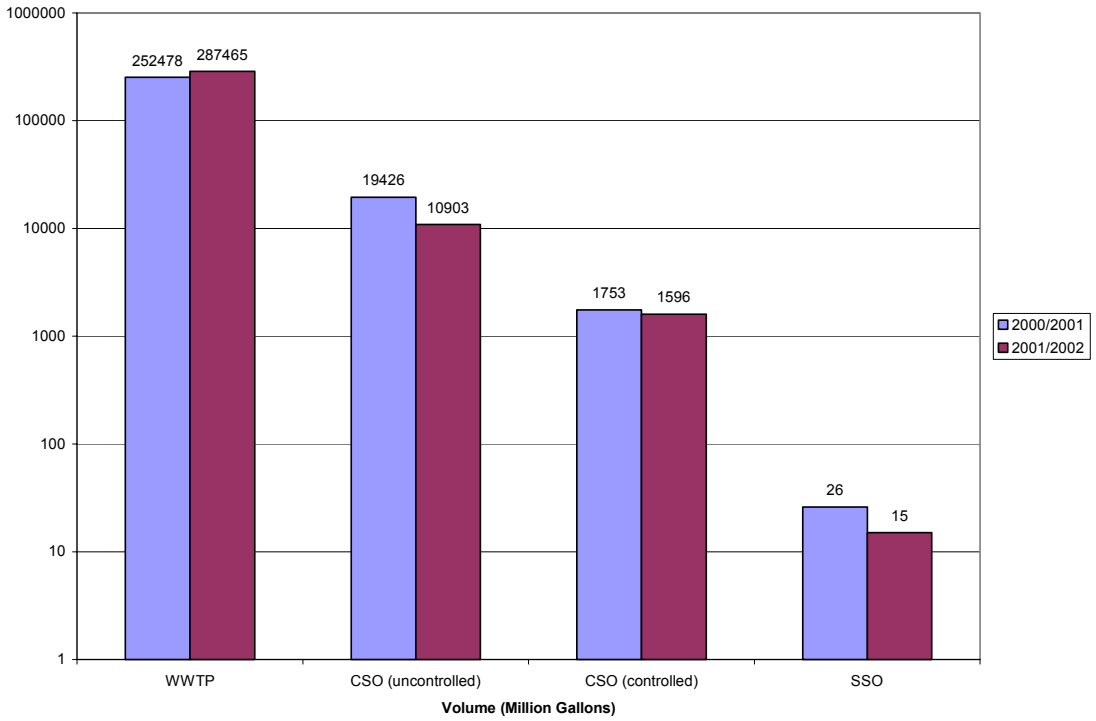


Figure 11. WWTP, CSO and SSO Volumes July 2000 – July 2002

The loadings attributable to the Detroit WWTP were summarized from Final Monthly Reports (FMR) produced by the plant. These reports include information regarding plant performance, including the pollutant loading attributed to the plant effluent. Monthly loadings are tabulated in Attachment 2.

CSO volumes were obtained from MDEQ records and pollutant concentrations were assumed to be equal to the values reported in Table 7 for Macomb County CSO facilities. Discharge volumes from City of Detroit CSOs were obtained from the CSO notification model. Additionally, undocumented CSOs likely occurred in the service area from uncontrolled overflow points. CSO pollutant loadings are tabulated by individual sites and included as Attachment 3.

SSO volumes were obtained from MDEQ records and pollutant concentrations were assumed to be equal to the values reported for the Macomb studies in Table 7 for SSOs. SSO pollutant loadings are tabulated by individual site and included as Attachment 4.

The pollutant loadings for each of the four sources detailed above are shown in Figure 12.

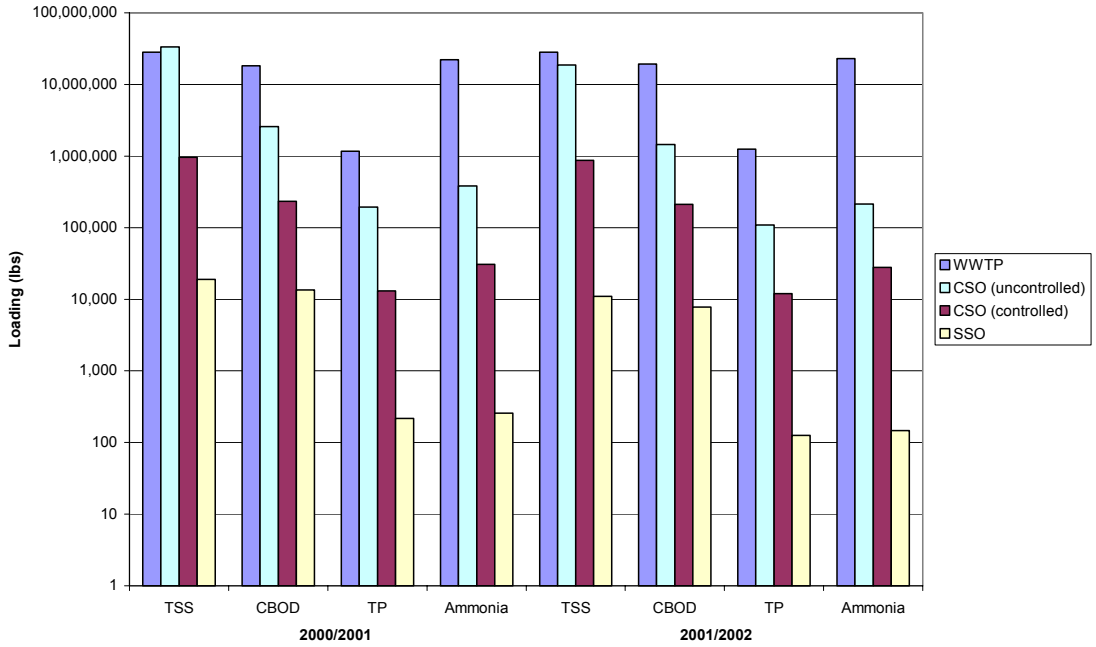


Figure 12. WWTP, CSO and SSO Loadings July 2000 – July 2002

The total loadings calculated were further categorized by the watershed that they discharge into. This analysis included the loadings from the WWTP, CSOs and SSOs. The estimated loadings to each of the watersheds are shown in Figure 13.

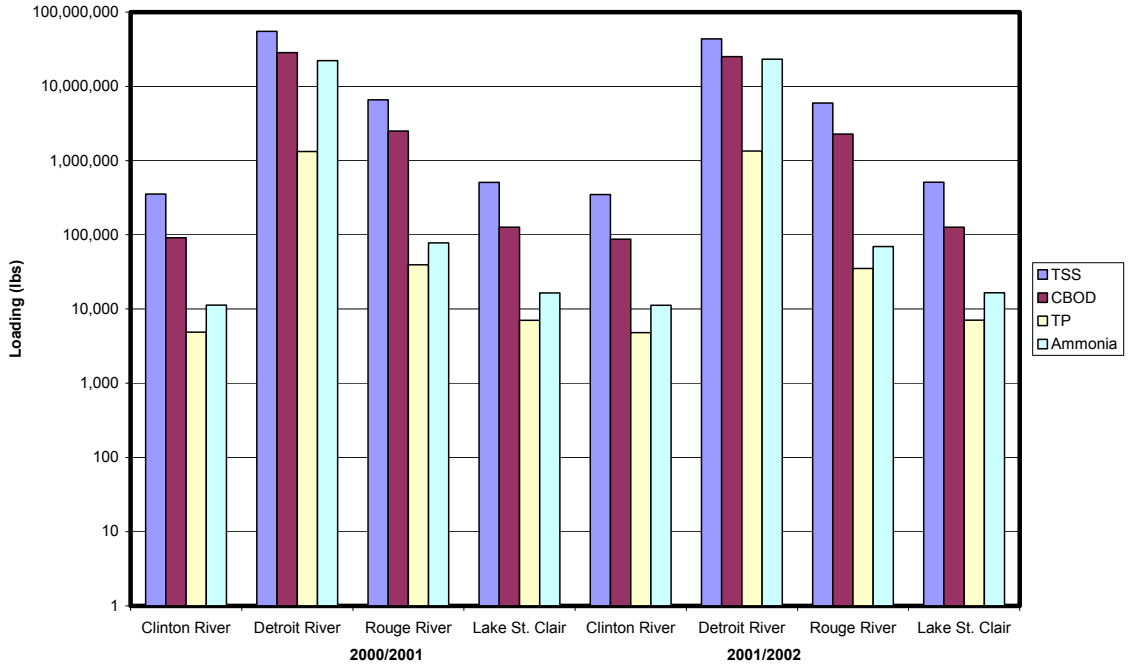


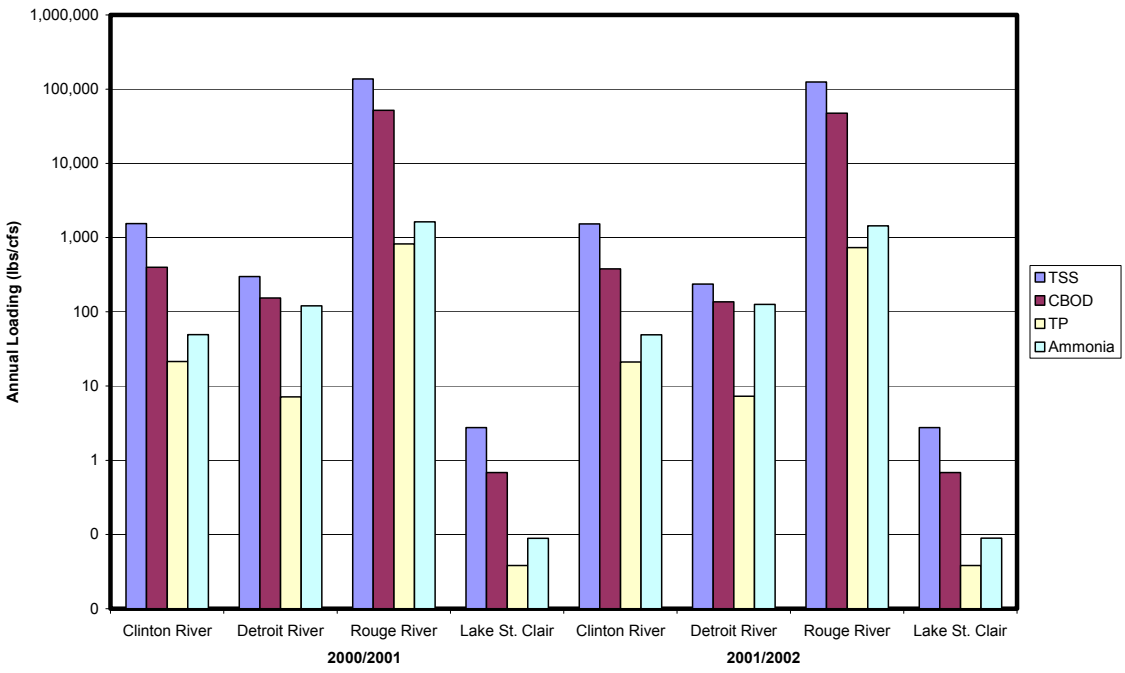
Figure 13. Pollutant Loading by Watershed

In order to normalize the pollutant loadings for each of the receiving streams shown in Figure 13, the average flow rate was obtained for each river. Detroit river flow is approximately 185,000 cubic feet per second (cfs). This same value was used for Lake St. Clair.

The flow rate for the Clinton River and Rouge River were obtained from USGS records. The gage is located on the Clinton River, near Fraser. The average flow, over an approximately 40-year period is 294 cfs. The gage on the Rouge River near Dearborn Heights was used to get a baseline flow for the Rouge River. The flow at that site averaged 68 cfs over several decades. Wet weather flows were not examined but it is expected that the wet weather flows in the Rouge River and Clinton River will be significantly higher. Flows in the Detroit and St. Clair Rivers will not be significantly impacted by wet weather events.

Normalized pollutant loadings are shown in Figure 14. This graph illustrates the fact that the impact of pollutants on the Rouge River, and to a lesser extent, the Clinton River are far more significant than the impact to the Detroit River due to the large difference in flow rates between the receiving waters.

Figure 14. Normalized Pollutant Loading by Watershed



4. Water Quality References

A list of reports that contain water quality information for southeast Michigan was compiled. A large portion of this list was adopted from water quality reports generated during the Long Term CSO Control Plan.

SSO Quantity and Quality Data

- Dearborn Heights Correction Action Plan, Wade-Trim.

  This report contains water quality data collected at a potential SSO site. Samples were collected during six storm events during the summer of 1999. The intent of the study was to quantify the impact if excessive sanitary flows were directed to the Dearborn Heights CSO basin.

CSO Quantity and Quality Data

- City of Detroit Long Term CSO Control Plan.

  A number of multi-volume reports have been generated by this project. Information contained in the reports includes water quality impact of CSOs and treatment efficiency of CSO basins.

- United States Geological Survey (USGS) CSO Toxic Sampling Program, DWSD.

  The USGS data involves the sampling of four Detroit River CSO outfalls in 1994 and 1995. This is an on-going sampling and testing program with tests being performed for 30 commonly used pollution parameters (including heavy metals) and 110 organic compounds.

- Quantity and Quality of Combined Sewer Overflows Volume 1 Summary, Volume 2 Report, September 1980, Giffels/Black and Veatch.

  The 1979 Giffels/Black and Veatch Study are based on CSO samples from eight Rouge River CSO outfalls and seven Detroit River CSO outfalls. Data on 23 pollution parameters was collected. Even though this data is very comprehensive, it is not representative of the current conditions because of the subsequent implementation of the industrial pretreatment program, improved operating protocols for the WWTP and sewer collection system implemented by DWSD in the early 1980's, and significant changes to tributary populations both inside and outside the City of Detroit.

- 1994 Rouge River CSO Data (for overflows outside of the City of Detroit), Rouge Program Office (RPO).

The Rouge Program Office (RPO) collected CSO data outside the City of Detroit limits in 1994. The data covers 18 pollutant parameters at ten different outfalls. This data is not representative of the volumes and characteristics of the Detroit CSOs because the data comes from areas with different combinations of land use (e.g. more heavy industrial areas in Detroit versus more agricultural land outside Detroit) and density (i.e. more open space in rural areas outside Detroit versus developed and densely populated areas in the City of Detroit). However, the RPO data provides information on first flush characteristics of CSOs and on their contribution to the river pollution upstream of Detroit CSOs.

In-Stream Water Quality Data – Rouge River

- 1994 Rouge River Data from the RPO.

  The 1994 Rouge River data was taken from sampling stations located with the City of Detroit. Samples were taken before, during and after rainfall events.

- Rouge River Ambient Monitoring Report (April 87 – April 88), Michigan Department of Environmental Quality (MDEQ), Surface Water Quality Division, December 15, 1988.

  The Rouge River Ambient Monitoring Program collected Rouge River data from five stations within the City of Detroit between April 1987 and April 1988. The samples were collected under a wide range of river and weather conditions.

In-Stream Water Quality Data – Detroit River

- Upper Great Lakes Connecting Channel Study, Volume II, Final Report, December 1988.

  The Upper Great Lakes Connecting Channel Study discusses water quality problems in the Detroit River and shows a mass balance of different pollutants with regard to the City of Detroit and City of Windsor, Ontario, Canada point sources, tributary river sources and Lake St. Clair exit and Lake Erie entrance water quality. The pollutant mass balance, however, does not relate to the CSO pollutant contribution.

- Ambient Water Monitoring in Michigan: Concentration and Loading Trends in the Detroit River and Great Lakes Tributaries (1961 – 1990), October 1993 MDEQ, Surface Water Quality Division.

  The ambient water monitoring trends report reflects the improvements in various parameters (especially phosphorus) over the years between 1961 and 1991.

- Conner Creek/Belle Isle Study, September 1993, Hinshon Environmental Consulting.

  The Conner Creek/Belle Isle Study relates water quality bacteria counts at Belle Isle Bathing Beach to Conner Creek CSO events.

- Water Works Park Monthly Report by DWSD – Raw Coliform Data, 1993 – 1995.

  At the Water Works Park Water Treatment Plant (water intake is located on the eastern end of Belle Isle), raw water total coliform samples are taken during every eight hour shift. This data was reviewed in conjunction with Southeastern Michigan Council of Governments (SEMCOG) rainfall data to determine if there was a relationship between upstream CSOs and Detroit River water quality.

- City of Detroit Health Department, Detroit River Shoreline Coliform Data (1993 – 1995)

  The City of Detroit Health Department samples the Detroit River shoreline every two weeks at 12 sampling stations from May to October each year. This data was reviewed with SEMCOG rainfall data to determine if there was a relationship between CSOs and Detroit River shoreline data.

- Bacteria Results for the Detroit River, 1989, Wayne County Department of the Environment.

  Bacteria results for the Detroit River in 1989, taken by Wayne County Department of Environment, showed Detroit River water quality during dry and wet weather. The effect of the Rouge River on the quality of the Detroit River was demonstrated.

- MDEQ and Ontario Ministry of the Environment, Stage I, Remedial Action Plan for Detroit River, Area of Concern, January 22, 1991, Draft for Public Comment.

  The Remedial Action Plan for the Detroit River describes the beneficial uses of the river, gives the fecal coliform concentrations along the river and discusses other quality parameters in the river.

- Draft Biennial Report – Remedial Action Plan for Detroit River Area of Concern, Chapter 9 Combined Sewer Overflow, Technical Work Group (TWG) Report MDEQ, February 1995.

  Chapter 9, Combined Sewer Overflow of the TWG Report, provides an update of the EPA CSO Control Strategy and discusses current Michigan CSO permitting strategy. The report discusses the Rouge River National Wet Weather Demonstration Project and City of Detroit phased Rouge and Detroit River CSO control activities. Objectives for water use goals are given for Stage 2 of the Detroit River Remedial Action Plan.

5. Conclusions

Based on the data presented in the memorandum, there is little evidence that SSO pollutant concentrations are noticeably higher than CSO pollutant concentrations. This is expected as many areas with SSOs have been found to have rainfall dependent I/I so that the percent of rainfall that enters the sewer system is as high as those typically found for combined areas. This indicates that SSOs and CSOs are both diluted the same amount. Furthermore, pollutant loading to the DWSD service area watersheds is only a small fraction of the loading from CSOs and the WWTP.

However, SSOs are typically discharged into smaller streams, drains, and rivers than those that CSO are discharged into. This may cause high localized loadings. In general, SSO pollutant concentrations are higher than the concentrations found in their receiving waters, which may lead to increased pollution concentrations above MDEQ established levels for public health safety. However, the volumes and loads for the area reviewed in this report do not indicate a noticeable increase in pollutant concentrations in receiving waters due to SSO discharges.

Attachment 1. City of Center Line
SSO Sampling Procedure

As part of the DWSD Wastewater Master Plan, a water quality study is being undertaken with the participation of six case study communities, in order to quantify the impact of SSOs. This plan has been developed for Center Line, which is one of the six case study communities.

Equipment List

- Bottles: 250 ml HDPE bottle for E. Coli
  1L HDPE bottle for Ammonia plus Phosphorous
  1L HDPE bottle for BOD plus TSS
- Coolers (supplied by lab)
- Ice: 2 bags of ice per cooler
- Permanent markers for labeling bottles
- Bottle labels
- Clear, waterproof tape
- Re-sealable bags if bottle labels required by lab
- Chain of Custody: a separate form is needed for each cooler (supplied by lab)
- Protective gloves: latex, 1 pair per station to prevent cross-contamination
- Sampling device: telescoping pole with attachment for bottle and a bottle harness attached to a lowering rope (both should be brought)
- Field sheet to record data
- Camera: to visually record anything significant.

Locations

A single sampling location has been identified in Center Line:

- Bypass meter pit chamber located in Stephens Road, near Van Dyke.

Procedure

STEP 1 - Labeling

Each bottle should be labeled with permanent marker directly on the cap and bottle before sampling. For this sampling the following nomenclature will be used:

Parameter	ATP= Ammonia & Total Phosphorous, TSO= Total Suspended Solids & Biochemical Oxygen Demand ECL= E. *Coli*.
Location	BMC = Bypass Meter Chamber
Community	AP = Allen Park CL = Center Line CT = Clinton Township FS = Fraser GC = Garden City MV = Melvindale
Date	mm/dd/yyyy format.
Time	military format.

For example "*TSO-BMC-CL 11/23/2001 13:20"* would read Total Suspended Solids at the Bypass Meter Chamber in Center Line on the 23rd of November 2001, at 1:20 PM.

STEP 2 - Field data recording

Field data such as recent weather (to include rainfall) and ambient temperature should be recorded, as well as the sample number, date and time (see attached field sheet). Any unusual observations should also be noted.

STEP 3 – Collection of Samples

- Each sample set consists of three bottles, one for each of the parameters listed above.
- Collect the first sample 0.5 hours after the start of the SSO event.
- Collect a second full sample set 2 hours after the start of the event, if the event lasts two hours.
- A final sample set can be collected 4 hours into the event, if the event lasts four hours.
- Samples should be placed on ice, in the cooler provided with the bottles, immediately upon collection.
- A chain of custody must be filled out for each sampling event.

STEP 4 – Sample Pickup

- If an SSO event occurs during regular business hours, please call Grant Hilbers at (313) 234-0312 to make arrangements for the samples to be picked up.
- For samples collected during the night (Sunday through Thursday) please leave a message at the number noted above and arrangements to collect the samples will be made in the morning. Keep the samples on ice while holding for transport.
- On the weekends please the after hours numbers for the lab that are listed below.

Contacts

Phone numbers are provided below for personal that will be coordinating this project as well as for the analytical laboratory that will be used for this project. Please attempt to contact Grant Hilbers first, with any questions about this sampling program. Alternatively Mr. Marc Stonehouse can be contacted.

To make arrangements for sample pickup please call the general lab number first (even after regular business hours). If no one is available at the main number then please call the after hours numbers.

CDM / TYJT

Grant Hilbers Tucker, Young, Jackson, Tull, Inc. 565 E. Larned, Suite 300 Detroit, MI 48226 TEL: 313-234-0312 FAX: 313-963-2156	Marc Stonehouse Camp Dresser & McKee One Woodward Avenue, Suite 1500 Detroit, MI 48226 TEL: 313-230-5617 FAX: 313-963-3130

Analytical Laboratory

AAC Trinity, Inc. 38855 Hills Tech Drive, Suite 550 Farmington Hills, MI 48331 TEL: 248-848-9656 FAX: 248-848-9657	Call lab. If no one is available at the lab a voice message will be played which will provide two alternative phone numbers

Attachment 2. Tabulation of WWTP Monthly Pollutant Loadings

Monthly Sum July 2000 - July 2002

Month	Plant Inflow (MGD)	TSS (KLBS)	CBOD (KLBS)	Phosphorous (KLBS)	Nitrogen - Ammonia (KLBS)
Jul-00	22,333	1,791	939	69	1,673
Aug-00	23,967	2,103	1,103	99	1,249
Sep-00	20,825	1,845	1,007	94	1,489
Oct-00	18,762	1,847	1,093	116	1,910
Nov-00	16,656	2,319	1,254	131	1,931
Dec-00	18,854	2,412	1,464	92	2,136
Jan-01	20,382	2,524	1,834	89	1,998
Feb-01	24,643	2,386	1,752	75	1,599
Mar-01	21,787	2,792	2,342	108	2,210
Apr-01	22,451	2,794	1,888	90	1,910
May-01	20,989	3,042	1,844	108	2,021
Jun-01	22,269	2,287	1,643	95	1,876
Jul-01	19,603	2,195	1,348	155	1,961
Aug-01	19,383	2,022	1,523	77	2,019
Sep-01	20,538	2,307	1,712	76	1,979
Oct-01	27,667	2,236	1,474	68	1,763
Nov-01	20,568	2,653	1,640	115	1,907
Dec-01	23,540	2,659	1,834	119	1,937
Jan-02	19,364	2,580	1,807	139	2,106
Feb-02	25,568	2,514	1,634	93	1,627
Mar-02	23,799	2,305	1,744	121	1,972
Apr-02	26,447	2,492	1,644	85	1,763
May-02	23,684	2,433	1,635	102	2,032
Jun-02	18,408	1,943	1,351	107	1,971

Source: Detroit WWTP Final Monthly Reports

Attachment 3. Tabulation of CSO Pollutant Loadings

CSO Notification Model

Total Volume For 2000 (Detroit)

Outfall Location	Volume, MG												
	Jan-00	Feb-00	Mar-00	Apr-00	May-00	Jun-00	Jul-00	Aug-00	Sep-00	Oct-00	Nov-00	Dec-00	Total
Conner Cr Backwater gate	0	0	0	330	146.4	0	169.7	320	274.3	122.7	4.6	32.4	1400
Conner/Freud PS	0	0	0	668.5	1073.5	652.8	1093	727.2	832.9	594	740.9	925	7308
McClellan	0	3.3	0	24.8	41.2	21.9	59.9	42.4	43.4	43.4	44.7	77.3	402.3
Fischer PS	0	0.046	0	4.6	1.3	0	4.9	7.35	8.7	0.914	0.505	0.827	29.14
Iroquois	0	0	0	3	0	0	0.19	3.1	10.9	0	0	0	17.19
Helen	0	0	0	12.1	0	0	8.7	18.5	21.7	0	0	0	61
Meldrum	0	0	0	12.6	0	0	2.55	15.9	22.6	0	0	0	53.65
Leib (CME)	0	0	0	19.2	0	0	49.4	0.898	58.8	0	0	0	128.3
Adair	0	0	0	11.3	0.5	0	11.2	5.2	9.5	0	0	0	37.7
Joseph Campau	0	0.159	0	67.5	6.1	0	44.4	54.5	57.6	8.035	0.431	0.582	239.3
Chene	0	0	0	0	0	0	0	0	0	0	0	0	0
Dubois	0	0	0	25.4	5.2	0	36.3	9.8	27.8	12.5	0.04	0	117
St.Aubin	0	0	0	0	0	0	0.589	0	0.08	0.039	0	0	0.708
Orleans (east/west)	0	0	0	16.3	4	0	16.9	7.5	9.8	7.956	0.128	0	62.58
Riopelle	0	0	0	2.2	0.417	0	3.6	0.712	2.6	1.031	0	0	10.56
Rivard	0	0	0	13.5	4.15	0	15.4	6.01	9.4	7.04	0.319	0.197	56.02
Hastings	0	0	0	0.773	0.065	0	5.8	0.642	4.1	0.693	0	0	12.07
Randolph	0	0	0	32.7	12.2	0	28.8	14.7	20.6	17.5	0.747	1.194	128.4
Bates	0	0	0	0.434	0.025	0	0.672	0.125	0.058	0.055	0	0.028	1.397
Woodward	0	0	0	32.1	4.2	0	62.1	11.95	53.04	14.4	0	0	177.8
Griswold	0	0	0	6.2	1.85	0	6.6	2.383	6.2	3.1	0	0	26.33
1st-Hamilton	0	0	0	63.2	15.2	0	79.3	20.8	78.9	23.6	0	0	281
3rd	0	0	0	5.9	0.59	0	17.8	4.5	14.2	4.4	0	0	47.39
Cabacier	0	0	0	10.5	5.021	0	8.9	4.9	7.8	5.9	0	0	43.02
11th	0	0	0	4.6	0.672	0	10.8	2.3	8.5	2.5	0	0	29.37
12th	0	0	0	9.8	2.9	0	11.9	3.96	10.4	4.989	0	0	43.95
Vermont	0	0	0	25.2	10	0	31.1	13.8	25.7	13.7	0	0	119.5
18th	0	0	0	4.3	0.159	0	18	2.3	13.9	2.3	0	0	40.96
21st	0	0	0	13.1	2.7	0	15.7	4.9	14.5	6.5	0	0	57.4
24th	0	0	0	29	7.4	0	42.96	12.1	37.4	14.2	0	0	143.1
W.Grand	0	0	0	0	0	0	0	0	0	0	0	0	0
Swain	0	0	0	0	0	0	0	0	0	0	0	0	0
Scotten	0	0	0	7.2	1.2	0	14.1	3.01	11.35	3.4	0	0	40.26
McKinstry	0	0	0	0	0	0	3.9	0.102	2.3	0	0	0	6.302
Summit-Clark	0	0	0	62.4	4.4	0	62.5	3.625	56.6	10.8	0	0	200.3
Ferdinand	0	0	0	0	0	0	0.066	0	0.072	0	0	0	0.138
Morrell	0	0	0	0	0	0	1.6	0	0.776	0	0	0	2.376
Junction	0	0	0	2.1	0	0	10.1	0	5.8	0	0	0	18
Campbell	0	0	0	9.6	0.022	0	19.7	2.6	15.7	3.2	0	0	50.82
Dragoon	0	0	0	0	0	0	4.7	0	0	0	0	0	4.7
Schroeder	0	0	0	0	0	0	10.1	0	5.7	0	0	0	15.8
Cary	0	0	0	0	0	0	0	0	0	0	0	0	0
Dearborn	0	0	0	28.9	13.3	0	34.1	13.6	27.5	14.9	0	0.284	132.6

CSO Notification Model

Total Volume For 2000 (Detroit)

Outfall Location	Volume, MG												
	Jan-00	Feb-00	Mar-00	Apr-00	May-00	Jun-00	Jul-00	Aug-00	Sep-00	Oct-00	Nov-00	Dec-00	Total
Pulaski	0	0	0	0	0	0	0	0	0	0	0	0	0
Flora/Carbon	0	0	0	0.085	0	0	1.335	0.078	0.999	0.011	0	0	2.508
DETROIT RIVER	**0**	**3.505**	**0**	**1559.092**	**1364.67**	**674.7**	2020	1341.4	1812	943.8	792.4	1038	11549
Baby Creek (BC+BC adjunct)	0	0	0	524.4	210.5	0	631.6	127.7	536.9	173	0	19.36	2223
W.Warren Siphon	0.097	0	0	3.04	2.1	2.12	1.9	2.6	12.4	2.3	0.033	0.15	26.74
Trinity-Tireman	0	0	0	87.7	47.4	47.45	91.3	41	90.2	42.2	0	0	447.2
West Chicago	0	0	0	78.4	4.2	4.208	87.1	25.5	85.2	24.6	0	0	309.2
W. Chicago Siphon	0.024	0.037	0.031	2.5	1.8	1.762	4.8	1.7	3.98	1.4	0.121	0.303	18.46
Glendale	0	0	0	10	2.6	2.63	46.7	6.9	42.9	4.4	0	0	116.1
Lahser/Dolson	0	0	0	13.9	3.6	3.632	34.3	3.23	31.3	4.9	0	0	94.86
Schoolcraft/W.Park	0.15	0	0	2.7	2.2	2.165	1.94	2.4	10.2	2.011	0.075	0.221	24.06
Lyndon/Brammel	0	0	0	13.1	1.04	1.038	33.2	3.5	35.8	4.33	0	0	92.01
5 Mile basin (treated)	0	0	0	4.42	0.01	0.01	0	0	18.5	0	0	0	22.94
7 Mile basin (treated)	0	0	0	3.929	0	0	0.002	0	15.4	0	0	0	19.33
Puritan Outfall (east shore)	0.133	0.159	0.192	1.65	2.37	2.37	1.8	1.7	16.3	1.4	0.248	1.28	29.6
Riverdale/McNichols	0	0	0	40.955	16.4	16.38	24	19.96	74	10.7	0	8.1	210.5
Glenhurst (west shore)	0.023	0.023	0.008	0.413	0.28	0.28	0.27	0.377	1.7	0.287	0.023	0.038	3.722
Seven Mile (east shore)	0	0	0	2.361	0.92	0.92	0.607	4.8	7.5	0.013	0	0	17.12
Pembroke	0	0	0	6.7	2.3	2.302	2.989	9.6	13.3	0.724	0.037	0	37.95
Oakwood PS	0	0	0	70.5	86.54	8.915	135.3	61.5	101	70.9	52.6	70.9	658.1
Fox Cr backwater gate	0	0	0	0	0	0	0	0	0	0	0	0	0
Rouge River	0.427	**0.219**	**0.231**	**866.668**	**384.26**	**96.18**	1098	312.5	1097	343.2	53.14	100.3	**4351**

CSO Notification Model

Total Volume For 2001 (Detroit)

Outfall Location	Volume, MG												
	Jan-01	Feb-01	Mar-01	Apr-01	May-01	Jun-01	Jul-01	Aug-01	Sep-01	Oct-01	Nov-01	Dec-01	Total
Conner Cr Backwater gate	0	40.8	0	57.9	88.9	34.67	219.7	98.431	276.8	272.8	334.1	6.359	1430
Conner/Freud PS	771	1722.9	338.1	1499.3	1725.6	788	869.1	328.79	1345	1431	1217	720.6	12756
McClellan	57.2	131.8	29.9	99.5	123.95	76.72	48.94	18.214	54.33	132.5	70.41	97.43	940.9
Fischer PS	0.03	2.1	0.327	2.2	2.48	0.478	5.565	0.34	2.008	2.162	8.931	0.761	27.38
Iroquois	0	0	0	0	0	0	7.019	0	0.321	0	13.22	0	20.56
Helen	0	0.547	0	0.011	1.43	0	16.45	3.169	8.239	0	22.06	0	51.91
Meldrum	0	0	0	0	0.343	0	19.72	4.324	4.977	0	20.16	0	49.52
Leib (CME)	0	0	0	0	0	0	0.839	1.485	0	0	1.95	0	4.274
Adair	0	0.82	0	0.347	1.1	0	2.866	1.984	2.193	0	3.864	0	13.17
Joseph Campau	0	7.2	0	5.2	11.93	0.191	35.73	16.318	21.29	4.4	45	0.212	147.5
Chene	0	0	0	0	0	0	0.127	0	0	0	0.208	0	0.335
Dubois	0	1.354	0	1.4	1.72	0	0.895	4.522	0.619	4.222	2.623	0	17.36
St.Aubin	0	0	0	0	0	0	0	0	0	0	0	0	0

CSO Notification Model

Total Volume For 2001 (Detroit)

Outfall Location	Volume, MG												
	Jan-01	Feb-01	Mar-01	Apr-01	May-01	Jun-01	Jul-01	Aug-01	Sep-01	Oct-01	Nov-01	Dec-01	Total
Orleans (east/west)	0	2.537	0	1.5	2.72	0	0.339	3.162	1.058	6.677	2.638	0	20.63
Riopelle	0	0.044	0	0.01	0.144	0	0	0.453	0.025	0.387	0.092	0	1.155
Rivard	0	3.2	0	2.1	2.91	0	0.379	2.416	1.425	7.02	3.597	0	23.05
Hastings	0	0	0	0	0.034	0	0	0.494	0	0	0	0	0.528
Randolph	0	9.1	0	4.6	6.24	0	0.501	6.276	5.605	17.9	11.8	0	62.02
Bates	0	0.122	0	0.055	0.006	0	0.025	0.001	0.08	0.126	0.023	0	0.438
Woodward	0	0	0	0.088	1.39	0	0.027	6.117	1.22	4.579	0.366	0	13.79
Griswold	0	0	0	0.239	0.619	0	0.131	1.288	0.794	1.533	1.123	0	5.727
1st-Hamilton	0	5.1	0	4.4	4.254	0	1.588	7.677	12.79	18.27	11.84	0	65.92
3rd	0	0	0	0.041	0.406	0	0	2.022	1.327	0.957	0	0	4.753
Cabacier	0	1.7	0	1.3	1.309	0	0.412	2.046	3.834	4.662	2.858	0	18.12
11th	0	0	0	0.014	0.379	0	0.144	0.988	0.657	0.678	0.016	0	2.876
12th	0	0.596	0	0.648	0.936	0	0.286	0	2.978	2.904	1.848	0	10.2
Vermont	0	6.2	0	3.554	2.765	0.05	0.903	4.636	10.07	13.23	7.218	0	48.63
18th	0	0	0	0	0.071	0	0	1.043	0.186	0.168	0	0	1.468
21st	0	0	0	0.046	1.147	0	0.256	2.183	2.998	2.926	0.812	0	10.37
24th	0	0.93	0	0.98	2.232	0	0.462	5.207	7.817	6.715	4.09	0	28.43
W.Grand	0	0	0	0	0	0	0	0	0	0	0	0	0
Swain	0	0	0	0	0	0	0	0	0	0	0	0	0
Scotten	0	0.009	0	0.049	0.392	0	0.142	1.264	1.446	1.291	0.502	0	5.095
McKinstry	0	0	0	0	0	0	0	0	0	0	0	0	0
Summit-Clark	0	1.7	0	0	0	0	0	0.195	6.471	11.31	2.819	0	22.49
Ferdinand	0	0	0	0	0	0	0	0	0	0	0	0	0
Morrell	0	0	0	0	0	0	0	0	0	0	0	0	0
Junction	0	0	0	0	0	0	0	0	0	0	0	0	0
Campbell	0	0	0	0	0.186	0	0	1.218	0.533	0.519	0	0	2.456
Dragoon	0	0	0	0	0	0	0	0	0	0	0	0	0
Schroeder	0	0	0	0	0	0	0	0	0	0	0	0	0
Cary	0	0	0	0	0	0	0	0	0	0	0	0	0
Dearborn	0	8.9	0	3.137	3.053	0.465	0.937	4.267	15.9	21.65	8.986	0	67.29
Pulaski	0	0	0	0	0	0	0	0	0	0	0	0	0
Flora/Carbon	0	0	0	0	0	0	0	0.049	0	0	0	0	0.049
DETROIT RIVER	828.23	1947.659	368.327	1688.619	1988.65	900.6	1233	530.58	1793	1970	1800	825.4	15875
Baby Creek (BC+BC adjunct)	0	135	0	27.4	21.255	4.853	0	32.137	236.7	424.2	157.7	0	1039
W.Warren Siphon	0.004	0.9	0.012	1.278	0.772	1.071	1.273	2.114	2.431	3.032	1.013	0.03	13.93
Trinity-Tireman	0	23.3	0	2.159	1.219	0	1.502	14.682	59.85	72.85	29.51	0	205.1
West Chicago	0	0	0	0	0	0	0	6.663	2.084	9.456	0	0	18.2
W. Chicago Siphon	0.055	0.8	0.103	0.715	0.681	0.532	0.56	0.802	1.789	2.536	0.9	0.099	9.572
Glendale	0	0.26	0	0.104	0.486	0	4.818	1.903	3.083	2.683	1.63	0	14.97
Lahser/Dolson	0	0	0	0	0	0	0	0.596	3.339	2.641	1.157	0	7.733
Schoolcraft/W.Park	0.02	0.959	0.033	1.262	0.841	1.15	1.162	2.745	2.585	3.82	0.793	0.038	15.41
Lyndon/Brammel	0	0	0	0	0	0	0	2.305	0	1.928	0	0	4.233
5 Mile basin (treated)	0	0	0	0	0	0	0	0	0	0	0	0	0

CSO Notification Model

Total Volume For 2001 (Detroit)

Outfall Location	Volume, MG												
	Jan-01	Feb-01	Mar-01	Apr-01	May-01	Jun-01	Jul-01	Aug-01	Sep-01	Oct-01	Nov-01	Dec-01	Total
7 Mile basin (treated)	0	0	0	0	0	0	0	0.022	0.004	1.024	0.004	0	1.054
Puritan Outfall (east shore)	0.276	1.5	0.136	0.98	0.941	1.267	1.04	3.048	2.28	3.536	1.346	0.424	16.77
Riverdale/McNichols	0	18.2	0	0	1.432	0	36.79	6.228	14.33	27.89	10.46	0	115.3
Glenhurst (west shore)	0.008	0.113	0.024	0.206	0.116	0.154	0.211	0.376	0.379	0.449	0.088	0.008	2.132
Seven Mile (east shore)	0	0	0	0	0.8	0.028	11.21	0.735	0.908	0.29	0.092	0	14.06
Pembroke	0	0.423	0	0.021	1.872	0.054	17.63	1.403	1.752	2.654	0.918	0	26.72
Oakwood PS	30.2	103	17.5	120.5	127.765	73.69	71.89	40.286	113.3	174.3	73.26	69.39	1015
Fox Cr backwater gate	0	0	0	0	0	0	0	0	0	0	6.028	0	6.028
Rouge River	**30.563**	**284.455**	**17.808**	**154.625**	**158.18**	**82.8**	**148.1**	**116**	**444.8**	**733.2**	**284.9**	**69.99**	**2525**

CSO Notification Model

Total Volume For 2002 (Detroit)

fall Location	Volume, MG												
	Jan-02	Feb-02	Mar-02	Apr-02	May-02	Jun-02	Jul-02	Aug-02	Sep-02	Oct-02	Nov-02	Dec-02	Total
Conner Cr Backwater gate	0	36.236	13.345	142.082	88.401	463	64.16	0					
Conner/Freud PS	728.824	778.143	714.029	1882.888	2287.85	1326	499.8	0					
McClellan	28.623	112.91	74.639	149.445	120.576	59	59.02	0					
Fischer PS	0	0.485	0.772	1.435	0.845	16.66	3.597	0					
Iroquois	0	0	0	0	0	24.26	0.438	0					
Helen	0	0	0	0.258	0	41.39	6.449	0					
Meldrum	0	0	0	0	0	42.93	4.902	0					
Leib (CME)	0	0	0	0	0	4.809	0	0					
Adair	0	0	0	0.615	0	7.146	1.221	0					
Joseph Campau	0	0.345	0.324	8.276	0.404	77.27	14.21	0					
Chene	0	0	0	0	0	2.339	0	0					
Dubois	0	0.007	0.02	3.305	1.584	1.616	0.738	0					
St.Aubin	0	0	0	0	0	0	0	0					
Orleans (east/west)	0	0	0.093	3.937	1.629	0.906	3.178	0					
Riopelle	0	0	0	0.354	0.315	0.014	0.431	0					
Rivard	0	0	0.543	4.88	1.647	0.89	2.538	0					
Hastings	0	0	0	0.067	0.38	0	0.211	0					
Randolph	0	0	1.275	13.032	4.185	2.51	6.236	0					
Bates	0	0.027	0.036	0.021	0.032	0.014	0.02	0					
Woodward	0	0	0	1.299	5.835	0	5.954	0					
Griswold	0	0	0	0.884	1.444	0	1.327	0					
1st-Hamilton	0	0	0	7.976	9.033	0.739	7.686	0					
3rd	0	0	0	0.358	2.363	0	1.983	0					
Cabacier	0.107	0	0	3.176	2.605	0.364	2.373	0					
11th	0	0	0	0.321	1.322	0.004	0.633	0					
12th	0.066	0	0	1.802	1.965	0.292	1.808	0					
Vermont	0.451	0	0.025	9.301	6.705	0.756	4.818	0					
18th	0	0	0	0	1.299	0	0.594	0					

CSO Notification Model

Total Volume For 2002 (Detroit)

fall Location	Volume, MG												
	Jan-02	Feb-02	Mar-02	Apr-02	May-02	Jun-02	Jul-02	Aug-02	Sep-02	Oct-02	Nov-02	Dec-02	Total
21st	0	0	0	0.911	2.536	0.158	2.322	0					
24th	0	0	0	3.25	6.393	0.276	5.543	0					
W.Grand	0	0	0	0	0	0	0	0					
Swain	0	0	0	0	0	0	0	0					
Scotten	0	0	0	0.395	1.433	0	1.102	0					
McKinstry	0	0	0	0	0	0	0.034	0					
Summit-Clark	0	0	0	0	1.087	0	0.914	0					
Ferdinand	0	0	0	0	0	0	0	0					
Morrell	0	0	0	0	0	0	0	0					
Junction	0	0	0	0	0	0	0	0					
Campbell	0	0	0	0	1.396	0	0.802	0					
Dragoon	0	0	0	0	0	0	0	0					
Schroeder	0	0	0	0	0	0	0	0					
Cary	0	0	0	0	0	0	0	0					
Dearborn	1.718	0	0.706	12.483	9.306	0.579	4.301	0					
Pulaski	0	0	0	0	0	0	0	0					
Flora/Carbon	0	0	0	0	0.046	0	0.012	0					
DETROIT RIVER	759.789	928.153	805.807	2252.751	2562.62	2074	709.3	**0**	**0**	**0**	**0**	**0**	**0**
Baby Creek (BC+BC adjunct)	147.359	0	0	158.74	106.298	0	55.25	0					
W.Warren Siphon	0.625	0.819	0.24	1.712	1.54	4.491	2.647	0.648					
Trinity-Tireman	10.06	0	0	29.906	22.678	0	12.37	0					
West Chicago	0	0	0	0	10.209	0	4.389	0					
W. Chicago Siphon	0.503	0.045	0.35	1.19	1.118	0.234	0.72	0.065					
Glendale	0	0	0	1.511	2.498	0	5.59	0					
Lahser/Dolson	0	0	0	0.3	2.377	0	0.196	0					
Schoolcraft/W.Park	0.669	0.043	0.322	1.992	1.14	0.107	2.445	0.663					
Lyndon/Brammel	0	0	0	0	1.554	0	0	0					
5 Mile basin (treated)	0	0	0	0	0	0	0	0					
7 Mile basin (treated)	0	0	0	0	0	0	0	0					
Puritan Outfall (east shore)	0.811	0.315	0.74	1.95	1.078	0.18	2.317	0.339					
Riverdale/McNichols	4.996	0	0	8.618	5.628	0	44.22	0					
Glenhurst (west shore)	0.086	0.008	0.046	0.266	0.16	0.033	0.35	0.094					
Seven Mile (east shore)	0	0	0	0.167	0	0	15.38	0					
Pembroke	0.106	0	0	0.993	0.305	0	25.66	0					
Oakwood PS	58.519	56.627	59.339	178.559	152.358	41.31	72.04	0					
Fox Cr backwater gate	0	0	0	0	0	16.09	0	0					
Total	1743.31	1914.16	1672.65	4891.406	5434.2	4211	1662	1.809					

Calculated Pollutant Loading

2000/2001	Vol	TP	BOD	TSS	Ammonia
	(MG)	(lbs)	(lbs)	(lbs)	(lbs)
Detroit River	15669	157945	1E+07	26982335	310626
Rouge Treated	34	256.299	4556.43	18510.49	598.03
Rouge Untreated	3698	37275.8	2422928	6367953	73309

2000/2001	Vol	TP	BOD	TSS	Ammonia
	(MG)	(lbs)	(lbs)	(lbs)	(lbs)
Detroit River	8862	89329.3	5806407	15260428	175681
Rouge Treated	1	7.96824	141.658	575.484	18.593
Rouge Untreated	3460	34876.7	2266983	5958096	68591

CSO Event Details July 2000 - July 2001

Responsible Entity	Outfall Location	Volume (million gallons)	Phosphorous Loading (KLBS)	BOD Loading (KLBS)	TSS Loading (KLBS)	Nitrogen - Ammonia Loading (KLBS)
8.5 mile relief Drain Drainage District	9 mile rd. @ Lake St. Clair	229	2,307	149,975	394,166	4,538
Beverly Hills/Birmingham	Evergreen & Beverly	33	336	21,838	57,394	661
Birmingham	Lincoln & Southfield	36	361	23,456	61,648	710
Bloomfield twp, Bloomfield & Birmingham	Cranbrook & 14	5	50	3,263	8,576	99
Bloomfield twp, Bloomfield & Birmingham	Cranbrook & 16	22	222	14,434	37,936	437
Bloomfield twp, Bloomfield & Birmingham	Cranbrook & 18	9	88	5,740	15,085	174
Bloomfield twp, Bloomfield & Birmingham	Cranbrook & 19	21	210	13,667	35,921	414
Bloomfield twp, Bloomfield & Birmingham	Cranbrook & 20	4	38	2,464	6,475	75
Bloomfield twp, Bloomfield & Birmingham	Cranbrook & 21	4	37	2,405	6,320	73
Grosse Pointe Farms	Provencal Blvd. @ Lake Shore Dr.	0	3	166	436	5
Grosse Pointe Farms	Tonnacour rd. @ Lake Shore Dr.	1	14	883	2,320	27
Milk River Intercounty Drainage Board	Milk River	312	3,148	204,649	537,861	6,192
Oakland Co SoCSDS 12 Towns RTF	Red Run Drain	633	6,381	414,742	1,090,026	12,549
South Macomb Sanitary District	Retention Treatment Basin outfall	41	410	26,667	70,085	807
South Macomb Sanitary District	9 mile rd.	177	1,781	115,774	304,277	3,503
South Macomb Sanitary District	Retention Treatment Basin outfall	169	1,704	110,729	291,018	3,350
Wayne Co/Dearborn Heights	Facility @ 23800 Edward Hines Dr.	13	133	8,675	22,799	262
Wayne Co/Inkster	facility @ 2001 Inkster rd.	53	529	34,399	90,407	1,041
Wayne Co/Redford/Livonia	facility @ 16100 Lola Dr.	17	172	11,172	29,364	338
		Totals	**17,925**	**1,165,096**	**3,062,112**	**35,252**

CSO Event Details July 2001 - July 2002

Responsible Entity	Outfall Location	Volume (million gallons)	Phosphorous Loading (KLBS)	BOD Loading (KLBS)	TSS Loading (KLBS)	Nitrogen - Ammonia Loading (KLBS)
Beverly Hills/Birmingham	Evergreen & Beverly	3	30	1,966	5,166	59
Birmingham	Lincoln & Southfield	0	5	308	809	9
Bloomfield Twp, Bloomfield & Birminham	Cranbrook & 14	1	8	531	1,395	16
Milk River Intercounty Drainage Board	Milk River	158	1,594	103,630	272,361	3,135
Oakland Co SOCSDS 12 Towns RTF	Red Run Drain	634	6,392	415,462	1,091,920	12,570
South Macomb Sanitary District	9 Mile Rd.	19	191	12,383	32,546	375
South Macomb Sanitary District	Retention Treatment Basin outfall	757	7,635	496,275	1,304,312	15,015
Wayne Co/Dearborn Heights	facility @ 23800 Edward Hines Dr.	7	75	4,875	12,812	147
Wayne Co/Inkster	facility @ 2001 Inkster Rd	15	152	9,877	25,959	299
		Totals	**16,082**	**1,045,306**	**2,747,280**	**31,627**

Attachment 4. Tabulation of SSO Pollutant Loadings

SSO Event Details July 2000 - July 2001

Responsible Entity	Outfall Location	Volume (million gallons)	Phosphorous Loading (KLBS)	BOD Loading (KLBS)	TSS Loading (KLBS)	Nitrogen - Ammonia Loading (KLBS)
Birmingham	Hidden Ravine @ Rouge River	0	0.0000	0.0000	0.0000	0.0000
Canton	Michigan and Haggerty	0.0045	0.0378	2.3436	3.3264	0.0446
Center Line	Center Line Lift Station	6.116946	51.3823	3185.7055	4521.6465	60.6312
Clinton Township	Beaconsfield PS#9	0.01728	0.1452	8.9994	12.7734	0.1713
Clinton Township	Golden and Danbury PS#4	0.01501	0.1261	7.8172	11.0954	0.1488
Clinton Township	King and Price PS#3	0.0396	0.3326	20.6237	29.2723	0.3925
Clinton Township	Mulberry and Remick PS#1	0.14425	1.2117	75.1254	106.6296	1.4298
Clinton Township	North Nunneley PS#2	0.07235	0.6077	37.6799	53.4811	0.7171
Clinton Township	Private Residence 1	0.25823	2.1691	134.4862	190.8836	2.5596
Clinton Township	Rutherford and Griswald PS#6	0.07259	0.6098	37.8049	53.6585	0.7195
Evergreen/Farmington	13 Mile and Middlebelt	0	0.0000	0.0000	0.0000	0.0000
Evergreen/Farmington	Eldon Rd between 9 & 10 Mile Rd.	0	0.0000	0.0000	0.0000	0.0000
Evergreen/Farmington	MH # WBT 133001	0	0.0000	0.0000	0.0000	0.0000
Evergreen/Farmington	MH # WBT 133002	0	0.0000	0.0000	0.0000	0.0000
Evergreen/Farmington	Walnut #1 Pump Station	4.131	34.7004	2151.4248	3053.6352	40.9465
Farmington Hills	12 Mile and Farmington Rd	0.061598	0.5174	32.0802	45.5332	0.6106
Farmington Hills	Lincolnshire Pump Station	0.0024	0.0202	1.2499	1.7741	0.0238
Farmington Hills	Utley and Middlebelt	0	0.0000	0.0000	0.0000	0.0000
Franklin	Cranbrooke & 14 mile	0.0001	0.0008	0.0521	0.0739	0.0010
Fraser	Beacon Lift Station	4.645057	39.0185	2419.1457	3433.6261	46.0418
Garden City	Dawson and Garden	0.03125	0.2625	16.2750	23.1000	0.3098
Garden City	Deering and Dawson	0.03125	0.2625	16.2750	23.1000	0.3098
Garden City	Harrison and Kathryn	0.03125	0.2625	16.2750	23.1000	0.3098
Garden City	Middlebelt and Maplewood	0.03125	0.2625	16.2750	23.1000	0.3098
Hazel Park	Tucker Street @ Dequindre	0.0873	0.7333	45.4658	64.5322	0.8653
Inkster	29450 Andover Street	0.656	5.5104	341.6448	484.9152	6.5023
Livonia	Pickford and Lamar	0.1088	0.9139	56.6630	80.4250	1.0784
Melvindale	Greenfield Rd @ I-94	0	0.0000	0.0000	0.0000	0.0000
Melvindale	Pumping Station	2.141	17.9844	1115.0328	1582.6272	21.2216

SSO Event Details July 2000 - July 2001

Responsible Entity	Outfall Location	Volume (million gallons)	Phosphorous Loading (KLBS)	BOD Loading (KLBS)	TSS Loading (KLBS)	Nitrogen - Ammonia Loading (KLBS)
Southfield	Wildbrook Drive and 12 Mile Rd.	0	0.0000	0.0000	0.0000	0.0000
St. Clair Shores	Jefferson PS @ Lake Boulevard	1.101	9.2484	573.4008	813.8592	10.9131
St. Clair Shores	Masonic and Jefferson Overflow PS	1.414	11.8776	736.4112	1045.2288	14.0156
Troy	Adam and Wattles	0.15	1.2600	78.1200	110.8800	1.4868
Troy	Beach and Tarragona	0.35	2.9400	182.2800	258.7200	3.4692
Troy	Binbrook and Kent	0.35	2.9400	182.2800	258.7200	3.4692
Van Buren Township	50901 Expressway	0	0.0000	0.0000	0.0000	0.0000
Waterford	Beverly Island	0.003	0.0252	1.5624	2.2176	0.0297
Waterford	Private Residence	0.00157	0.0132	0.8177	1.1605	0.0156
Wayne	Hayes, N of Annapolis W of Merriman	0.2	1.6800	104.1600	147.8400	1.9824
Western Twp Utility Authority	Lower EQ Basin	0.005	0.0420	2.6040	3.6960	0.0496
Western Twp Utility Authority	Michigan and Haggerty	1.6295	13.6878	848.6436	1204.5264	16.1516
Western Twp Utility Authority	Ward and Tyler	0.0001	0.0008	0.0521	0.0739	0.0010
Western Twp Utility Authority	WWTP	0.00005	0.0004	0.0260	0.0370	0.0005
Westland	Annapolis and Middlebelt	0.24	2.0160	124.9920	177.4080	2.3789
Westland	August and Louise	1.38	11.5920	718.7040	1020.0960	13.6786
Westland	Cavell and Warren	0.36015	3.0253	187.5661	266.2229	3.5698
Westland	Hanover and Admiral	0.27	2.2680	140.6160	199.5840	2.6762
Westland	Schuman and Avondale	0.435	3.6540	226.5480	321.5520	4.3117
		Total	**223.34**	**13847.23**	**19654.13**	**263.54**

SSO Event Details July 2001 - July 2002

Responsible Entity	Outfall Location	Volume (million gallons)	Phosphorous Loading (KLBS)	BOD Loading (KLBS)	TSS Loading (KLBS)	Nitrogen - Ammonia Loading (KLBS)
Birmingham	Hidden Ravine @ Rouge River	N/A	0.0000	0.0000	0.0000	0.0000
Canton	Michigan Ave. East of Denton Rd.	0.00005	0.00	0.03	0.04	0.0005
Canton	Michigan East of Sheldon	0.00005	0.00	0.03	0.04	0.0005
Center Line	Center Line Lift Station	0.0874	0.73	45.52	64.61	0.8663
Center Line	Center Line Lift Station	0.446	3.75	232.28	329.68	4.4208
Center Line	Center Line Lift Station	0.525073	4.41	273.46	388.13	5.2045
Center Line	Stevens and Van Dyke	0.023347	0.20	12.16	17.26	0.2314
Center Line	Stevens and Van Dyke	0.392907	3.30	204.63	290.44	3.8945
Clinton Township	Beaconsfield PS#9	N/A	0.00	0.00	0.00	0.0000
Clinton Township	Beaconsfield PS#9	0.00033	0.00	0.17	0.24	0.0033
Clinton Township	Beaconsfield PS#9	0.00253	0.02	1.32	1.87	0.0251
Clinton Township	Golden and Danbury PS#4	0.3138	2.64	163.43	231.96	3.1104
Clinton Township	Mulberry and Remick PS#1	0.0019	0.02	0.99	1.40	0.0188
Clinton Township	North Nunneley PS#2	0.00472	0.04	2.46	3.49	0.0468
Clinton Township	Private Residence 2	0.00001	0.00	0.01	0.01	0.0001
Clinton Township	Private Residence 2	0.054	0.45	28.12	39.92	0.5352
Clinton Township	Rutherford and Griswold PS#6	N/A	0.00	0.00	0.00	0.0000
Evergreen/Farmington	Evergreen and Eight Mile Roads	4.776	40.12	2487.34	3530.42	47.3397
Evergreen/Farmington	Walnut #1 Pump Station	0.072	0.60	37.50	53.22	0.7137
Evergreen/Farmington	Walnut #1 Pump Station	2.59	21.76	1348.87	1914.53	25.6721
Evergreen/Farmington	Walnut #1 Pump Station	0.1546	1.30	80.52	114.28	1.5324
Evergreen/Farmington	Walnut #1 Pump Station	0.464	3.90	241.65	342.99	4.5992
Farmington Hills	13 Mile and Middlebelt	N/A	0.00	0.00	0.00	0.0000
Fraser	Beacon Lift Station	0.005312	0.04	2.77	3.93	0.0527
Fraser	Beacon Lift Station	0.024702	0.21	12.86	18.26	0.2448
Fraser	Beacon Lift Station	0.146658	1.23	76.38	108.41	1.4537
Fraser	Beacon Lift Station	0.293307	2.46	152.75	216.81	2.9073
Fraser	Beacon Lift Station	0.96866	8.14	504.48	716.03	9.6014
Fraser	Beacon Lift Station	0.008408	0.07	4.38	6.22	0.0833
Fraser	Beacon Lift Station	0.022772	0.19	11.86	16.83	0.2257
Garden City	Dawson and Garden	0.0175	0.15	9.11	12.94	0.1735
Garden City	Harrison and Kathryn	0.0175	0.15	9.11	12.94	0.1735
Inkster	3700 john Daly	0.0195	0.16	10.16	14.41	0.1933
Oakland County - Clinton Oakland District	Spring Lake Lift Station; 6120 Maybee Road	0.000003	0.00	0.00	0.00	0.0000
St. Clair Shores	Jefferson PS @ Lake Boulevard	0.70056	5.88	364.85	517.85	6.9440
St. Clair Shores	Masonic and Jefferson Overflow PS	0.514	4.32	267.69	379.95	5.0948
Troy	Beach and Tarragona	0.007	0.06	3.65	5.17	0.0694
Troy	Binbrook and Kent	0.007	0.06	3.65	5.17	0.0694
Waterford	Herbell Dr. 90' E of Lorberta Lane	0	0.00	0.00	0.00	0.0000
Western Twp Utility Authority		N/A	0.00	0.00	0.00	0.0000
Western Twp Utility Authority		N/A	0.00	0.00	0.00	0.0000
Western Twp Utility Authority	1190 Parkway Drive	0	0.00	0.00	0.00	0.0000