ST. LOUIS COUNTY PHASE II STORMWATER MANAGEMENT PLAN

THIRD TERM PERMIT 2013-2018

St. Louis County Phase II Stormwater Management Plan
Prepared by
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Executive Summary

The Phase II Stormwater Regulations were promulgated to provide appropriate stormwater management for political subdivisions in urbanized areas which were exempted under the 1990 (Phase I) regulations. Exemption of certain urbanized areas because of the size of the political subdivisions created so-called "donut holes" in the national stormwater program. Appendix 6, *Governmental Entities Located Fully or Partially Within an Urbanized Area,* of the preamble to the USEPA's December 8, 1999 rule listed nearly all of the political subdivisions in St. Louis County as entities requiring a Phase II NPDES Permit. The St. Louis metropolitan area may have been the largest "donut hole" in the nation because of exempted combined sewers serving the City of St. Louis and the numerous small political subdivisions in St. Louis County.

Missouri's Phase II Stormwater Regulations for small MS4s (municipal separate storm sewer system) are contained in 10 CSR 20-6.200. The statute allows regulated Small MS4s to seek coverage under a general permit or under a site-specific permit. In either case, they can apply individually as an entity or co-permittee. It is emphasized in the regulations at (5)(C)1 that:

> *"the department encourages cooperation between potential small MS4 applicants when addressing application requirements and in the development, implementation and enforcement of the six minimum measures under issued permits."*

It is also stated that:

> *"applicants within one urbanized area...should consider applying as co-applicants...to become co-permittees under an issued permit."*

There is a "patchwork" of political jurisdictions in St. Louis County connected by shared streets and highways. Utilities are provided on a regional basis by both private and public entities. The Metropolitan St. Louis Sewer District (MSD) provides collection and treatment of wastewaters generated by residential, commercial and industrial activities. MSD is also responsible for operation and maintenance of the separate storm sewer systems serving all of the municipalities in the St. Louis County area, except for the cities of Eureka and Pacific.

Many communities provide municipal operations and public services that impact stormwater management. Permitting each municipality separately under the Phase II Regulations did not seem appropriate or administratively feasible because of service overlap. The topography of the area suggested individual municipal permits with respect to stormwater conveyance identification would be overly complex with possible jurisdictional disputes. Natural watercourses often leave one municipality, enter the jurisdictional boundaries of a second or third municipality and re-enter a portion of the first municipality. Individual municipal permits were not considered a viable means of ensuring control of stormwater pollutants to the maximum extent practicable.

CHAPTER 1

Phase II Plan Coordination

A. Plan Coverage

The Metropolitan St. Louis Sewer District (MSD) is a regional sewer district, formed in 1954, under the provisions of Article 6, Section 30(a) of the Missouri constitution. Under these provisions, voters in the City of St. Louis and in the portion of St. Louis County roughly east of current Interstate 270, adopted a plan proposed by a board of freeholders. The size of the district was increased in 1977 through a voter-approved annexation of most of the rest of St. Louis County east of Highway 109. The boundaries of MSD and land area covered by MSD are shown in Figure 1.1.
This Plan is intended to cover the portion of St. Louis County that is included within the MSD boundaries, excluding those county municipalities which are served by combined sewers or have populations less than 1000. Of the 90 municipalities in St. Louis County, two municipalities, the City of Pacific and the City of Eureka, are located outside of MSD's service area. MSD's boundaries cover approximately 525 square miles, and will henceforth be referred to as the "Plan Area."

Although there are 88 municipalities located within MSD's county service area, only 58 will be co-permittees under this Plan. The original list of 61 co-permittees contained 59 municipalities, St. Louis County and MSD. However, St. George disincorporated in November 2011. Of the 88 municipalities, 11 are largely served by combined sewers and are, therefore, exempt pursuant to Section (1)(C)16.C of the Missouri stormwater regulation 10 CSR 20-2.600. One municipality was previously listed as exempt due to combined sewers; however, in response to an April 5, 2011 request from the Missouri Department of Natural Resources (MDNR) to re-evaluate, the City was determined to no longer be exempt. An additional 18 municipalities are waived under the provisions of Section (1)(C)24.A of the regulation based on EPA criteria and having populations less than 1000. These 18 municipalities can be viewed as "donut holes" within the overall Plan Area. While these communities will not be co-permittees, they will benefit from some of the activities proposed within this Plan. In addition to the 18 previously population exempt municipalities, one co-permittee's population dropped below 1000 in the 2010 census; however, this co-permittee will remain in the program until studies can indicate they do not significantly contribute to urban runoff pollution. Figure 1.2 shows the St. Louis County municipalities and the City of St. Louis.

Of the 58 municipalities that are co-permittees, 57 lie wholly within the Plan Area. About 61% of the City of Wildwood, on the western edge of the MSD boundary, lies outside the Plan Area, but it is anticipated that the city will apply all elements of this Plan to its entire corporate area. Likewise, St. Louis County will apply all elements of the Plan to its entire area of jurisdiction. MSD's western boundary may change slightly as small voluntary annexations occur. As new areas are annexed into the MSD service area, they will be fully covered by all elements of the Plan for which MSD and others have responsibility.

Figure 1.1: Map showing MSD boundaries

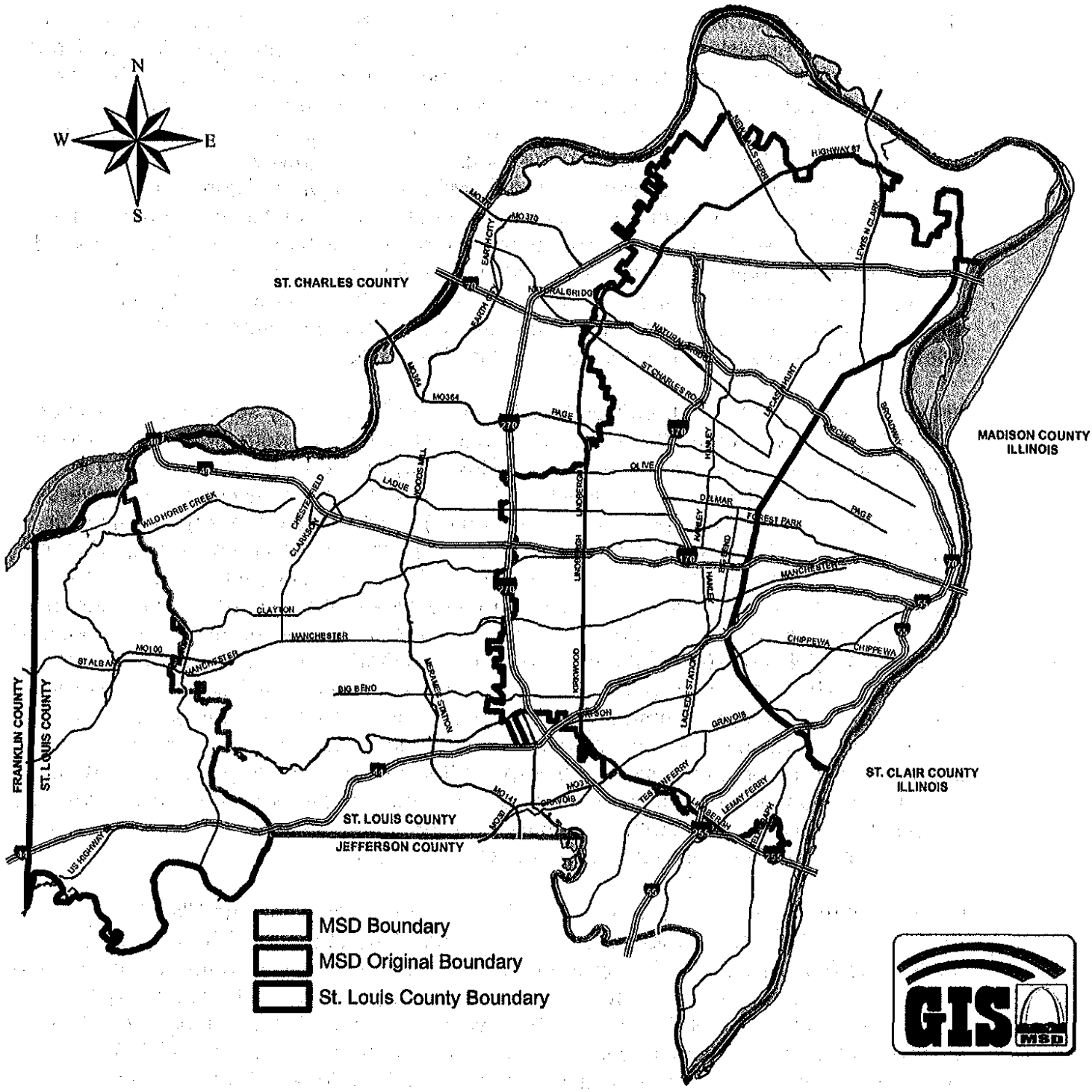
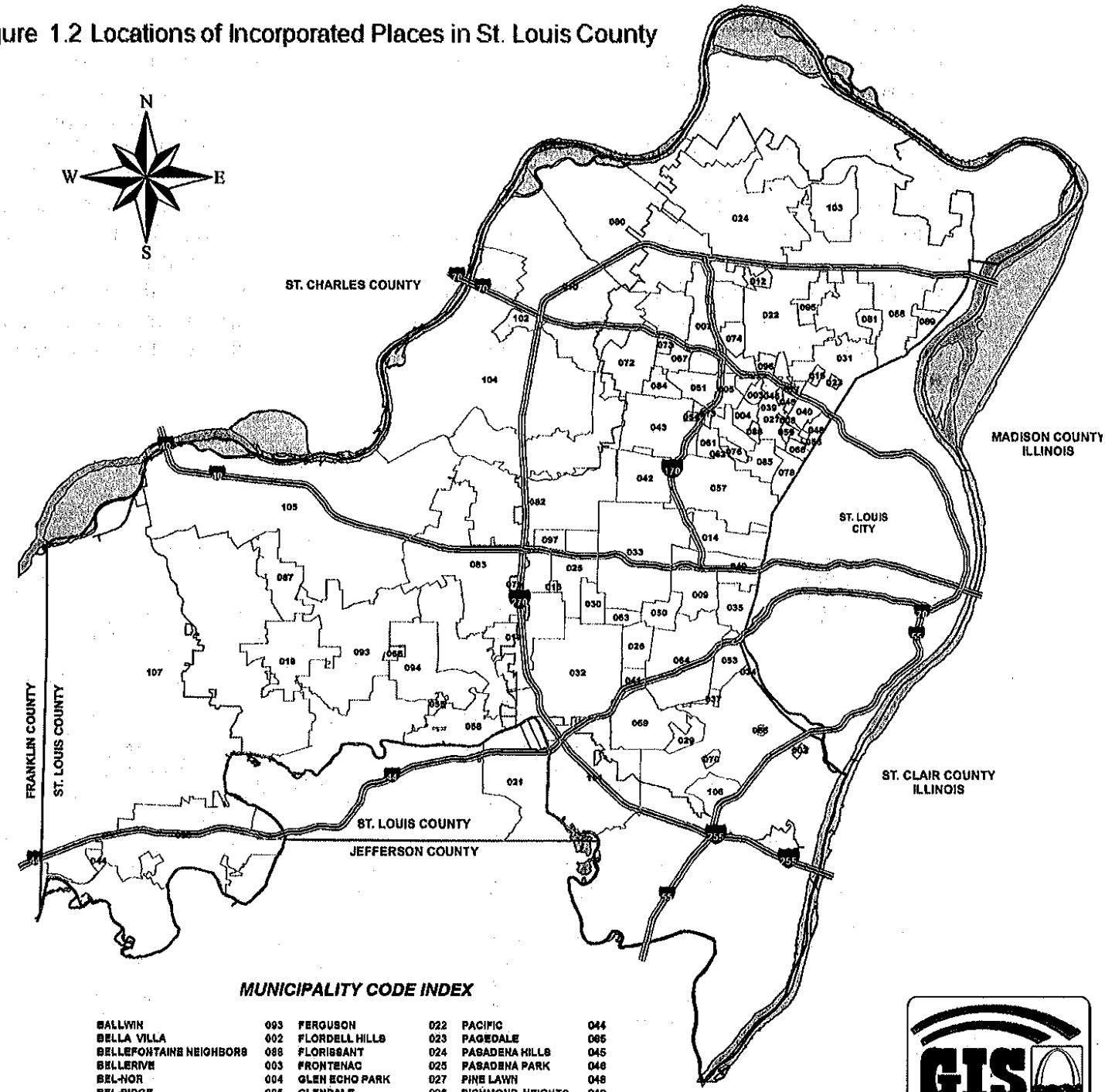


Figure 1.2 Locations of Incorporated Places in St. Louis County



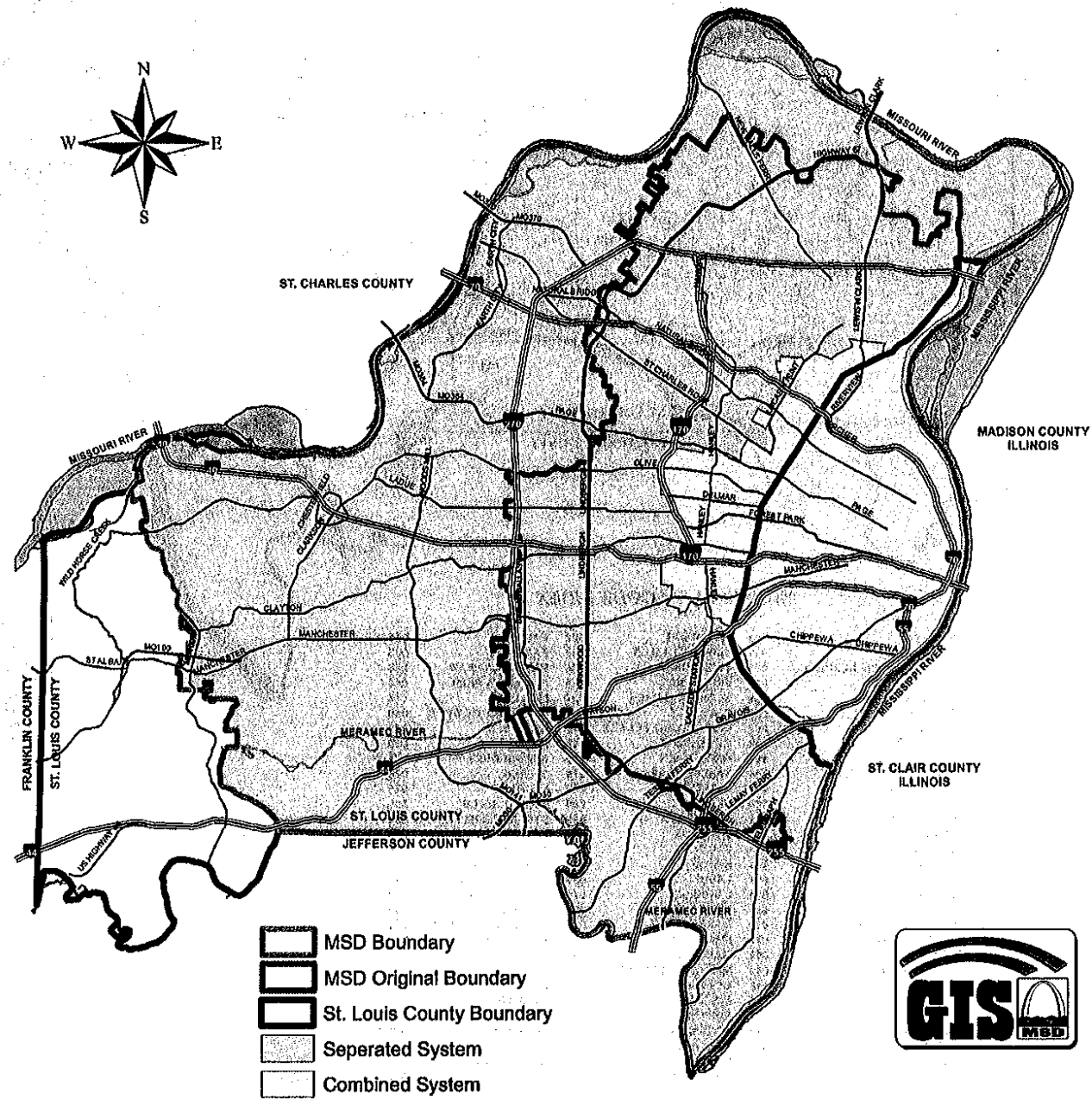
MUNICIPALITY CODE INDEX

BALLWIN	093	FERGUSON	022	PACIFIC	044		
BELLA VILLA	002	FLORDELL HILLS	023	PAGEDALE	095		
BELLEFONTAINE NEIGHBORS	088	FLORISSANT	024	PASADENA HILLS	045		
BELLERIVE	003	FRONTENAC	025	PASADENA PARK	046		
BEL-NOR	004	GLEN ECHO PARK	027	PINE LAWN	048		
BEL-RIDGE	005	GLENDALE	026	RICHMOND HEIGHTS	049		
BERKELEY	007	GRANTWOOD VILLAGE	029	RIVERVIEW	099		
BEVERLY HILLS	008	GREENDALE	086	ROCK HILL	050		
BLACK JACK	103	GREENPARK	106	SHREWSBURY	053		
BRECKENRIDGE HILLS	084	HANLEY HILLS	076	ST. ANN	072		
BRENTWOOD	009	HAZELWOOD	080	ST. JOHN	051		
BRIDGETON	010	HILLSDALE	068	SUNSET HILLS	101		
CALVERTON PARK	012	HUNTLEIGH	030	SYCAMORE HILLS	054		
CHAMP	102	JENNINGS	031	TOWN AND COUNTRY	069		
CHARLACK	013	KINLOCH	074	TWIN OAKS	055		
CHESTERFIELD	105	KIRKWOOD	032	UNIVERSITY CITY	057		
CLARKSON VALLEY	087	LADUE	033	UPLANDS PARK	056		
CLAYTON	014	LAKESHIRE	070	VALLEY PARK	058		
COOL VALLEY	096	MACKENZIE	034	VELDA CITY	059		
COUNTRY CLUB HILLS	015	MANCHESTER	004	VELDA VILLAGE HILLS	060		
COUNTRY LIFE ACRES	079	MAPLEWOOD	035	VINITA PARK	061		
CRESTWOOD	089	MARLBOROUGH	037	VINITA TERRACE	062		
CREVE COEUR	092	MARYLAND HEIGHTS	104	WARSON WOODS	063		
CRYSTAL LAKE PARK	016	MOLINE ACRES	081	WEBSTER GROVES	064		
DELLWOOD	095	NORMANDY	039	WELLSTON	078		
DES PERES	017	NORTHWOODS	040	WESTWOOD	097		
EDMUNDSON	073	NORWOOD COURT	077	WILBUR PARK	066		
ELLISVILLE	019	OAKLAND	041	WILDWOOD	107		
EUREKA	098	OLIVETTE	042	WINCHESTER	068		
FENTON	021	OVERLAND	043	WOODSON TERRACE	067		

B. Major Watersheds

St. Louis County stormwater drains into three major watersheds: the Mississippi River, the Meramec River, and the Missouri River as illustrated in Figure 1.4. All stormwater runoff from the Plan Area ultimately enters the Mississippi River. The Mississippi River forms the eastern boundary of the southernmost and northernmost portions of the Plan Area with the remainder of the Plan Area entering the western boundary of the City of St. Louis and its combined sewer system. The extent of the combined sewer area is shown in Figure 1.3. The Meramec River, tributary to the Mississippi River to the south, forms the southern boundary of the Plan Area except for a portion of the Plan Area in which tributaries to the Meramec drain from the south to the north into the Meramec River. The Missouri River, tributary to the Mississippi on the north, forms the northern boundary of the Plan Area. Many small tributaries located within the Plan Area feed into each of these three major rivers.

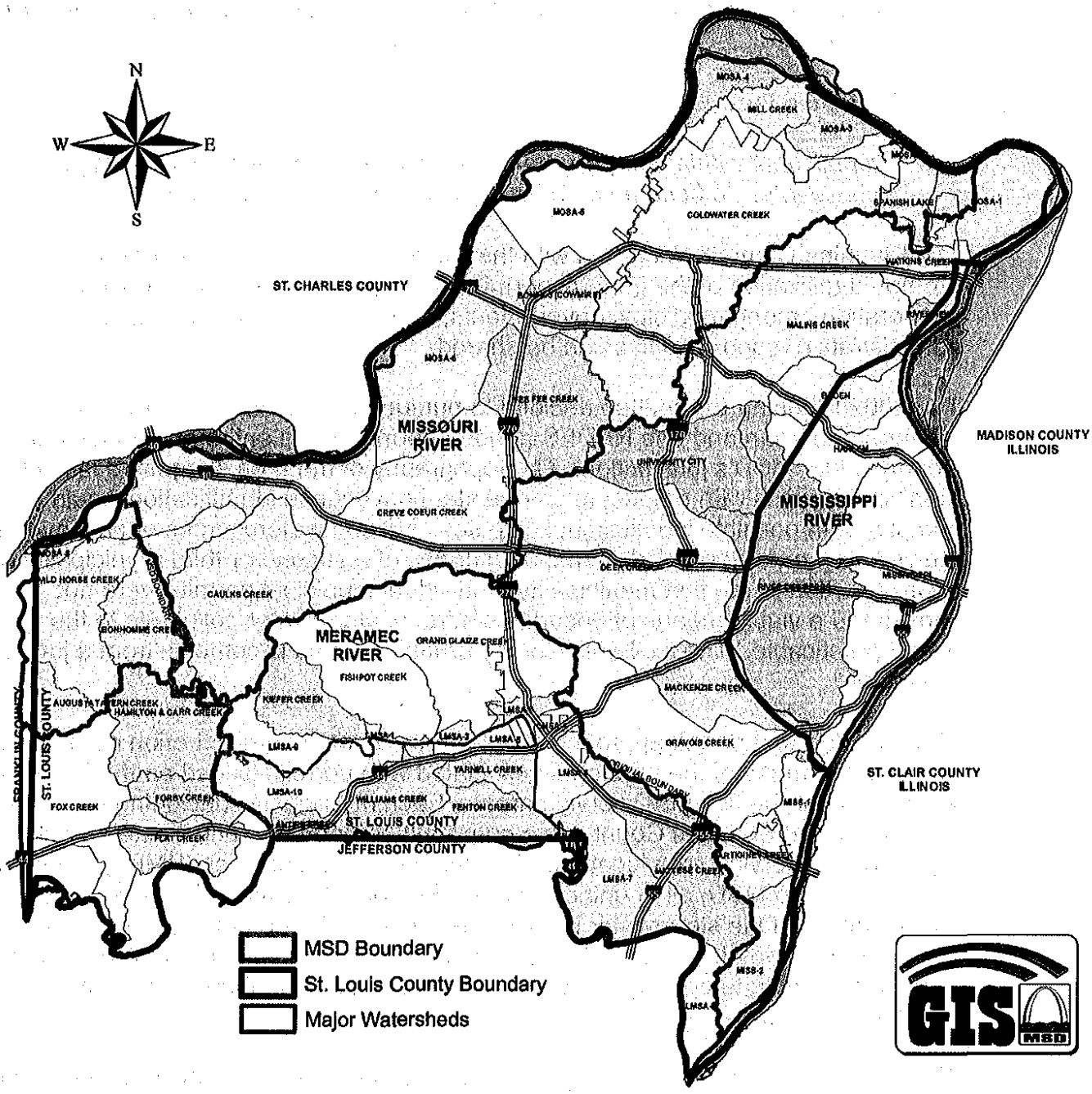
Figure 1.3: Location of combined sewer area



C. Minor Watersheds

Stream tributaries to the three major watersheds in the Plan Area were studied using detailed methods by FEMA for the St. Louis County Flood Insurance Study. The tributary streams within each major watershed are identified and described below. Figure 1.4 shows the location of the tributaries within the major watersheds and Plan Area.

Figure 1.4: Stream tributaries within the Plan Area



D. Permitting Strategy

The State's Phase II Stormwater Regulations for Small MS4s are contained in 10 CSR 20-6.200. The regulated Small MS4s must seek coverage under a general permit or under a site-specific permit. In either case, they can seek individual or co-permittee coverage. It is emphasized in the regulations at (5)(C)1 that:

> *"the department encourages cooperation between potential small MS4 applicants when addressing application requirements and in the development, implementation and enforcement of the six (6) minimum measures under issued permits."*

It is also stated that:

> *"applicants within one (1) urbanized area...should consider applying as co-applicants...to become co-permittees under an issued permit."*

The Planning Committee agreed with the State's regulatory recommendations and has promoted utilization of the general permit and co-permittee option to encourage cooperation among municipal governments, and so that legal, financial and administrative responsibilities can be shared.

The 2002 Planning Committee decided to pursue one Phase II Stormwater Management Plan and one NPDES general permit for the entire area of St. Louis County under MSD's jurisdiction. The topography of the area suggested individual municipal permits with respect to stormwater conveyance identification would be overly complex with possible jurisdictional disputes. Natural watercourses often leave one municipality, enter the jurisdictional boundaries of a second or third municipality and re-enter a portion of the first municipality. Individual municipal permits were not considered a viable means of ensuring control of stormwater pollutants to the maximum extent practicable. The St. Louis County urbanized area is complex from a jurisdictional viewpoint.

The one plan and permit approach simplified the overall administration of the program and avoided many of the problems associated with permits issued on the basis of watersheds or the five MSD service areas. Each municipality (including MSD and unincorporated St. Louis County) is a co-permittee operating under one permit regardless of service area location. Best management practices (BMPs) selected will be applicable to MSD, all of unincorporated St. Louis County and their regulated municipalities. One stormwater management plan with one annual reporting obligation has been developed. Cooperation is encouraged among all municipalities, regional authorities and state agencies in the development, implementation and enforcement of the plan provisions.

Each co-permittee has been assigned responsibilities related to their obligation to comply with the six MCMs. For example, since MSD already has responsibility to operate and maintain the separate storm sewer systems in the county, it has responsibility to comply with the requirements of MCM 3, Illicit Discharge Detection and Elimination to regulate illegal discharges into the storm sewer system. St. Louis County and the municipalities with their land disturbance programs control pollution from land

disturbance activities to comply with the requirements of MCM 4, Construction Site Stormwater Runoff Control. Because MSD is the recognized continuing authority for sewer extensions within its jurisdictional boundaries and has plan review responsibilities for stormwater control, it is responsible for BMPs in stormwater facility design to comply with MCM 5, Post Construction Stormwater Management in New Development and Redevelopment. St. Louis County and the municipalities control the land use aspect of MCM 5 and therefore their ordinances need to be implemented in conjunction with MSD's to ensure program compliance. All co-permittees are responsible for complying with requirements under MCM 6, Pollution Prevention/Good Housekeeping for Municipal Operations. Public Education and Outreach (MCM 1) on stormwater impacts and Public Involvement and Participation (MCM 2) can best be coordinated by the MSD with municipal support because of its various educational activities already in place and its policy to work with community groups in cleaning up streams impacted by pollution.

Eighty-eight (88) municipalities exist in the Plan Area. Eighteen (18) of the municipalities are exempt from the Phase II Regulations because of the application of EPA waiver criteria, including populations less than 1,000. An additional co-permittee has been notified to petition to the State to be removed from the permit due to their population dropping below 1000 and demonstration that the waiver criteria applies as a result of the 2010 census. Eleven (11) additional St. Louis County municipalities within the Plan Area are exempt because of combined sewer service. A complete list of municipalities within the Plan Area is provided in Table 1.1. The location of a listed municipality can be determined by using the "map reference number" included in the Table and the map of municipalities in Figure 1.2.

E. Selection of a Coordinating Authority

Under its charter, MSD has been given the responsibility for providing adequate sewer and drainage facilities within its boundaries. For the St. Louis County Plan Area, MSD is the obvious agency of choice to coordinate compliance activities associated with the Phase II Stormwater Regulations. However, the Phase II Regulations were specific in naming cities that must be issued permits under the program and must meet applicable minimum control requirements, e.g. municipal operations, such as vehicle maintenance, and salt storage. MSD has been recognized as the coordinating authority for development and implementation of the St. Louis Area Phase II Stormwater Management Plan by St. Louis County, co-permittee municipalities and the Missouri Department of Natural Resources.

F. Establishing a Planning Committee

The third St. Louis Municipalities Phase II Stormwater Planning Committee was formed in February 2012 and held monthly planning meetings through November 2012 to evaluate best management practices, and make decisions regarding goals for the second permit term. Membership of the committee is identified at the beginning of this Plan (on page i), and includes a number of municipal representatives from small and large cities, and representatives from local and state agencies. The evaluation process was divided up into two sub-committees, made up by planning committee members, to specifically address MCMs 1 through 3 and 4 through 6.

Table 1.1: Land Area and Population of Municipalities in MSDs Service Area

MUNICIPALITY	MAP REF*	AREA**						2010 POP	EXEMPTION BASIS***
		TOTAL	BIS	CWC	LOM	MOR	RDP		
Ballwin	93	7.74			6.76	0.98		30404	
Bella Villa	2	0.13					0.13	729	Waiver Criteria
Bellefontaine Neighbors	88	4.36	4.36					10860	
Bellerive	3	0.34	0.34					188	Waiver Criteria
Bel-Nor	4	0.63	0.09				0.54	1499	
Bel-Ridge	5	0.78	0.78					2737	
Berkeley	7	4.96	1.73	3.23				8978	
Beverly Hills	8	0.10	0.10					574	Comb Sewer
Black Jack	103	2.61	0.75	1.86				6929	
Breckenridge Hills	84	0.80		0.80				4746	
Brentwood	9	1.95					1.95	8055	
Bridgeton	10	14.32		1.96		12.36		11550	
Calverton Park	12	0.42	0.15	0.27				1293	
Champ	102	0.80				0.80		13	Waiver Criteria
Charlack	13	0.27	0.27					1363	
Chesterfield	105	32.21			0.03	32.18		47894	
Clarkson Valley	87	2.73			0.02	2.71		2632	
Clayton	14	2.51					2.51	15939	
Cool Valley	96	0.46	0.46					1196	
Country Club Hills	15	0.17	0.17					1274	Comb Sewer
Country Life Acres	79	0.12			0.02	0.03	0.07	74	Waiver Criteria
Crestwood	69	3.58					3.58	11912	
Creve Coeur	82	10.25				4.90	5.35	17833	
Crystal Lake Park	16	0.10					0.10	470	Waiver Criteria
Dellwood	95	1.03	1.03					5025	
Des Peres	17	4.29			2.75		1.54	8373	
Edmundson	73	0.27		0.27				834	Waiver Criteria
Ellisville	19	4.19			3.23	0.96		9133	
Fenton	21	6.35			6.35			4022	
Ferguson	22	6.17	6.03	0.14				21203	
Flordell Hills	23	0.12	0.12					822	Comb Sewer
Florissant	24	11.42	0.20	10.39		0.83		52158	
Frontenac	25	2.89					2.89	3482	
Glendale	26	1.30					1.30	5925	
Glen Echo Park	27	0.03	0.03					160	Waiver Criteria
Grantwood Village	29	0.81					0.81	863	Waiver Criteria
Greendale	86	0.19					0.19	722	Waiver Criteria
Green Park	106	1.31					1.31	2622	
Hanley Hills	76	0.35					0.35	2101	
Hazelwood	80	15.04		5.71		9.33		25703	
Hillsdale	68	0.34	0.34					1478	Comb Sewer
Huntleigh	30	0.98					0.98	334	Waiver Criteria
Jennings	31	3.77	3.77					14712	
Kinloch	74	0.72	0.61	0.11				298	Waiver Criteria
Kirkwood	32	9.19			5.43		3.76	27540	

* In Figure 1.2 from St. Louis County

** Areas are in square miles

BIS=Bissell CWC=Coldwater Creek LOM=Lower Meramec MOR=Missouri River RDP=River Des Peres

*** Municipalities exempt or waived from Phase II requirements

Combined sewer systems, exempt per 10 CSR 20-6.200(1)(C)16.C.

Populations less than 1000 and EPA waiver criteria, waived per 10 CSR 20-6.200(1)(C)24.A.

MUNICIPALITY	MAP REF*	AREA**						2010 POP	EXEMPTION BASIS***
		TOTAL	BIS	CWC	LOM	MOR	RDP		
Ladue	33	8.55					8.55	8521	
Lakeshire	70	0.21					0.21	1432	
Mackenzie	34	0.02					0.02	134	Waiver Criteria
Manchester	94	5.00			5.00			18094	
Maplewood	35	1.56					1.56	8046	Comb Sewer
Marlborough	37	0.24					0.24	2179	
Maryland Heights	104	22.09				22.09		27472	
Moline Acres	81	0.57	0.57					2442	
Normandy	39	1.86	1.52				0.34	5008	
Northwoods	40	0.67	0.67					4227	
Norwood Court	77	0.13	0.13					959	*****
Oakland	41	0.61					0.61	1381	
Olivette	42	2.76					2.76	7737	
Overland	43	4.40	0.19	1.76		0.05	2.40	16062	
Pagedale	85	1.21	0.21				1.00	3304	
Pasadena Hills	45	0.21	0.21					930	Comb Sewer
Pasadena Park	46	0.30	0.30					470	Waiver Criteria
Pine Lawn	48	0.61	0.61					3275	Comb Sewer
Richmond Heights	49	2.29					2.29	8603	
Riverview	89	0.84	0.84					2856	
Rock Hill	50	1.10					1.10	4635	
St. Ann	72	3.15		2.73		0.42		13020	
St. John	51	1.43	1.03	0.39			0.01	6517	
Shrewsbury	53	1.44					1.44	6254	
Sunset Hills	101	9.04			7.83		1.21	8496	
Sycamore Hills	54	0.13	0.10	0.03				668	Waiver Criteria
Town & Country	63	11.55			3.45	6.63	1.47	10815	
Twin Oaks	55	0.26			0.26			392	Waiver Criteria
University City	57	5.88					5.88	35371	****
Uplands Park	56	0.07	0.07					445	Comb Sewer
Valley Park	58	3.16			3.16			6942	
Velda City	59	0.17	0.17					1420	Comb Sewer
Velda Village Hills	60	0.12	0.12					1055	Comb Sewer
Vinita Park	61	0.73	0.06				0.67	1880	
Vinita Terrace	62	0.06					0.06	277	Waiver Criteria
Warson Woods	68	0.57					0.57	1962	
Webster Groves	64	5.89					5.89	22995	
Wellston	78	0.93	0.31				0.62	2313	Comb Sewer
Westwood	97	0.62					0.62	278	Waiver Criteria
Wilbur Park	65	0.06					0.06	471	Waiver Criteria
Wildwood	107	25.02			3.87	21.15		35517	
Winchester	66	0.25			0.25			1547	
Woodson Terrace	67	0.78		0.78				4063	
St. Louis County, Unicp	NA	158.72	26.43	26.08	71.01	9.99	25.21	321027	
Total		**448.36**	**54.87**	**56.51**	**119.42**	**125.41**	**92.15**		

* In Figure 1.2 from St. Louis County

** Areas are in square miles

BIS=Bissell CWC=Coldwater Creek LOM=Lower Meramec MOR=Missouri River RDP=River Des Peres

*** Municipalities exempt or waived from Phase II requirements

Combined sewer systems, exempt per 10 CSR 20-6.200(1)(C)16.C.

Populations less than 1000 and EPA waiver criteria, waived per 10 CSR 20-6.200(1)(C)24.A.

**** Combined sewer exemption no longer applies, MDNR notified the City on November 8, 2012.

***** Population less than 1000 due to 2010 census, waiver contingent upon MDNR action.

G. Keeping the Community Informed

To keep the community informed of Planning Committee activities and progress being made on developing this Plan, three newsletters entitled the *Cloud Burst* were published by MSD's Division of Environmental Compliance. The newsletter was mailed to municipal officials, the stakeholder group, the MDNR, and provided to other interested parties such as members of the East West Gateway Regional Water Resources Advisory Council. Also, presentations about the third term Plan development process and proposed goals updates were provided at two Regional Water Resources Advisory Council meetings and the 7th annual co-permittee administrator's workshop.

The MSD Strategic Business Plan called for obtaining input and feedback from public stakeholders for the Planning Committee on the third term Plan proposed goals. An MDNR 2011 audit report also recommended involving public stakeholders in developing future goals. A Stakeholder Group was formed in May 2012. Over a series of three meetings, stakeholder comments were presented to the Planning Committee and Planning Committee responses were discussed with the stakeholders providing a two way dialogue. Nearly 30 stakeholder organizations were invited to participate and represented many diverse interests including community associations; census designated places; contractors; designers; developers; environmentalists; industry; local and state agencies; small and large cities; and watershed groups. The meetings were well attended and stakeholders were very engaged. Representatives of the following organizations attended at least one of the three stakeholder group meetings:

- AARP
- American Public Works Association Missouri Chapter
- American Planning Association St. Louis Metro Section
- American Society of Civil Engineers St. Louis Section
- St. Louis Audubon Society
- BMP Maintenance Contractors
- City of Crestwood
- Council of Construction Consumers
- Deer Creek Watershed Alliance
- East West Gateway Council of Governments
- City of Ellisville
- City of Frontenac
- U.S. Green Building Council - Missouri Gateway Chapter
- City of Green Park
- Home Builders Association
- Home Owner Association
- League of Women Voters of St. Louis
- City of Maryland Heights
- Metropolitan St. Louis Sewer District
- Missouri Botanical Garden
- Missouri Department of Conservation
- Levee Districts
- North County Incorporated
- City of Olivette
- Partnership for Tomorrow
- River Des Peres Watershed Coalition
- SITE Improvement Association
- Spanish Lake Community Association
- St. Louis County
- St. Louis Soil and Water Conservation District

A draft Plan was placed on public notice for comments on the MSD web site. All co-permittees were notified of the draft plan and it was also promoted by an MSD blog, St. Louis County Municipal League newsletter, and the East-West Gateway Council of Governments newsletter.

H. Plan Revisions

This Phase II Stormwater Management Plan is written for submittal with the co-permittees' MS4 permit application in December 2012. Regulatory circumstances may change prior to the completion of this five-year Plan in 2018. For example, if the Missouri 303(d) list of impaired streams is revised and TMDLs are approved, additional MS4 permit conditions may become applicable. Likewise, this Plan may need to be revised, however, not to exceed the requirements of the Clean Water Act to implement controls to reduce the discharge of pollutants to the maximum extent practicable.

Also, MDNR may designate additional cities subject to MS4 permitting. The new cities would need to be included in the Plan and a goal timeline established for them to implement the program, if they apply to MDNR as a co-permittee. MSD, as the coordinating authority, would need to consult with the MDNR, and revise the Phase II Stormwater Management Plan accordingly.

CHAPTER 2

Demographics of the St. Louis Area

A. Introduction

St. Louis is a slow growing region. Between 2000 and 2010, the population of the region grew about 4 percent. Neighboring peer regions such as Louisville, Kansas City and Indianapolis grew at more than twice that rate.

Despite the low population and employment growth, the region continues to spread out. Between 1950 and 2010, the urbanized area for the St. Louis region more than quadrupled. By contrast, the population of the 16 county regions grew only 47%.

Within the region, the City of St. Louis and St. Louis County have been losing population. Still, there are some areas of population growth in both the City and County, and in the County there are areas of new development. Some of the most ecologically significant land in St. Louis County lies near areas experiencing new development.

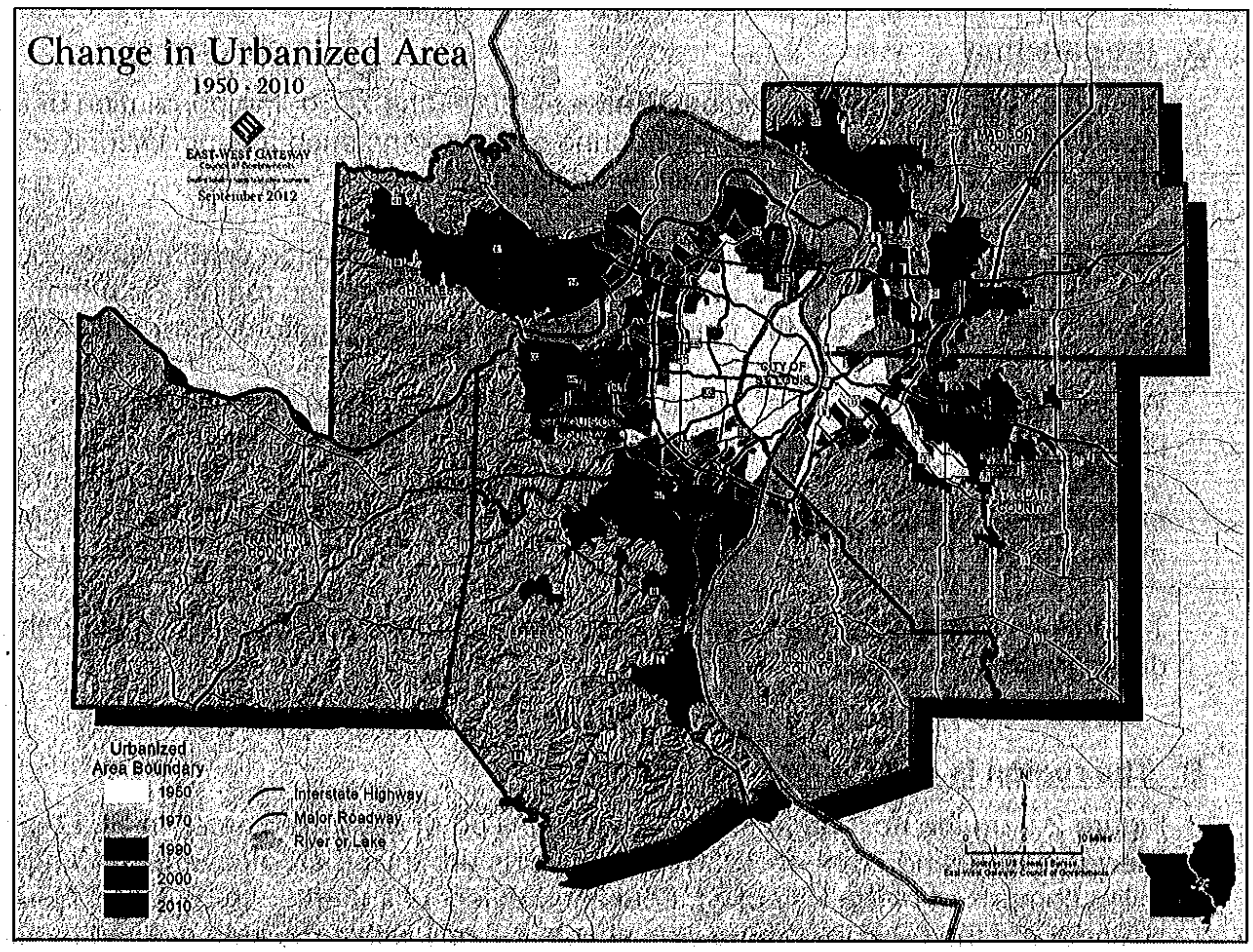
The following maps and tables within this chapter provide additional detail on these demographic trends.

B. The region is getting more dispersed.

Figure 2.1 on the next page shows the expansion of urbanized area[1] in St. Louis region between 1950 and 2010. In 1950, the St. Louis urbanized area covered 240 square miles comprised of the City of St. Louis and adjacent suburbs. In St. Louis County, the boundary of the urbanized area was almost entirely within the loop defined by Lindbergh Boulevard. By 2010, the urbanized area expanded farther west to include Wentzville in St. Charles County, farther south to Festus in Jefferson County, and farther east to O'Fallon/Scott Air Force Base in St. Clair County, encompassing 978 square miles.

[1] Urbanized Area: According to the Census Bureau, an urbanized area is a land area comprising one or more places — central place(s) — and the adjacent densely settled surrounding area — urban fringe — that together have a residential population of at least 50,000 and an overall population density of at least 1,000 people per square mile.

Figure 2.1: Change in urbanized area between 1950 and 2010



C. St. Louis City and St. Louis County have lost population.

Table 2.1 shows population counts from the decennial Census for the years 1950-2010.

The City of St. Louis has been losing population since 1950, although the population loss between 2000 and 2010 was the smallest in the last 60 years. St. Louis County grew rapidly from the 1950s to the 1970s. Population growth leveled off between 1980 and 2000, before declining in the most recent period, 2000 - 2010.

Table 2.1: Population, St. Louis City and St. Louis County, 1950-2010

	1950	1960	1970	1980	1990	2000	2010
St. Louis city	856,796	750,026	622,236	453,085	396,685	348,189	319,294
St. Louis County	406,349	703,532	951,353	973,896	993,529	1,016,315	998,954
Total	1,263,145	1,453,558	1,573,589	1,426,981	1,390,214	1,364,504	1,318,248

Although the number of persons in St. Louis County declined between 2000 and 2010, the number of households increased slightly, a reflection of declining household sizes. Table 2.2 shows the number of households for St. Louis City and St. Louis County for the years 1990-2010:

Table 2.2: Number of Households, St. Louis City and St. Louis County, 1990-2010

	1990	2000	2010
St. Louis City	164,931	147,076	142,057
St. Louis County	380,110	404,312	404,765
Total	545,041	551,388	546,822

D. There are some areas of growth.

Although the population of City of St. Louis and St. Louis County as a whole declined between 2000 and 2010, there were areas within City of St. Louis and St. Louis County where population grew during this period. The map in Figure 2.2 on page 2-5 displays the population changes between 2000 and 2010 in areas within the St. Louis region.

In the City, the central corridor saw strong population growth, from Downtown through the Central West End. Neighborhoods just north and south of Downtown, including Soulard and Old North St. Louis, also saw population increases.

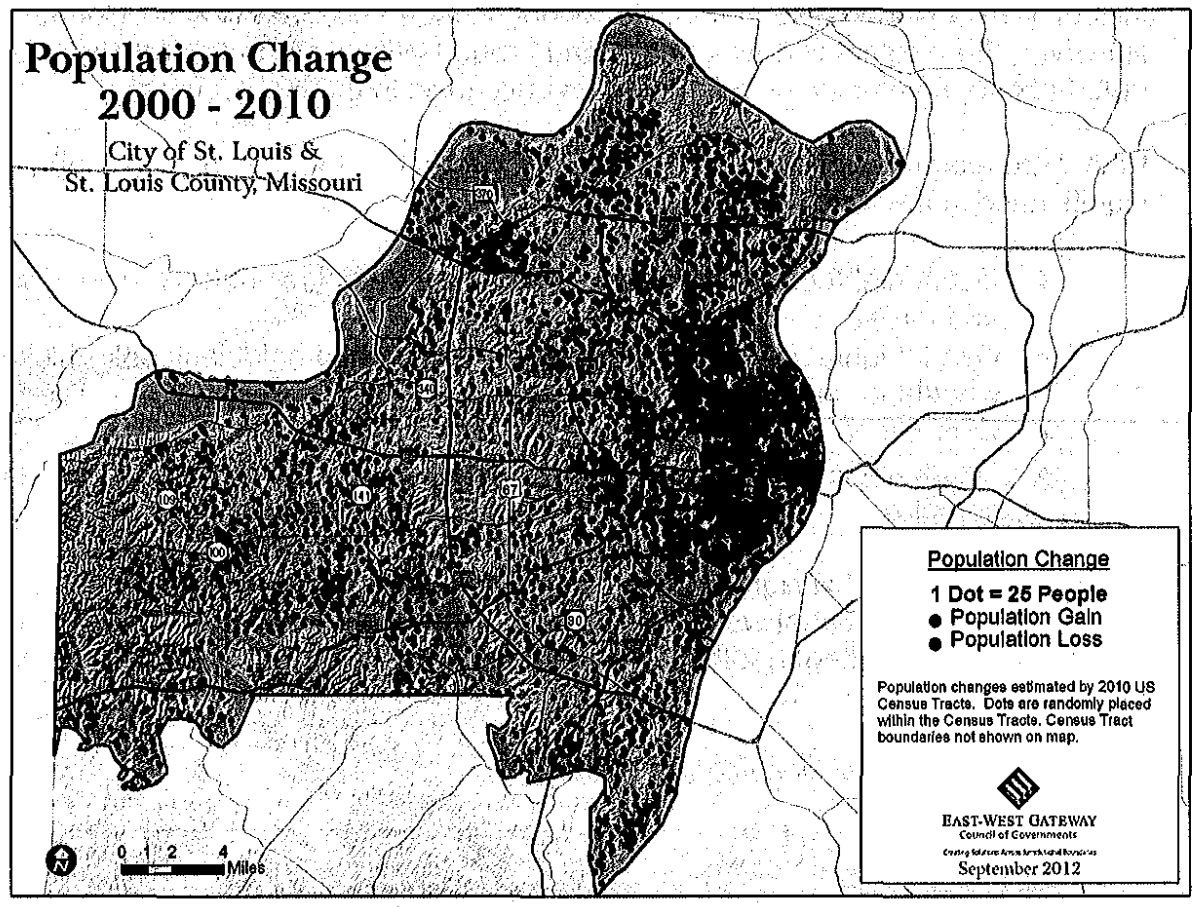
In St. Louis County, there were many pockets of population growth between 2000 and 2010. Table 2.3 on the next page shows 20 municipalities and unincorporated communities that experienced some population growth. Much of the new development in the last 10 years has been in the vicinity of Eureka and Wildwood. However, redevelopment and infill development occurred throughout the county.

Table 2.3: Population Growth, St. Louis County, 2000-2010: Top Twenty Places

Place	2000	2010	Change	Percent Change
Clayton	12,825	15,939	3,114	24.3
Wildwood	32,884	35,517	2,633	8.0
Eureka	7,676	10,189	2,513	32.7
Maryland Heights	25,756	27,472	1,716	6.7
Florissant	50,497	52,158	1,661	3.3
Pacific	5,482	7,002	1,520	27.7
Creve Coeur	16,500	17,833	1,333	8.1
Oakville CDP	35,309	36,143	834	2.4
Chesterfield	46,802	47,484	682	1.5
Valley Park	6,518	6,942	424	6.5
Brentwood	7,693	8,055	362	4.7
Olivette	7,438	7,737	299	4.0
Sappington CDP	7,287	7,580	293	4.0
Sunset Hills	8,267	8,496	229	2.8
Kirkwood city	27,324	27,540	216	0.8
Glasgow Village	5,234	5,429	195	3.7
Glendale	5,767	5,925	158	2.7
Black Jack	6,792	6,929	137	2.0
Cool Valley	1,081	1,196	115	10.6
Lakeshire	1,375	1,432	57	4.1

Note: CDP=Census Designated Place, an unincorporated area recognized by the Census Bureau as a discrete community.

Figure 2.2: Population change between 2000 and 2010



E. Potential new development, St. Louis County.

Much of St. Louis City and St. Louis County is already built out. Thus, new construction in much of the area will take the form of redevelopment or infill development. However, areas in the southwest portion of St. Louis County remain attractive for new development. Some of the potentially developable areas include patches of land with high ecological significance.

The Missouri Resources Assessment Partnership (MORAP) was commissioned by the East-West Gateway Council of Governments to assess the ecological significance of land in the eight county metropolitan planning region. The map in Figure 2.3 on the next page shows the results of this assessment. Red hues in the map indicate areas of relatively low ecological significance, while greens show areas with higher significance; a darker green means greater significance.

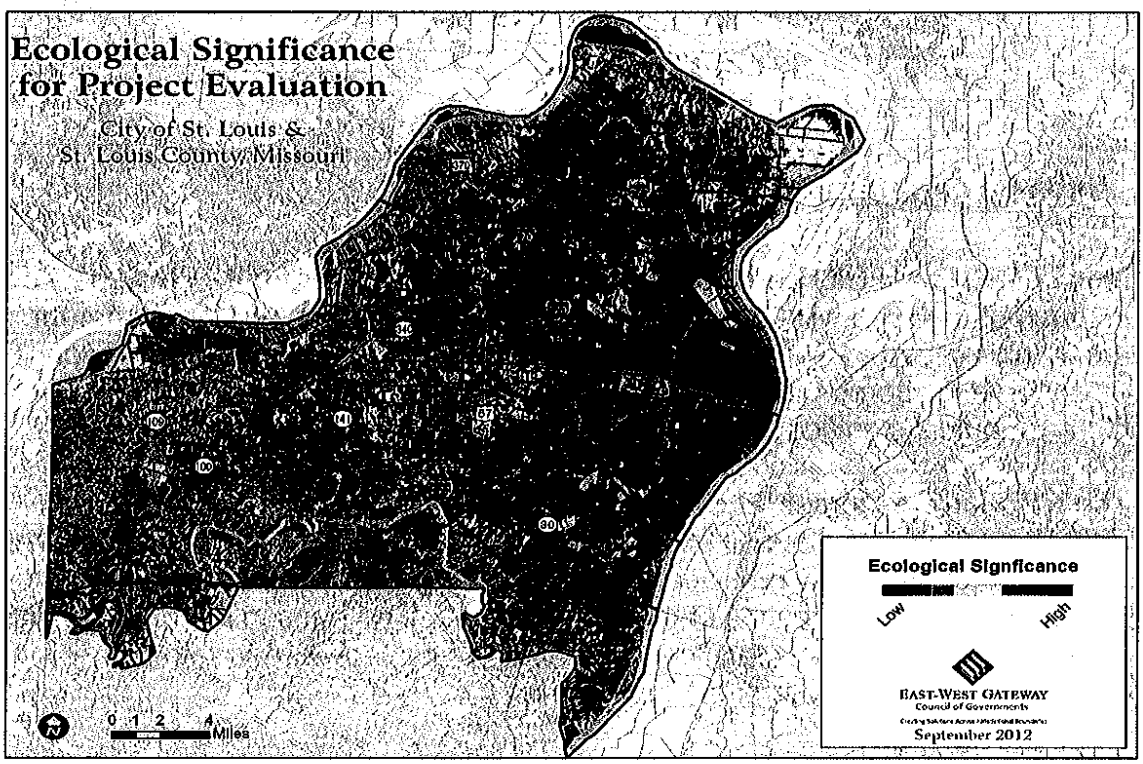
Most of the land in City and County is urbanized, and hence considered to have relatively low ecological significance. The largest patches of highly significant land are in the far southwest portion of St. Louis County. Much of this area is protected land, including Rockwood Reservation, Rockwood Range and Greensfelder County Park. However, there remains developable land around Wildwood and Eureka where, as noted above, some new development has occurred in the last 10 years.

Below are examples of some of the types of vegetation found in areas of high ecological significance in the vicinity of Wildwood:

- Ozark highlands: chert backslope, white oak/black oak - dogwood woodland and forest
- Ozark highlands: loess and til backslope, white oak/black oak - hickory woodland and forest
- Bottomland forest
- Ozark highlands: limestone/dolomite upland glade/chinquapin oak woodland complex

Other patches of highly significant ecological resources lie along the Missouri River, including some significant wetlands. There are several recent examples of floodplain development, indicating that these areas may not be immune from development pressures.

Figure 2.3: Ecological significance of land



CHAPTER 3

Water Quality in St. Louis County Streams

A. Missouri Water Quality Standards

The water quality standards for Missouri waters are set forth in Missouri regulation 10 CSR 20-7.031. This regulation identifies various general categories of waters; establishes classifications and designates beneficial uses for some waters; establishes general water quality standards that must be met for all waters; and establishes specific water quality criteria that must be met for classified waters. The general categories of waters identified in the regulation include:

- Metropolitan No-Discharge
- Outstanding National Resource Waters
- Outstanding State Resource Waters
- Losing Streams
- Classified Streams and Classified Lakes
- Unclassified Streams and Unclassified Lakes
- Groundwater

There is overlap among these categories with some water bodies falling into more than one category. Except for Outstanding National and State Resource Waters, all of these categories are represented within the St. Louis County Plan Area. Unclassified lakes and streams make up the majority of water bodies in the Plan Area. Table 3.1 on page 3-3 lists streams and lakes in the Plan Area and identifies the applicable category and classification information from the Missouri Water Quality Standards.

Sections (3) and (4) of the regulation lists general and specific criteria, which apply to all waters of the state at all times and are included in the permit:

> *The following general water criteria shall be applicable to all waters of the state at all times including mixing zones. No water contaminant, by itself or in combination with other substances, shall prevent the waters of the state from meeting the following conditions:*
>
> - *Waters shall be free from substances in sufficient amounts to cause the formation of putrescent, unsightly or harmful bottom deposits or prevent full maintenance of beneficial uses;*
> - *Waters shall be free from oil, scum and floating debris in sufficient amounts to be unsightly or prevent full maintenance of beneficial uses;*
> - *Waters shall be free from substances in sufficient amounts to cause unsightly color or turbidity, offensive odor or prevent full maintenance of beneficial uses;*
> - *Waters shall be free from substances or conditions in sufficient amounts to result in toxicity to human, animal or aquatic life;*

- *There shall be no significant human health hazard from incidental contact with the water;*
- *There shall be no acute toxicity to livestock or wildlife watering;*
- *Waters shall be free from physical, chemical or hydrologic changes that would impair the natural biological community; and*
- *Waters shall be free from used tires, car bodies, appliances, demolition debris, used vehicles or equipment and solid waste as defined in Missouri's Solid waste Law, section 260.200, RSMo, except as the use of such materials is specifically permitted pursuant to section 260.200-260.247.*

Subsequent sections of this Plan describe how the co-permittees will protect the quality of stormwater runoff within the Plan Area.

Table 3.1 Water Bodies in the St. Louis County Phase II Plan Area

(that are listed in the Missouri Water Quality Standards 10 CSR 20-7.031 as amended 5/31/12)

Water Body[1]	Location	Classification[2]		Designated Beneficial Uses[3]								Metro ND[4]	Losing[5]	MSD Service Area[6]
	From Mouth or Segment	Class	Length	IR	LW	AQ	CF	WB	SC	DW	IN	Length	Length	
Mississippi River	Meramec R. to N. Riverfront Park	P	28.3	X	X	X			X	X	X			6
Meramec River	18,44N,5E	P	22.8		X	X		A	X	X	X			LOM
Meramec River	18,44N,5E to Big R.	P	15.7		X	X	X	A	X	X	X			LOM
Bee Tree Lake	03,42N,06E	L3	10 ac		X	X		B	X					LOM
Mattese Creek	15,43N,6E	P	1.1		X	X		B	X					LOM
Fenton Creek	35,43N,05E	P	0.5		X	X		B						LOM
Grand Glaize Creek	9,44N,5E	C	4.0		X	X		B				All		LOM
Fishpot Creek	13,44N,04E	P	3.5		X	X		B				All		LOM
Fishpot Creek	NW,NE,SW,01,45N,04E to NE,NE,SW,13,44N,04E											All	5.0	LOM
Un-named Tributary	NW,NW,SE,03,44N,04E to NW,NW,NW,13,44N,04E												2.0	LOM
Williams Creek	SUR 880,44N,5E	P	1.0		X	X		B						LOM
Kiefer Creek	15,44N,04E	P	1.2		X	X		A						LOM
Kiefer Creek	NE.NW,NW,04,44N,04E to NW,SE,SE,14,44N,04E												3.0	LOM
Un-named Tributary	SE,NE,NE,05,44N,04E to NW,SW,NE,09,44N,04E												1.0	LOM
Hamilton Creek[7]	SW,SW,SE,10,44N,03E to NE,NW,NW,14,44N,03E												0.5	LOM
Un-named Tributary[7]	SW,NE,NW,12,44N,03E to SE,SE,NE,14,44N,03E												1.0	LOM
Antire Creek	34,44N,4E	P	1.9		X	X		B						LOM
River des Peres	SUR1359,44N,6E	P	2.6		X	X			X					RDP
River des Peres	SUR1359,44N,6E to Sur2037,45N,6E	P	3.7		X	X			X					RDP
Gravois Creek	24,44N,6E	P	2.3		X	X		B				All		RDP
Gravois Creek	24,44N,6E to16,44N,6E	C	6.0		X	X		B				All		RDP
Deer Creek	1930,45N,6E	P	1.6		X	X		A	X					RDP
Black Creek	21,45N,6E	P	1.6		X	X		B	X					RDP
Maline Creek	3125,46N,7E	C	0.5		X	X			X					BIS
Maline Creek	SUR3125,46N,7Eto9,46N,7E	C	0.6		X	X		B	X					BIS
Watkins Creek	Hwy . 270	C	1.4		X	X		B						BIS

1 Water Bodies are arranged in ascending order from the lowest point in the Plan Area. An indented water body is tributary to the one above it. All stream lengths are in miles.

2 Classified Waters Classifications:
L3 = Private and public lakes other than major reservoirs and other than lakes used primarily for water supply.
P = Streams that maintain permanent flow even in drought periods.
C = Streams that may cease flow in dry periods but maintain permanent pools that support aquatic life.

3 Beneficial Uses:
IR = Irrigation; LW = Livestock & wildlife watering; AQ = Protection of warm water aquatic life and human health--fish consumption; CF = Cool water fishery; WB = Whole body contact recreation (A or B); SC = Secondary contact recreation; DW = Drinking water supply; IN = Industrial

4 Metropolitan No-Discharge Streams:
These streams may only receive uncontaminated cooling water, permitted stormwater discharges and wet weather bypasses that do not interfere with beneficial uses. The no-discharge condition applies to the entire watershed of the stream, including all tributaries.

5 Losing Streams: Streams that lose a significant portion of their flow during low-flow conditions via permeable geologic materials into aquifers.

6 Parts of the Mississippi River are included in the BIS, RDP and LOM service areas. Parts of the Missouri River, in the BIS, CWC and MOR.

7 The main stem of Hamilton Creek is outside the Plan Area. However, the upper reach of the losing tributary is within the Plan Area.

8 LOM=Lower Meramec RDP = River Des Peres BIS = Bissell

Table 3.1 Water Bodies in the St. Louis County Phase II Plan Area (continued)
(that are listed in the Missouri Water Quality Standards 10 CSR 20-7.031 as amended 5/31/12)

Water Body[1]	Location	Classification[2]		Designated Beneficial Uses[3]								Metro ND[4]	Losing[5]	MSD Service Area[9]
	Mouth or Start of Segment	Class	Length	IR	LW	AQ	CF	WB	SC	DW	IN	Length	Length	
Missouri River	Gasconade R.	P	104.5	X	X	X		B	X	X	X			6
Sunfish Lake	SUR 3097,I55,1840 47N 07E	L3	27 ac		X	X		B	X					MOR
Coldwater Creek	13,47N,7E	C	6.9		X	X		B			X	All		CWC
Creve Coeur Creek	Below lake 6,45N,5E	P	2.1		X	X		B				All		MOR
Creve Coeur Lake	20,46N,05E	L3	327ac		X	X		B	X			All		MOR
Creve Coeur Creek	Above lake 6,45N,5E	C	3.8		X	X		B						MOR
Fee Fee Creek (new)	Sur 992,46N,5E	P	1.5		X	X		B				All		MOR
Fee Fee Creek (old)	1 Mi. above Hwy. 70	P	1.0		X	X		B				All		MOR
Bonhomme Creek	2031,45N,4E	C	2.5		X	X		B						MOR
Bonhomme Creek [8]	SE,NW,NE,11,44N,03E to SE,SW,NE,02,44N,03E												0.7	MOR
Caulks Creek	NE,SW,NE,06,44N,04E to NE,NE,SW,31,45N,4E												0.5	MOR
Caulks Creek	NW,NW,SW,06,44N,04E to NE,SE,SE,13,45N,3E												3.0	MOR
Un-named Tributary	NW,SW,NW,32,45N,04E to NW,SE,SW,30,45N,04E												1.0	MOR

1 Water Bodies are arranged in ascending order from the lowest point in the Plan Area. An indented water body is tributary to the one above it. All stream lengths are in miles.
2 Classified Waters Classifications:
L3 = Private and public lakes other than major reservoirs and other than lakes used primarily for water supply.
P = Streams that maintain permanent flow even in drought periods.
C = Streams that may cease flow in dry periods but maintain permanent pools that support aquatic life.
3 Beneficial Uses:
IR = Irrigation; LW = Livestock & wildlife watering; AQ = Protection of warm water aquatic life and human health--fish consumption; CF = Cool water fishery; WB = Whole body contact recreation (A or B); SC = Secondary contact recreation; DW = Drinking water supply; IN = Industrial
4 Metropolitan No-Discharge Streams:
These streams may only receive uncontaminated cooling water, permitted stormwater discharges and wet weather bypasses that do not interfere with beneficial uses. The no-discharge condition applies to the entire watershed of the stream, including all tributaries.
5 Losing Streams: Streams that lose a significant portion of their flow during low-flow conditions via permeable geologic materials into aquifers.
6 Parts of the Mississippi River are included in the BIS, RDP and LOM service areas. Parts of the Missouri River, in the BIS, CWC and MOR.
7 The main stem of Hamilton Creek is outside the Plan Area. However, the upper reach of the losing tributary is within the Plan Area.
8 The losing upper reach of Bonhomme Creek is outside the Plan Area. However, parts of the Plan Area drain to this reach.
9 CWC = Coldwater Creek MOR = Missouri River

B. Impaired Waters

Section 303(d) of the federal Clean Water Act requires states to identify water bodies that do not meet water quality standards after applying the existing regulations. For waters on this list (impaired waters), a plan must be developed to fix the problem. Such plans will include a Total Maximum Daily Load (TMDL) calculation of the maximum amount of a pollutant a water body can absorb without being impaired.

At the time this Plan was developed and written, EPA had not approved any TMDLs to address pollutants from the St. Louis MS4. Table 3.2 identifies the water bodies located within the Plan Area on the 2012 303(d) list:

Table 3.2: 2012 303(d) listing

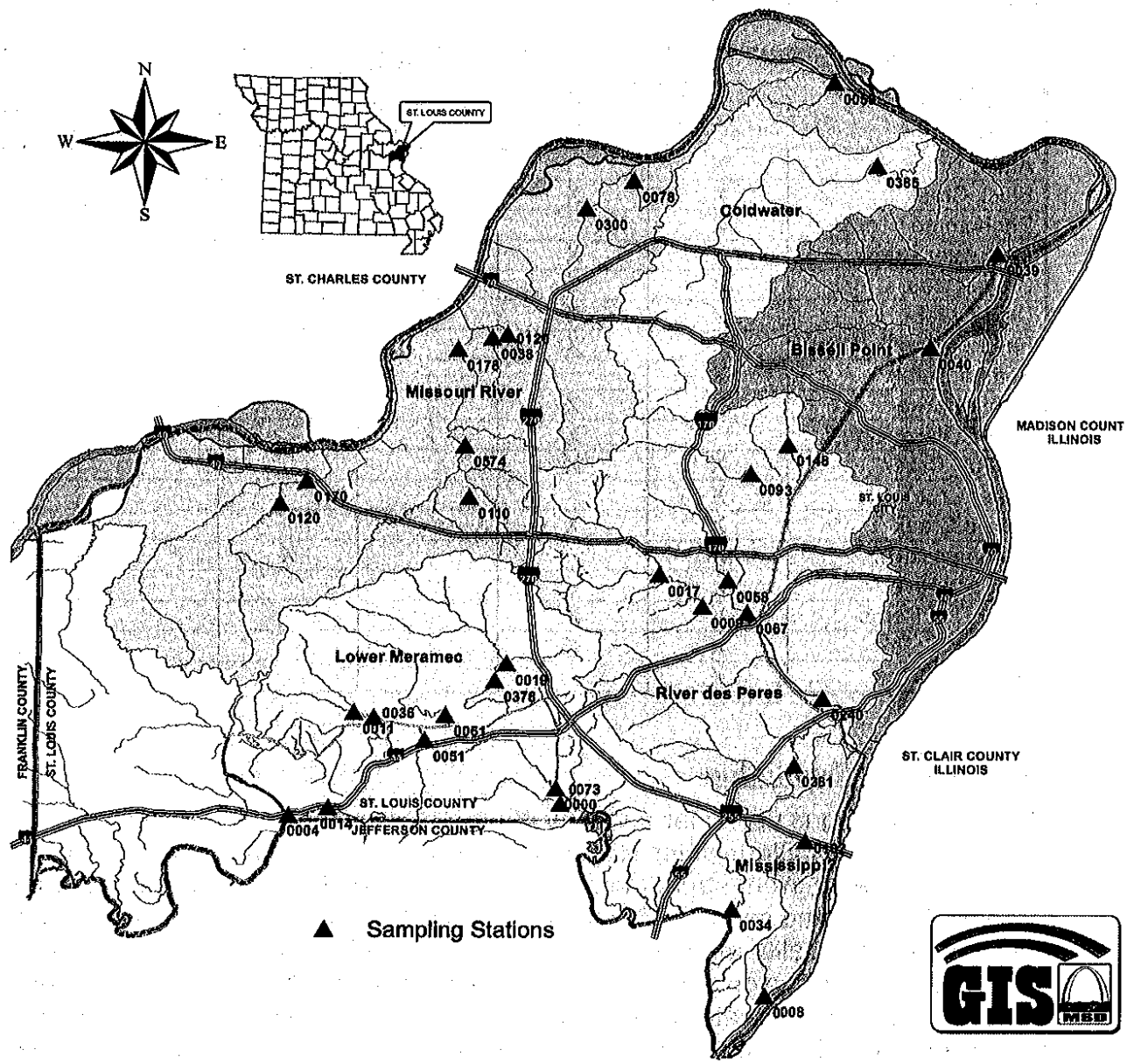
Water Body	Parameter					
	Bacteria (E Coli)	Chloride	Dissolved Oxygen	Lead	Mercury	pH
Antire Creek	X					X
Black Creek	X	X				
Bonhomme Creek	X					X
Coldwater Creek	X	X	X			
Creve Coeur Creek	X	X	X			
Deer Creek	X	X				
Fee Fee Creek (New)	X	X				
Fenton Creek	X					
Fishpot Creek	X	X				
Grand Glaize Creek		X	X		X	
Gravois Creek	X	X				
Kiefer Creek	X	X				
Maline Creek	X	X				X
Meramec River	X			X		
Missouri River	X					
River Des Peres	X	X				
Watkins Creek	X	X				X
Williams Creek	X					X

C. Water Quality Monitoring

Stream monitoring is useful for a variety of purposes, one of which is to evaluate efforts under the Phase II Stormwater Regulations. The analytical data collected on streams and rivers allows current stream conditions to be defined, the development of program practices for reducing sources of pollutants, and measuring water quality improvements. Data from water quality monitoring will be used to understand the streams as a whole and to educate the region's residents about water quality. As monitoring continues into the future, changes in water quality over time will be tracked. The data will show the overall condition of stream water quality so that future plans for the region may be made based on sound scientific information. Stream sampling events are conducted on pre-

scheduled days at monthly intervals. The MSD sampling locations are shown in Figure 3.1. Basic statistics and historical sample data graphs (for the listed impaired streams in the above table) for samples collected from June 2009 through August 2012 are provided in the Water Quality Section at the Appendices. This data is the most representative data available for characterizing these streams due to the consistent monthly sampling methodology used and serve as an indicator of potential water quality issues, and are not intended to duplicate Missouri's 303(d) listing methodology that requires a different statistical analysis. Previous permit term Plans contained sample results that emphasized wet weather conditions to evaluate pollutant levels in stormwater runoff.

Figure 3.1: Sampling locations



D. Identification of Area Stormwater Pollution Problems/Sources

The data resulting from the sampling efforts and MDNR's 303(d) listing process described above were reviewed to identify specific concerns that would need to be addressed in the implementation of the Phase II Stormwater Management Plan. Table 3.3 shows the percentage of the dissolved oxygen, chloride, and bacteria samples collected between June 2009 through August 2012 in small streams that exceeded the values listed in the water quality regulations. Bacteria samples were collected during the recreational season April through October. Table 3.3 is simply an indicator of water quality issues by comparing results with values listed in the regulations and does not attempt to duplicate the detailed methodology and 303(d) listing process conducted by MDNR under the water quality regulations to determine compliance with the Water Quality Standards.

Table 3.3: Samples exceeding water quality limits

Parameter	Sampling Results (June 2009 - August 2012)				
	Total Samples	Exceeds Water Quality Limits			
		Acute		Chronic	
		Number	%	Number	%
Bacteria (E.coli)	133	-	-	91	68%
Chloride	1332	20	2%	132	10%
Dissolved Oxygen	1568	-	-	67	4%
pH	1605	-	-	123	8%

The following limits are listed in the Missouri Water Quality Standards (10 CSR 20-7.031 as amended 05/31/12):
Dissolved Oxygen water quality limit = 5 mg/L
Bacteria (E. coli) whole body contact class B water quality limit = 206/100 mL geometric mean
Chloride water quality limits = 860 mg/L acute and 230 mg/L chronic
pH shall not be outside the range of 6.5 to 9.0

Specific sources contributing to the dissolved oxygen and pH exceedances have not been identified at this time. The pollutants and sources that have been identified are described below.

1. Suspended Solids

The Missouri Water Quality Standards do not contain numerical criterion for suspended solids. However, the general criteria, as enumerate above, require that waters be free from substances that cause unsightly or harmful bottom deposits, unsightly color or turbidity or prevent full maintenance of uses. Suspended solids in excessive amounts can contribute to all of these water quality problems. A particular cause is sediment discharged from land areas disturbed by construction activities including but not limited

to subdivisions, shopping centers, and road projects. Excessive stream velocities influenced by impervious areas can erode stream banks and beds adding to suspended solids.

Base flow total suspended solids (TSS) levels are generally in the single to low double digit figures while storm event (first flush) results range from ten to two-hundred times the base flow levels. The results show considerable variation in TSS levels from storm to storm at the same station. There is no apparent, direct correlation based on stream flows or storm intensity at the time of sampling.

Field observations of streams after storm events have noted deposition of sediments downstream from land disturbance sites. Runoff from the highly developed, and therefore more impervious county areas, coupled with stream channelization in those areas also promotes greater erosion of stream banks, which contributes to elevated solids levels.

Land disturbance site problems have been addressed through enactment of appropriate ordinances in implementing MCM 4 requirements as described in the previous two Plans with adequate enforcement and through increased public education as discussed in other sections of this Plan.

2. Bacteria

Bacteria criteria in Missouri's Water Quality Standards (WQS) are tiered based on two categories of whole body contact recreation (WBCR): 1) WBCR Category A (WBCR-A); and 2) WBCR Category B (WBCR-B). WBCR-A waters were assigned an E. coli criterion of 126/100 mL, and WBCR-B waters were assigned an E. coli criterion of 206/100 mL. The secondary contact recreation (SCR) criterion is 1,134/100 mL. Missouri E. coli criteria are expressed as a recreational season (April 1 to October 31) geometric mean. Although no longer applicable, prior to 2009 Missouri's WQS included a fecal coliform WBCR of 200/100 mL. Most classified stream segments within the MSD Plan Area are designated as WBCR-B.

A 2012 Geosyntec Consultants data trend report prepared for MSD states that in general, bacteria levels peak during late spring/early summer and in early fall; although fall peaks appear much less pronounced in the small streams. This peaking pattern is closely mirrored by precipitation data from the St. Louis Lambert Airport weather station (2004-2010), suggesting small stream bacteria levels are driven by stormwater runoff events. As local precipitation patterns are generally mimicked at the watershed scale, big river peaking patterns also appear to be runoff influenced. Bacteria levels in big rivers also follow flow patterns, which peak during the late spring/early summer based on flow data from USGS stations Missouri River at Hermann and Mississippi River at St. Louis.

EPA's Nationwide Urban Runoff Program (NURP) study found high levels of fecal coliform in urban runoff and concluded that levels can be expected to exceed water quality criteria during and immediately after storm events in many surface waters, even those providing high degrees of dilution. As shown in the previous Plan, fecal coliform levels, at the St. Louis County sampling stations, during periods of stormwater runoff, typically exceed the recreational-use standard by several orders of magnitude. Other studies have reported that primary sources of pathogens in urban stormwater runoff are animal wastes (including pets), failing septic systems, and illicit sewage connections. In recent years, the increasing use of DNA technology to identify specific sources appears to be strengthening the case for animal wastes being a more significant source of fecal coliform than previously thought. A review of the data indicates that a significant source of fecal coliform in the Plan Area streams is animal wastes.

As stated in EPA's BMP guidance information on pet waste collection for municipal operations, "According to recent research, nonhuman waste represents a significant source of bacterial contamination in urban watersheds. Genetic studies by Alderiso et al. (1996) and Trial et al. (1993) both concluded that 95% of fecal coliform found in urban stormwater were of nonhuman origin."

The increasing evidence that wild and domestic animals are significant contributors to high levels of E. coli in stormwater runoff adds to the difficulty of reducing this pollutant in water bodies. E. Coli from wild animals is somewhat beyond local governments' ability to control. On the other hand, BMPs that can be effective in reducing fecal coliform from domesticated animals, particularly household pets, can be instituted. Such BMPs typically include appropriate enforceable ordinances such as those listed in the model Operation and Maintenance program document to comply with MCM 6 and public education as discussed in other sections of this Plan. With regard to reducing E. coli from human sources, MSD is working on a multiple decade, multiple billion dollar capital improvement program to improve the area's sanitary collection system in addition to implementing BMPs to address illicit discharges.

3. Chloride

The Missouri Water Quality Standards currently set a chloride chronic criterion of 230 mg/L for streams and lakes designated for protection of aquatic life. MDNR's analysis of the chloride concentrations for the Missouri 303(d) list provides evidence for concern regarding this nonpoint source pollutant.

Significant contributions of chloride to the water bodies is expected to be from snow and ice removal through the use of salt application on roads, parking lots and driveways. The higher chloride values observed during the winter months supports this conclusion. As in the second term Plan, winter salt application and salt storage BMPs will continue to be implemented under this Plan in Chapters 4 and 9 to increase awareness among co-permittees and the public about this problem.

4. Trash

One of the general criteria in the Missouri Water Quality Standards requires waters to be free from floating debris in sufficient amounts to be unsightly or prevent full maintenance of beneficial uses. Items discarded in or near streams can consist of anything from simple waste paper and plastics to used oil filters and toxic chemicals. Trash discarded in a stream can contribute to violations of any of the general criteria enumerated earlier.

Trash has been identified as a significant problem based on direct observations of streams, roadsides, and other areas including: residential, industrial, and commercial sites. Roadside litter and overflowing trash containers have been observed in many areas of the county. Trash containers at industrial and commercial sites are often either undersized or are not emptied frequently enough. Employees of such establishments, when faced with this situation, typically leave the lids open and stack additional trash well above the sides of the container or simply pile it on the ground next to the full container. Much of this material ends up scattered about the landscape and is eventually blown or washed into nearby streams. It is not uncommon to see debris, from these and other sources, caught up in the branches of stream bank vegetation, carried in storm-swollen streams, or heaped in stream channels after storm-induced flows have subsided. These problems are being addressed through enactment of appropriate ordinances such as those listed in the model Operation and Maintenance program document to comply with MCM 6, with adequate enforcement and through increased public education and involvement as discussed in Chapter 4, 5, and 6 of this Plan.

5. Lead

Within the Phase II Plan Area, the Meramec River is the only water body listed as impaired due to lead. The lead impaired segment is between the Mississippi confluence and Highway 141. The lead source has been identified to be from lead mining tailings and is not addressed as a non-point source pollutant in this Plan.

6. Mercury

The main source of the mercury has been identified as atmospheric deposition. The Grand Glaize Creek mercury listing in table 3.2 is based on the levels of mercury in fish tissue. As a result of the Grand Glaize listing and Missouri fish consumption advisories, mercury is a pollutant of concern under this Plan. It should be noted that Grand Glaize Creek is not unique in exhibiting a mercury problem. Increasing mercury levels have been found in fish statewide and the Missouri Department of Health and Senior Services currently has an advisory against consumption of certain fish from all Missouri waters due to mercury contamination.

Other sources of mercury in the environment result from mercury containing products that are improperly disposed. These products include household hazardous waste and electronic devices, which will be addressed along with the public education and public participation efforts related to trash in Chapters 4 and 5 of this Plan.

CHAPTER 4

Public Education and Outreach (MCM 1)

A. MS4 Permit Requirements

Section 4.2.1.1 of the general MS4 permit requires the permittee to implement a public education program to distribute educational materials to the community or conduct equivalent outreach activities about the impacts of stormwater discharges on water bodies and the steps that the public can take to reduce pollutants in stormwater runoff. The permit requires inclusion of the following elements in this program:

Identification of the target pollutant sources the permittee's public education program is designed to address;

Identification of target audiences for the permittee's education program who are likely to have significant storm water impacts (including commercial, industrial, and institutional entities);

Plans to inform individuals and households about the steps they can take to reduce storm water pollution;

Plans to inform individuals and groups on how to become involved in the SWMP (with activities such as local stream and lake restoration activities);

An outreach strategy, including the mechanisms (e.g., printed brochures, newspapers, media, workshops, etc.) that will be used to reach the target audiences and the number of people this strategy is expected to reach;

Plans to evaluate the success of this minimum control measure.

B. General Pollution Prevention Compliance Activities

MSD will have the overall responsibility for coordinating the public education and outreach efforts described in this Plan. Programs will include, but are not limited to, the distribution of educational materials and promotion of outreach activities. Programs will be implemented throughout the Plan Area to the maximum extent practicable using a variety of approaches, and will consider the various needs of the community.

Depending on the type of pollution contained in stormwater runoff, the impact on natural watercourses can be cumulatively severe. It is readily recognized that runoff pollution is the major cause of water quality problems in most urban watersheds. It must also be recognized that each individual is personally responsible for the pollutants in the runoff from his or her occupied land area. It is obvious that we can never meet our water quality goals for streams and lakes until we convince owners and land users to change behaviors and become better watershed stewards. Ordinary citizens must also be

conscious of their responsibility for proper handling of trash, pet wastes, and other sources of pollution wherever they are located.

The basic implementation approach will be to seek out and form partnerships with municipalities, civic organizations, educational institutions, watershed groups, and businesses to assure the water quality needs of the community are met. Education and information will address general pollution prevention goals plus specific pollution problems identified through previous field investigations as having a significant impact on Plan Area water quality, i.e., trash, animal waste, soil solids, chloride, and mercury. Where possible, the program design will utilize and promote the use of educational materials found to be effective previously or by other metropolitan areas, states, or organizations. Educational materials will offer options and alternatives for prevention and proper disposal of pollutants that could be discharged in stormwater. Emphasis will be given to the economic importance and community benefits of pollution prevention, proper waste disposal, and resource management activities.

C. Compliance Activities using Printed Material

MSD and partners developed, printed, and distributed numerous brochures and other educational materials dealing with various topics, and continues to distribute various brochures, fact sheets and booklets on an ongoing basis using established outlets

D. Compliance Activities using Presentations

MSD presents stormwater quality educational information to grade school classrooms, plus various industry, community groups, and professional workshops. Most of the classroom presentations involve the presentation of a nonpoint source pollution model. Booths at public events are another method MSD uses to present information to the public

E. Compliance Activities using Other Media

The Plans' distribution process will utilize several approaches to reach target audiences. A variety of mechanisms will continue to be used to deliver programs throughout the Plan Area, including websites, fact sheets, newsletters, utility bill inserts, speaking engagements , brochures, school curricula, and seminars.

The MSD web site was completely re-organized during the second term Plan. The new web site is easier to navigate and includes a stronger presence in social media with a calendar of events, an MSD blog, and a presence and links to Twitter, Facebook, and YouTube. MSD's re-organization of its web site has resulted in the water quality information being integrated better within the site overall, and particularly the plan review information and BMP Toolbox for post-construction BMP selection and design information under MCM 5. The National Association of Clean Water Agencies, awarded the BMP Toolbox the 2013 National Environmental Achievement Award for the Public Information and Education Award (E-Media) category.

MSD continues to support the airing of the pollution prevention videos, developed under the first Plan, on Youtube through the MSD web site, such as responsible winter salt usage, kitchen waste grease management, pet waste disposal, and rain barrel installation. Also from previous mass media distribution of messages, MSD has available an impervious surface video, three cartoon videos (on grease, pet waste and salt), and 5 radio spots developed during the second Plan.

The communication committee, implemented in the second term Plan, developed an outdoor rain garden sign template that anyone may use to explain what is a watershed, what is stormwater, what is a rain garden, why plant a rain garden, and why use native plants.

F. Rationale for New Goals

The success of MSD's education outreach efforts during the first and second term Plans has been through the development and distribution of several printed educational materials. The 2012 MSD Stormwater Education Survey identified that brochures is one of the best ways to provide information to residents about water quality. Nearly fifteen (15) active education materials developed since the 2002 Plan are available for distribution. MSD and partners will evaluate each of these publications and update the material as applicable to ensure the material includes the latest BMP strategies and contact information. Brochures will be published in two formats; One based on the MSD standardized format for distribution by MSD and another without the MSD logo for distribution by others. A new brochure to specifically address individual sewage disposal system operation and maintenance responsibilities will be developed under a MCM 3 goal.

During the third term planning process, there was consensus that educating young people about nonpoint source pollution and its influence on water quality can encourage future generations to better understand and appreciate the value of protecting and improving water quality. Although MSD presents stormwater quality educational information to school classrooms, a large number of students are not reached and nonpoint source pollution is not a required curriculum. A work group will be formed to evaluate nonpoint source pollution education in the St. Louis County Plan Area. Work group members will include educators and youth group (i.e., cub scouts and girl scouts) leaders.

The 2012 MSD Stormwater Education Survey stated that the percent of residents who reported they had seen or heard MSD sponsored information about water quality or stormwater pollution increased significantly from 2007. However, there were significant decreases in the percent of residents who reported they had seen co-permittee sponsored information from 2007, as well as an overall decrease in those who reported seeing or hearing water quality information. A 2011 MDNR audit report recommends that co-permittees develop ways to ensure as many residents as possible are aware of the MS4 program. The 2012 MSD Stormwater Education Survey indicated that the Internet has become an increasingly effective way of reaching residents. A review of

the Internet found that nearly all co-permittees have web sites. In response, co-permittees will be asked to develop and maintain a web site, or link to a regional web site, with educational resources on stormwater impacts and ways to improve water quality. As part of the goal, MSD will develop a model template of what to include in the web page.

Another method chosen to increase resident and elected official awareness of the MS4 program in the third term Plan is to develop specific water quality messages for co-permittees. Messages may cover updates on local impaired streams and addressing individual sewage disposal systems. A 2011 MDNR audit report recommends reaching residents using city specific messages. Although MSD will be responsible for developing messages, co-permittees may develop their own messages. Co-permittees will be responsible for distributing messages, such as through mailers or the internet.

Specific goals for each year of the permit are presented as follows:

Annually

MSD will report the number of brochures and other educational materials distributed to improve water quality.

MSD will report the number of presentations on water quality and nonpoint source pollution education.

MSD will maintain its web site with educational materials on stormwater impacts and ways to improve water quality, and will report the number of Phase II web page visits.

MSD will distribute educational materials on a relevant topic throughout the District using bill inserts (distributed to all customers) or cable (distributed to all subscribing households) or other mass media.

Year 1

No new goals planned

Year 2

A work group will be formed to evaluate nonpoint source pollution education in schools. The evaluation will consider past efforts, and may include a survey to determine the number of schools and students reached and how. Findings and recommendations to enhance education efforts will be established.

Year 3

A work group will be formed to review and update the existing inventory of educational materials to improve water quality.

Year 4

MSD will develop specific water quality messages for co-permittees that are particularly relevant to the area.

Year 5

MSD will ask co-permittees to develop and maintain a web site, or link to a regional web site, with educational resources on stormwater impacts and ways to improve water quality.

The specific co-permittee water quality messages developed by MSD in Year 4 will be distributed within the population, or co-permittees may also develop their own messages.

To test the public's knowledge of stormwater issues a questionnaire will be developed and a telephone survey conducted. The information will be used to analyze the impact of MSD's educational activities on making the public more aware of stormwater quality issues and needs. Effective actions will be continued but subject matter may be revised and expanded.

CHAPTER 5

Public Involvement and Participation (MCM 2)

A. MS4 Permit Requirements

Section 4.2.2.1 of the general MS4 permit requires the permittee to implement a public involvement/participation program that complies with State and local public notice requirements, and involve the public in the development and oversight of the Plan, policies and procedures. The permit requires inclusion of the following elements in this program:

> ***Involvement of the public in the development and submittal of the permit application and storm water management program;***
>
> ***Plans to actively involve the public in the development and implementation of the public involvement/participation program;***
>
> ***Identification of the target audiences, including the types of ethnic and economic groups engaged;***
>
> ***Identification of the types of public involvement activities to be included with the following mandatory (where appropriate):***
>
> - ***Citizen representatives on a storm water management panel***
> - ***Public hearings***
> - ***Working with citizen volunteers willing to educate others about the program***
> - ***Volunteer monitoring or stream/beach clean-up activities***

B. Public Involvement in Stormwater Plan Development

As part of the third term Plan development, three public stakeholder meetings were held to obtain input and feedback on all of the proposed goals. Over this series of meetings in June, August and September 2012, stakeholder comments were presented to the Planning Committee and Planning Committee responses were discussed with the stakeholders providing a two way dialogue. Over 30 stakeholder organizations participated and represent many diverse interests including community associations; census defined places; contractors; designers; developers: environmentalists; industry; local and state agencies; small and large cities; and watershed groups. The meetings were well attended and stakeholders were very engaged.

For ongoing public involvement, the Metropolitan St. Louis Sewer District has the overall responsibility for coordination of the public participation and involvement activities described in this Plan. The St. Louis Metropolitan area benefits from a number of different environmental groups, stream teams, and other organizations concerned with various aspects of environmental protection. MSD participates in a number of public environmental initiatives, involving watershed coalitions, partnerships, etc., upon

request. These groups assist in promoting public awareness and serve as volunteers to participate in activities to reduce the impact of stormwater pollution in the Plan Area. As part of managing the stormwater system, MSD utilizes strategic planning initiatives, implements a Community Outreach program and builds relationships with stakeholders. A public Rate Commission is used for addressing MSD's funding needs and making recommendations for the revenue needed.

C. Public Participation Programs

Citizens are encouraged to partner with MSD on a number of programs to educate the community or participate in clean-up projects to remove trash from area streams. The programs include:

Storm Drain Marking Program – This educational program involves working with groups to install four inch diameter plastic markers on storm drain inlets with the message, "No Dumping, Drains to Stream". This is an ongoing communication at the source of discharge informing the public not to use storm drains for dumping waste. Educational outreach extends further when the groups use door hangers, as instructed, explaining the purpose of the markers to the community. In all new construction, MSD's Standard Construction Specifications for drainage facilities requires precast concrete inlet covers to contain the "No Dumping, Drains to Stream" message.

Stream Clean-ups – MSD partners with community groups in being an enabler to help them accomplish a successful stream clean-up effort. Depending on the group involved and the need, MSD has provided: trash disposal, glove and bag supplies, flyer printing, press release, volunteer labor, paid labor, and heavy equipment, such as trucks and tractors.

The MSD sponsored third annual 2011 "Confluence Trash Bash" was selected to receive the 2011 Missouri Attorney General's Justice Award for demonstrating an extraordinary commitment to justice in the Environmental Protection Category.

Nonpoint Source Pollution Education – A network of teachers and community group leaders help MSD educate the public on nonpoint source pollution. The main vehicle used is a nonpoint source pollution model with script provided by MSD.

Household Hazardous Waste Collection – St. Louis County Department of Health is responsible for engaging the public in participating in household hazardous waste & recyclables collection days. St. Louis County is developing a permanent drop-off program for household hazardous waste, evolving the program from periodic one-day events to permanent, fixed drop-off locations. The first permanent site will be located at 291 Hoffmeister, St. Louis on the grounds of MSD's Lemay Wastewater Treatment Plant.

D. Pet Owner Responsibilities

E. coli levels in Plan Area watercourses have been found to be elevated, and animal sources contribute significantly. Groups that include pet owners, pet stores, veterinarians, humane societies, and members of the community were asked to help address pet waste management, and continue ongoing distribution of public educational materials. Communities have addressed pet owner responsibilities in the development of ordinances or other enforcement mechanisms and means to ensure proper pet waste disposal.

E. Rationale for New Goals

A new goal to report on participation activities to promote stormwater management public involvement programs that reduce the volume and/or rate of discharges of stormwater will be implemented. This activity is related a second term Plan goal that was met through MSD rain barrel sales and the ShowMe Raingardens (SMRG) program web site that contains information about the benefits of rain gardens and links to native landscaping, plant lists, and plant retailers. In the third term Plan, MSDs' report will include the number of participation activities, such as the number of SMRG web page views and number of rain barrels sold by MSD, as applicable, to promote public involvement programs. Stakeholders comments during the planning effort demonstrated interest toward tracking the number and location of rain gardens installed. With a number of groups interested in pursuing a database of this nature, partnerships will be pursued.

A new goal will be implemented to accommodate environmental stewardship and recognize co-permittees, business and organizations progressive participation in the MS4 program. This goal would be carried out by a work group to identify and develop a list of incentives and awards (i.e., certifications, yard signs, nursery coupons for native plants), and other ways citizens and organizations can participate in the MS4 program and be recognized. The work group will identify existing awards programs and will consider developing an annual certificate award program that honors corporations, schools, and municipalities that implement nonpoint source pollution control projects. An award program can broaden the visibility of these projects, recognize good work, and gain a variety of advocates for the MS4 program.

MSD will continue to sponsor Plan Area clean-up activities, such as the increasingly popular "trash bash" events. To enhance activities, address solid waste problem areas referenced in MCM 6, and address a 2011 MDNR audit report recommendation to develop new and additional ways to get citizens involved with the MS4 program, MSD and partners will train co-permittees on how to select clean-up sites, help team lead MSD sponsored clean-up events, and how to solicit volunteers. Based on MSD's experience in working with various groups on community and stream clean-up events, public participation activities will be enhanced through an intentional, coordinated clean-up effort attempting to involve all co-permittees in participating in a clean-up event and planning events targeted throughout the Plan Area.

Specific goals for each year of the permit are presented as follows:

Annually

MSD will report on the number of volunteer presentations supported.

MSD will report on the number of storm drain marking projects supported.

MSD will report on the number of volunteer neighborhood and stream clean-ups supported.

St. Louis County will report on the amount of household hazardous waste collected.

MSD will organize with partner organizations one or more annual stream or neighborhood clean-up events to cover the Plan Area. Each co-permittee will participate with a planned event, or participate in their own stream or neighborhood clean-up activity in the community.

Report on public participation activities to promote stormwater management public involvement programs that reduce the volume and/or rate of discharges of stormwater.

Year 1

A work group will be formed to identify and develop a list of incentives and awards (i.e., certifications, yard signs, nursery coupons for native plants), and other ways citizens and organizations can participate in the MS4 program.

Year 2

Distribute a report listing incentives and awards (i.e., certifications, yard signs, nursery coupons for native plants) and other ways citizens and organizations can participate in the MS4 program

Year 3

No new goals planned

Year 4

No new goals planned

Year 5

MSD, supported by citizen volunteers, will publish a report of their activities, including outcomes and recommendations for future volunteer activities.

CHAPTER 6

Illicit Discharge Detection and Elimination (MCM 3)

A. MS4 Permit Requirements

Section 4.2.3.1 of the general MS4 permit requires the permittee to develop, implement and enforce a program to detect and eliminate illicit discharges (as defined in 10 CSR 20-6.200) into the permittee's small MS4.

> *10 CSR 20-6.200(1)(C)7 defines an illicit discharge as "any discharge to a municipal separate storm sewer that is not composed entirely of storm water, except discharges pursuant to a state operating permit, other than storm water discharge permits and discharges from firefighting activities."*

The program must include development and implementation of, at a minimum:

> ***A storm sewer system map showing the locations of all outfalls and the names and location of all waters of the State that receive discharges from those outfalls;***
>
> ***An ordinance or other regulatory mechanism to effectively prohibit non-storm water discharges into the permittee's storm sewer system, with appropriate enforcement procedures and actions;***
>
> ***A plan to detect and address non-storm water discharges, including illegal dumping, to the permittee's system. The plan shall also address on-site sewage disposal systems that flow into the permittee's storm drainage system;***
>
> ***Plans to address the thirteen categories of non-storm water discharges or flows, identified in Section 4.2.3.1.4 of the permit, only if the permittee identifies any of them as significant contributors of pollutants to the permittee's small MS4;***
>
> ***A list, subject to the conditions in Section 4.2.3.1.5 of the permit, of other similar occasional incidental non-storm water discharges that the permittee has determined will not be addressed as illicit discharges; and***
>
> ***Inventory, inspect and have enforcement authority for industries and commercial enterprises within their boundary that may contribute pollutants via storm water to the MS4***

The Planning Committee has not identified any listed category of non-stormwater discharge in Section 4.2.3.1.4 of the permit which significantly contributes pollutants to St. Louis County water bodies. Should any of the listed categories or other similar occasional non-stormwater discharges be found to contribute significant pollutants, action will be initiated to effectively prohibit or control such discharges using existing ordinance provisions and enforcement actions. The Planning Committee does not

believe there is a need to develop a list of allowable incidental non-stormwater discharges at this time. Under the existing program implementation, any incidental non-stormwater discharge that is identified as a potential source of significant pollutants, appropriate local controls or conditions will be placed on such discharges.

B. Identification of Storm System Components

For many years MSD has utilized "facilities maps" which show the location, size, depth, material of construction, and other useful information to identify sanitary sewers, combined sewers, storm sewers and their appurtenances. These maps are used by MSD staff engineers, maintenance personnel, private contractors, and others to "locate and tie into" for collection and transport of wastewater and/or stormwater from commercial, industrial and residential properties.

Originally these facilities maps were sepia drawings that were copied and provided to users in an indexed paper format. All maps have now been digitized and are accessible in the office or field by computer. All MSD collection system maintenance personnel have mobile computers that contain the most up-to-date versions of these maps.

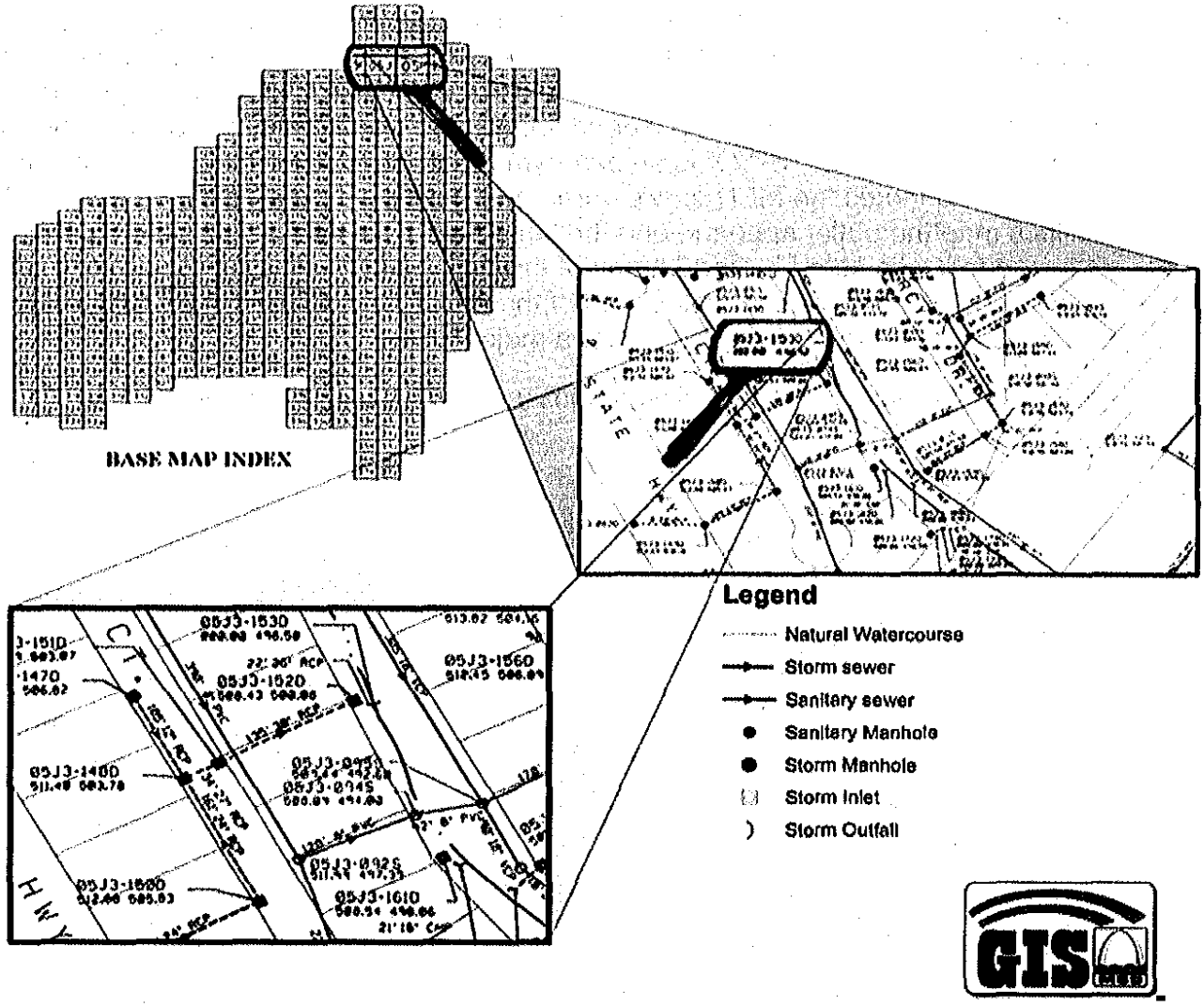
When the second term Plan was produced, MSD used Intergraph Corporation's Microstation GIS (graphical interface system) Environment (MGE) as the mapping software of choice. In 2008, MSD migrated to an Enterprise Geographic Information System based on Environmental Sciences Research Institute's (ESRI) ArcGIS platform that gave MSD the following capabilities:

- Enabled map viewing, inquiry and geoprocessing using browsers to access published web map services removing the need for specialized software on each computer;
- Mobile applications allowing creation and editing of features by field crews. (GPS, Photo capture);
- Tight integration with IBM's Maximo asset management system used by MSD; and
- Spatial analysis using ArcGIS desktop with future analysis available using published Web applications.

The coordinate system used in the ESRI ArcGIS at MSD is NAD 1983 State Plane Missouri East FIPS 2401(Feet).

A schematic diagram depicting the process of locating and identifying sewers and structures is presented in Figure 6.1 along with an abbreviated key of symbols and numbering system utilized for structure identification.

Figure 6.1: Schematic of Sewer and Structure Location Procedure

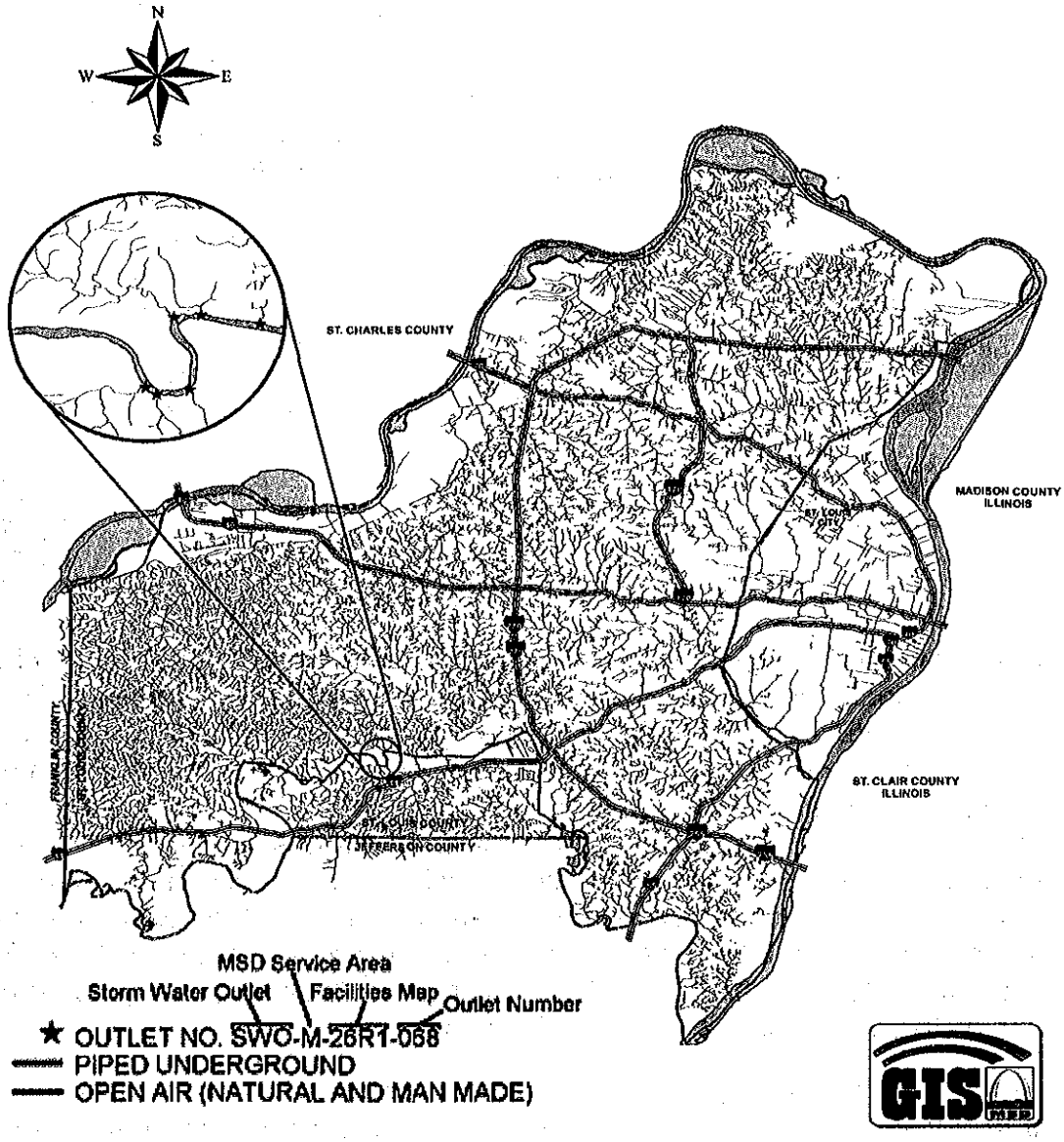


MSD has identified 17,591 storm sewer outfall structures, either owned by MSD or other entities, of various sizes and configurations in St. Louis County. MSD defines these storm sewer outfall structures as the "end of pipe" or the downstream end of every enclosed storm sewer pipe or tunnel structure in the MSD GIS system that discharges to daylight. They may discharge drainage from a single lot or from several city blocks. Designation of these outfalls and other stormwater conveyances for permitting purposes would create a heavy administrative burden with little increase in pollution control. When the number of outfall structures increases from construction in undeveloped areas of St. Louis County, or when changes are made to existing systems, MSD's maps are updated. Because of MSD's GIS mapping capabilities, updating the separate storm sewer system is a continuing and routine task.

The Missouri Small MS4 general permit application Form L requires outlets, along with their receiving waters to be listed. The Form L instructions indicate that these outlets may be the point(s) where stormwater leaves the municipality/area. Since St. Louis

County and its numerous incorporated municipalities were included in a single Plan, it was determined that only the stormwater outlets discharging stormwater into the Mississippi, Missouri, and Meramec Rivers needed to be identified. Figure 6.2 shows the multitude of stormwater outlets which discharge stormwater from the boundaries of the Plan Area. The insert enlargement on the figure focuses on six such outlets denoted by "red stars." The map legend shows how each outlet has an identification number assigned to it. "SWO" is an acronym for "stormwater outlet," the following single letter denotes the MSD service area, the next four characters indicate on which facilities map the outlet appears, and the last three digits denote the outlet number assigned to it. As noted in "red," many of the drainage channels upstream of the outlets have been enclosed. Also, the location of the outlets is typically where a tributary stream leaves the Plan Area and meets a major River.

Figure 6.2: Stormwater Outlets from Land Areas in St. Louis County



MSD has identified 217 stormwater outlets exiting the Phase II Plan Area. These outlets have been identified by designated numbers as explained above, the MSD service area, the municipality where located and the major natural watercourse receiving the discharge. The location of each specific point of discharge has been identified by state coordinates, longitude and latitude and by Township, Range and Section. A complete listing of all identified stormwater outlets from the Phase II Plan Area is presented in the Outlet Appendix.

Since the selected discharge points are natural drainage topography, updating of these outlet's locations and physical configurations will not be a major task. For inclusion in this Plan, the MSD has also prepared maps to visually associate each listed outlet with roadways and receiving streams. These maps are presented in the Outlets Appendix with the first map serving as the Plan Area index for the more detailed outlet maps. Missouri regulations define an "outfall" as a point source, defined by 10 CSR 20-2.010, as the point where a municipal separate storm sewer discharges and does not include open conveyances connecting two (2) municipal separate storm sewers, pipes, tunnels or other conveyances which connect segments of waters of the state and are used to convey waters of the state. The MSD stormwater outlets identified in this Plan do not meet the Missouri definition of an outfall for purposes of legal enforcement. The outlets are identified for administrative purposes to avoid the vanity of identifying tens of thousands of actual MS4 outfalls. Also, the list of outlets does not include any outlets discharging stormwater within the combined sewer system area.

C. Illicit Discharge Enforcement Mechanism

Since the late 1960s, MSD has utilized provisions in its sewer use ordinances to prohibit illicit discharges into the separate storm sewer system. Currently, MSD Ordinance No. 12559 adopted December 13, 2007, is used as the legal enforcement tool to control such discharges. Article IV of this Ordinance, "Control of Pollutant Discharges to Separate Storm Sewers and Watercourses," contains the following statement:

> *"Discharges to the District's separate storm sewers enter waters of the State directly or after conveyance through the District's system and are subject to NPDES permit regulations."*

It is further stated in the ordinance that:

> *"All users shall comply with the provisions of this article to ensure that discharges from the District's separate storm sewers do not violate conditions of any of the District's NPDES permits or of any NPDES permit regulations, including stormwater discharge regulations, or cause any violations of State or Federal water quality standards."*

A specific provision (Article IV, Section One, Paragraph A) requires NPDES permits for discharges to separate storm sewers:

> *"No person shall discharge any wastewater treatment plant effluent, cooling water, unpolluted water or any other water that is not composed entirely of stormwater as defined in Article II into any separate storm sewer or watercourse unless such discharge is authorized by an NPDES permit or is exempt from NPDES permit regulations, is not otherwise prohibited by this Ordinance, and the discharge is in compliance with all provisions of any NPDES permit authorizing the discharge, and does not cause or contribute to a violation of water quality standards or cause or contribute to a violation of any of the District's NPDES permit conditions or constitute a nuisance or hazard to the public."*

Stormwater associated with industrial activity is prohibited unless certain criteria are met as described in Article IV, Section One, Paragraph B:

> *"No person shall discharge or cause to be discharged into any separate storm sewer or watercourse any stormwater associated with industrial activity as defined in 40 CFR 122.26(b)(14) or any stormwater associated with small construction activity as defined in 40 CFR 122.26(b)(15) or any other wastewater discharge subject to NPDES permit regulations unless the discharge is in compliance with all applicable provisions of the NPDES stormwater regulations in 40 CFR 122.26 and any applicable State regulations"*

As noted in Chapter 9, the St. Louis County area has a trash and litter problem that will require greater attention under Phase II Regulations. Provisions are contained in Article IV, Section Two, Paragraph B that can be cited to prohibit trash discharges into area watercourses:

> *"No person shall place or deposit into any outfall, drainage facility, separate storm sewer or watercourse within the District any garbage, trash, yard waste, animal waste, soil, rock or similar material, or any other substance which obstructs flow in the system or damages the system or interferes with the proper operation of the system or which negatively impacts water quality or constitutes a nuisance or a hazard to the public or which causes or contributes to a violation of water quality"*

Appropriate enforcement procedures and actions are contained in the ordinance to deal with violators and to mitigate the effects of illegal discharges. Article IX - Enforcement, lists various enforcement actions that can be initiated against a violator such as:

- Section One - Notification of Violation (verbal and written)
- Section Two - Administrative Orders (to include cease and desist order, compliance order, show cause order and consent order)
- Section Three - Emergency Action (mitigative action taken by MSD)
- Section Four - Legal Action and Penalties (to include injunctive relief, consent decree, and fines and imprisonment)
- Section Five - Liability Due to Violations (violator liable for expenses and damages)
- Section Six - Recovery of Costs (MSD's costs are reimbursable)

Depending on the severity of the violation, the response of the violator, and other incident specific conditions, any and all of these enforcement tools are available to the MSD.

Also available to the MSD is the authority to prohibit or regulate discharges by means presented in Article VI, Section One under the heading "control alternatives." In order to ensure compliance, the MSD may take one or more of the following actions:

1. Prohibit the discharge;
2. Require pretreatment or treatment to a condition acceptable for discharge;
3. Require controls on the quantities and rates of discharge;
4. Require payment to cover added costs of handling and treating;
5. Require the development of compliance schedules;
6. Require the submission of reports necessary to assure compliance;
7. Require discharge permits;
8. Conduct inspections, surveillance and monitoring;
9. Require submission of management plans;
10. Require sampling and analysis of discharges;
11. Terminate service.

MSD has the necessary legal authority already in place to enforce provisions of the Phase II Regulations at the local level in its role as coordinating authority. No additional legal authority is considered necessary. Because of MSD's existing legal authority and experience in enforcing ordinance provisions, enforcement of Phase II regulatory requirements was simply an expansion of normal business activities.

D. Illicit Discharge Detection/Elimination

Within St. Louis County, the MSD has 3,217 miles of separate storm sewers and 17,591 identified outfalls. There are also 1,380 miles of surface streams, which includes open natural and constructed drainage ditches and channels. MSD's program to detect and address illicit discharges to the stormwater system, including illegal

dumping, involves a detection team of two people that will inspect the streams during dry weather conditions. The primary focus is to look for potentially illicit discharges, such as dry weather flows, and evidence of pollution in the stream from illicit discharges. The capability for field screening exists through test kits for parameters such as pH and chlorine, plus sampling containers are carried for collecting samples for laboratory analysis. Illicit discharges are also identified through various engineering studies of the collection system, and illegal connections are reported to MSD's emergency response unit for investigation of responsible parties and to initiate enforcement action.

As potentially illicit discharges are identified, a referral is made to investigate the finding. The referral is made to MSD's pretreatment unit to investigate regulated industrial sources, the MSD emergency response unit to investigate all other discharges, and/or to MDNR for non-compliant discharges from NPDES permitted facilities. As appropriate after source confirmation, illegal discharges are referred to St. Louis County Department of Health regarding solid waste issues and private laterals. The MSD investigation procedure involves sewer map review, identification of possible sources of the pollutant in the area, site inspections of probable facilities, covert sampling activities if needed, and confirmation dye studies. Once the source or sources of the pollutants have been identified, then the ordinance enforcement tools described earlier will be utilized to mitigate the situation.

The team's mission is to identify and document, not only illicit discharges to MSD storm sewer systems, but also illegal dumping and infrastructure needs; such as, sanitary sewer structures exposed by stream erosion. Such visual documentation and corrective actions will help prevent spills of wastewater from sanitary sewers that are structurally threatened. Problems are identified that also impact others, such as stream crossings, erosion, or problems with debris buildup. The information obtained is shared with municipalities and highway departments concerned with bridge protection; with sewer district maintenance personnel concerned with collection system integrity and stream blockages that could cause flooding; with engineering design staff concerned with prioritizing capital projects involving sanitary and storm sewer systems; and others assigned responsibility for erosion control.

The team uses mobile computers that allow them to locate themselves via GPS on a map in the field. This tool is extremely helpful to identify facilities properly since there are no markers or location indicators on structures. Findings are recorded directly into the GIS database as feature attributes.

MSD's inspection schedule will ensure the entire Plan Area's 1,380 miles of streams will be inspected within a 5-year permit period. MSD's stream mileage is calculated from the GIS and includes all open channels, streams, creeks and observable ditches to any depth. The inspection mileage reported annually is tabulated daily, based on inspections looking for outfalls and other concerns identified above. Recording the findings from the inspections involves the use of a mobile computer with a screen map and GPS that records the findings with the GPS coordinates. In the office, the data is

downloaded into MSDs GIS and can be viewed on a map. The MSD Engineering Department, Division of Environmental Compliance administers the stream survey program.

E. Publicizing Hazards Associated With Illicit Discharges

Pollutants from point and nonpoint sources that impact stream water quality are usually conveyed to the stream by stormwater runoff. It must also be recognized that each individual is personally responsible for the pollutants in the runoff from his or her occupied land area. The public education measures of this Plan have addressed this issue from the public's perspective by informing individuals and households on the proper application of lawn fertilizers and pesticides, pet waste control, car washing, waste management, and automotive fluid changing plus others. The educational programs developed for illicit discharge hazards will continue to be promoted with brochures and public service announcements under MCM 1. MSD's web site lists MSD's 24 hour customer service line for reporting illegal discharges, plus other agency contact information for spills, dumping, and other environmental reporting.

Education can also raise awareness of water quality needs and pollution prevention techniques for industry. Through the MSD Industrial Pretreatment Program and associated facility inspections, industrial customers are given brochures explaining the best practices for material handling and storage, fleet maintenance, and general waste control practices. Where discharges are found to violate MSD's ordinance or NPDES permit regulations, the pretreatment enforcement response plan and procedures will be followed. The MSD Division of Environmental Compliance will be responsible for such information dissemination.

F. On-site sewage disposal systems

Individual sewage disposal systems when not properly designed, installed and maintained can impact water quality with elevated E. coli levels. The magnitude of the impairment related to these systems is unknown at this time. In the second term Plan, a Plan Area work group developed a document titled *Addressing Individual Sewage Disposal Systems in the Stormwater Phase II St. Louis County Plan Area-Existing Activities and Recommendations Report*, May 2012. The report addresses activities related to educating the public on septic systems, promoting system maintenance, and providing tools to assist homeowners in maintenance. To address failing individual sewage disposal systems and facilitate better cooperation and understanding, St. Louis County and MSD enforcement roles and responsibilities were defined. The report was distributed to the co-permittees and local sewage system service providers, who were encouraged to consider implementing recommendations in the report.

G. Rationale for New Goals

MSD survey of all the Plan Area stream areas will continue with 1,380 miles of open channel inspection reported during the permit term, averaging 280 miles of streams surveyed per year over 5 years. In response to a 2011 MDNR audit report recommendation, MSD will report IDD and waste finding reports to co-permittees to improve communications in detecting and eliminating illicit discharges. Reports will include stream miles inspected, the findings of the inspections, and the MSD actions taken within the co-permittee boundaries. Although MSD will continue to enforce its sewer use Ordinance to address IDDs, co-permittees will be encouraged to use the findings to enforce their applicable ordinances and codes related to IDDs caused by improper management of land disturbance activities, yard waste, and solid waste, particularly trash and litter. Co-permittees can address waste findings by organizing a clean-up event to meet the MCM 2 clean-up event annual participation goal.

The planning committee agreed to develop and distribute a brochure to address individual sewage disposal systems in response to a recommendation in the *Addressing Individual Sewage Disposal Systems in the Stormwater Phase II St. Louis County Plan Area-Existing Activities and Recommendations Report.* The brochure will be developed by a work group and modeled after the second term East-West Gateway Council of Governments *Homeowner's Guide to Septic System Maintenance* brochure for residents living in the Lower Meramec Watershed. The brochure will describe the elements of an individual sewage disposal system, how it operates, homeowner maintenance responsibilities, signs of a malfunctioning systems, enforcement, and resource information. Distribution of the brochure will be implemented through the assistance of partners and co-permittee by posting it on web sites and as a specific message under MCM 1 goals.

The *Addressing Individual Sewage Disposal Systems in the Stormwater Phase II St. Louis County Plan Area-Existing Activities and Recommendations Report* reveals that the Plan Area lacks a comprehensive inventory of individual sewage disposal system. To assist with developing an inventory for the future, a new goal to identify sources that are tracking individual sewage disposal system data, including, but not limited to installations, repairs, and enforcement actions will be implemented.

Specific goals for each year of the permit are presented as follows:

Annually

Survey 1,380 miles of area streams for illicit discharge over permit term, averaging 280 miles per year over 5 years. MSD will report stream miles inspected, the findings of the inspection, and the actions taken.

MSD will inspect outdoor waste handling areas at restaurants and other facilities as part of the interceptor/grease trap inspections, and report the numbers of inspections and violations.

MSD will distribute illicit stormwater discharges brochure to the industrial customers inspected by the pretreatment unit each year.

MSD will report IDD and waste finding reports to co-permittees to improve communications in detecting and eliminating illicit discharges. Reports will include stream miles inspected, the findings of the inspections, and the MSD actions taken within the co-permittee boundaries.

Year 1

No new goals planned.

Year 2

No new goals planned.

Year 3

MSD in coordination with St. Louis County will develop a brochure to address individual sewage disposal systems. The brochure will describe the elements of an individual sewage disposal system, how it operates, homeowner maintenance responsibilities, signs of a malfunctioning systems, enforcement, and resource information.

Identify sources that are tracking individual sewage disposal system data, including, but not limited to installations, repairs, and enforcement actions will be implemented.

Year 4

MSD, partners, and co-permittees will distribute the brochure to address individual sewage disposal systems. Distribution may include web site posting.

Year 5

No new goals planned.

CHAPTER 7

Construction Site Stormwater Runoff Control (MCM 4)

A. MS4 Permit Requirements

Section 4.2.4.1 of the general MS4 permit requires the permittee to develop, implement and enforce a program to reduce pollutants in stormwater runoff from construction activities that result in a land disturbance of greater than or equal to one acre. Reduction of stormwater discharges from construction activity disturbing less than one acre shall be included in the program if that construction activity is part of a larger common plan of development or sale that would disturb one acre or more. The program must include development and implementation of, at a minimum:

> **An ordinance or other regulatory mechanism to require erosion and sediment controls, as well as sanctions to ensure compliance, to the extent allowable under State or local law;**
>
> ***Requirements for construction site operators to control construction –site waste such as discarded building materials, concrete truck washout, chemicals, litter, and sanitary waste at the construction site that may cause adverse impacts to water quality;***
>
> ***Procedures for site plan review which incorporate consideration of potential water quality impacts;***
>
> ***Procedures for receipt and consideration of information submitted by the public; and***
>
> ***Procedures for site inspection and enforcement of control measures.***

B. Land Disturbance Requirements

Within the Plan Area, construction and land disturbance activities are performed by private entities, as well as by MSD, St. Louis County, and many of the municipal co-permittees. Land disturbance activities conducted by the co-permittees are handled in-house or with the use of a contractor. These activities fall under the land disturbance permitting requirements of the MDNR's Water Protection Program for projects disturbing one acre of more of land.

As a result of the first Phase II permit, each Plan Area co-permittee has amended its existing construction and land disturbance program or developed a new program, which includes adoption of appropriate Phase II compliant policies, procedures, and ordinances to reduce pollutants from construction activities that result in a land disturbance of equal to or greater than 1 acre in size. Activities conducted by private entities are subject to the land disturbance permitting requirements of the co-permittee, depending upon the governmental jurisdiction within which the site is located. In

addition to any local approvals, every construction site operator must also obtain a separate state permit for any land disturbance activities affecting an area of one acre or more. Regardless of the status of local approvals, land disturbance activities on such sites may not commence prior to the issuance of a state land disturbance permit.

C. Land Disturbance Activities

The co-permittees and their areas of responsibility include:

1. Metropolitan St. Louis Sewer District

MSD has primary responsibility and authority to review and approve plans and specifications for sewerage and drainage works within the Plan Area. Any public or private sewerage or drainage works proposed to be constructed, altered or reconstructed by any person or corporation, public or private, within the District boundaries, must be reviewed by MSD. This review incorporates the post-construction stormwater management controls required by MCM 5, as discussed in the next chapter. MSD does not review and approve land disturbance projects, except when the District performs or contracts for its own land disturbance activities.

2. St. Louis County

Two departments within St. Louis County government are involved in the authorization and inspection of construction and land disturbance activities:

Department of Public Works (DPW)

As per Section 4.310 of the St Louis County Charter, effective November 6, 1979, the DPW issues permits and performs inspections of all construction activities on private property within the unincorporated areas of Saint Louis County. In addition, the DPW issues permits and provides inspection services on all county government owned projects and also provides inspection services for grading permits issued by the St. Louis County Department of Highways and Traffic on private property. The DPW also provides, by contract, permitting and inspection services to most of the municipal governments in the county, and to many governments specifically on the land disturbance code. As per Section 1101 of the St. Louis County Revised Code, the DPW serves as the coordinator of major development projects, acting as the central control on permit issuance. The DPW holds issuance of any permit until all other County departments have signed off on the project: Zoning, Highways, and Health. The County also coordinates with MSD to ensure that planning for stormwater management has begun prior to land disturbance.

Department of Highways and Traffic (H&T)

As per Section 1105 of the St Louis County Revised Code, the H&T Department issues permits and performs inspections of all projects in county right-of-ways. The H&T Department also performs land disturbance stormwater pollution prevention plan reviews and issues permits for all projects within the flood plains of the unincorporated area of the county. The H&T Department also issues permits for grading required on

subdivision developments. In addition, the H&T Department also performs or contracts for its own land disturbance activities while performing maintenance, repair, or construction of county roadways.

Two other county government departments own and operate facilities in the Plan Area and may be involved in land disturbance activities:

Aviation Department

The Spirit of St. Louis Airport in Chesterfield is wholly owned by the St. Louis County government. The Airport serves as the landlord for a major industrial park, out-leasing buildings and land to business activities both associated with flight operations at the airport and activities completely independent of flight operations.

Parks Department

This department owns and operates 70 county parks throughout St. Louis County both in the unincorporated areas and in the municipal areas. The Parks Department may perform land disturbance activities within these facilities either with in-house personnel or by contract.

D. MDNR Land Disturbance Permit Requirements

The Missouri Department of Natural Resources has two general land disturbance NPDES permits to cover varying situations throughout the state:

- General permit MO-R100 covers land disturbance activities conducted by a city, county or other governmental jurisdiction.
- General permit MO-RA00000 covers land disturbance activities conducted by any entity.

Each of these general land disturbance permits apply specifically to land disturbance conducted by or under contract by the co-permittees, and contain additional requirements not specifically identified within the MS4 permit requirements. Since some of the co-permittees subject to this Plan currently utilize these general permits and since any co-permittees may utilize them, the additional requirements of these permits are addressed in this Plan. The MDNR conditions contained in the Requirements section of these permits are:

- Site operators must develop Stormwater Pollution Prevention Plans (SWPPP) specific to each site and must amend the plans whenever certain conditions occur. The required contents of a SWPPP and the conditions which would trigger SWPPP amendments are identified in the permit Requirements section;
- Good housekeeping practices shall be maintained to keep waste from entering waters of the state;

- All fueling facilities on site must adhere to applicable federal and state regulations concerning storage (underground and above ground) and dispensers;
- Hazardous wastes that are transported, stored or used on site must be managed according to the provisions of the Missouri Hazardous Waste Laws and Regulations;
- Site operators must designate individuals with overall responsibility for environmental matters;
- Paint, solvents, petroleum products and petroleum waste products and the containers for these materials must be stored according to BMPs and be inspected for leaks and spills weekly;
- Quarterly reporting of the list of active land disturbance sites to MDNR;
- Site operators must inspect outfalls and any structures or BMPs at the site provided to prevent pollution of stormwater or to remove pollutants from stormwater to ensure all BMPs are continually implemented and are effective. Inspections must be scheduled at least weekly and within 48 hours after a rainfall, that causes runoff, has ceased during a normal workday and within 72 hours if the rain event ceases during a non-workday such as a weekend or holiday, and the observed conditions noted in weekly reports. Deficiencies must be corrected within seven days of the report;
- Site operators must post a copy of a public notification sign, as required by MDNR.

E. Plan Area Land Disturbance Programs

As required by the Phase II permit, co-permittees have implemented programs that require erosion and sediment controls for construction site operators. Activities conducted by private entities are subject to these land disturbance permitting requirements of the applicable co-permittee, depending upon the governmental jurisdiction within which the site is located.

1. St. Louis County

St. Louis County adopted a Land Disturbance Code (LDC) in October of 2003 and modified the Administrative provisions of that Code in September of 2005. This was accomplished under County Ordinances 21,578 and 22,468. The technical provisions of the County's LDC are virtually identical to the provisions contained in the Model Ordinance in Appendix A12-1 of the 2002 Plan. St. Louis County enforces the LDC in unincorporated St. Louis County and in many municipalities in the County that have contracted for the enforcement of the LDC.

The LDC separates land disturbances into two basic categories: Major Land Disturbances for land disturbance activities involving 1 acre or more of land or a site involving less than 1 acre as part of a proposed development that will ultimately disturb 1 acre or more; and Ordinary Land Disturbances for land disturbance activity involving less than 1 acre of land. The County currently issues approximately 30 major land

disturbance permits annually for residential developments and approximately 50 major land disturbance permits for commercial developments.

The County's system of enforcement is outlined in the LDC, as it follows the provisions of the Model Ordinance contained in Appendix A12-1 of the 2002 Plan. For Major Land Disturbances, this involves the following primary elements:

- Submission of land disturbance plans and SWPPP for review, approval and permit issuance by the County.
- Assignment of a Special Inspector who is supplied by the permittee and approved by St. Louis County. The Special Inspector is required to inspect the site weekly, after heavy rains and inspect related to complaints. This Inspector is required to report on each inspection to the Department of Public Works. If the Special Inspector finds deficiencies, he is required to call for the deficiencies to be corrected and to reinspect the site to confirm that the deficiencies have been corrected. In the event they are not corrected, the Special Inspector is to request the assistance of the County in causing the deficiencies to be corrected.
- The inspectors in the residential and commercial inspection sections of the County's Code Enforcement Division also inspect Major Land Disturbance sites for compliance with the LDC including BMP's. This is done in conjunction with permits to construct facilities on these sites.
- The residential & commercial inspection sections of the County's Code Enforcement Division also have Senior Site Development Specialists who assist inspectors in these sections in resolving major issues or concerns. These Senior Site Development Specialists also review the reports of the Special Inspectors for discrepancies and other problems and inspects Major Land Disturbance Sites, as necessary to assure that discrepancies are corrected and problems resolved.
- The County also supplements, as necessary, Code Enforcement Division inspections with inspections performed by inspectors from other Departments.

The County Code Enforcement Division maintains records of weekly inspections by Special Inspectors, complaints investigations by Special Inspectors and Code Enforcement Division Inspectors, inspections after heavy rains, escrow release inspections, and formal written violation notices as well as further deficiency correction action.

The St. Louis County LDC contains monetary penalties for not obtaining required permits and for other violations of the Code to include possible imprisonment. The LDC contains provisions that allows the code official to stop the work, when deemed necessary.

2. Municipalities

Each incorporated municipality has the authority and responsibility to perform construction permitting and inspection services as a basic element of the police powers afforded municipal governments in Missouri, and under the 2002 Plan, has implemented a Phase II compliance land disturbance program to regulate construction within their jurisdiction. Some municipalities provide full permitting and inspection services with their own resources. These municipalities have adopted the model procedural guidance manual and ordinance as is or as it deems appropriate to meet its specific community needs. These municipalities have implemented the project reviews, permitting, inspection, complaint response, and other activities needed to implement the Phase II land disturbance program.

A second option many municipalities have taken is to adopt St. Louis County's ordinance and contract with St. Louis County for Code Enforcement. The County contracts for permitting (including plan review and construction authorization documents) and code enforcement, including periodic and critical event inspections. The County contract requires the construction site operator to gain zoning approval from the municipality for a project before a county permit is issued. In addition, the municipality issues its final occupancy permits only after the Department of Public Works has completed all construction inspections. In all cases the ordinance authority and any penalties for non-compliance are the responsibility and authority of the individual municipal governments.

Finally, a third option implemented for those cities that are built out and have little potential for land disturbance over one acre, was passing a resolution of no need, prohibiting land disturbance over one acre, without a Phase II program in place.

3. Other Entities

In addition to the above local entities, the Missouri Department of Transportation also engages in land disturbance activities within the Plan Area. As previously noted, MoDOT's activities, within the Plan Area, will be covered under a separate statewide MS4 permit issued by MDNR to MoDOT, and the applicable stormwater land disturbance permit.

F. Rationale for New Goals

With the continued implementation of Phase II compliant land disturbance programs throughout the Plan Area for all public and private construction projects, goals will continue to focus on ensuring effective implementation of the programs through training and education. St. Louis County will continue to maintain its on-line land disturbance toolbox, developed in the second term, that contain several resources, including inspection checklist templates, links to certification programs and organizations that can help solve erosion and sediment control problems, and information on managing runoff from small sites under St. Louis County Ordinary Permits.

A key element of an effective land disturbance program is the inspection process. To assure the proper functioning of soil erosion and, sedimentation, and stormwater control measures during permitted land disturbance activities and to address a 2011 MDNR audit report recommendation, MSD and St. Louis County will develop and conduct a staged land disturbance inspection training workshop for municipalities.

Specific goals for each year of the permit are presented as follows:

Annually

Municipalities and St. Louis County will report permits issued by name and area disturbed. This information was requested by MDNR for coordination to ensure land disturbance program compliance.

Municipalities and St. Louis County will report the number of formal, written notices of violation and further enforcement actions taken, and the companies they were taken against.

Year 1

MSD and St. Louis County will develop and conduct one staged inspection training workshop for municipalities to improve implementation of their Phase II land disturbance programs.

Year 2

No new goals planned

Year 3

MSD and St. Louis County will provide educational program or training for developers and construction company employees, engineers, contractors, or local inspectors on sediment and erosion control BMPs, and evaluate training effectiveness.

Year 4

No new goals planned

Year 5

No new goals planned

CHAPTER 8

Post-Construction Stormwater Management in New Development and Redevelopment (MCM 5)

A. MS4 Permit Requirements

Section 4.2.5.1 of the general MS4 permit requires the permittee to develop, implement and enforce a program to address stormwater runoff from new development and redevelopment projects that disturb greater than or equal to one acre, including projects less than one acre that are part of a larger common plan of development or sale, that discharge into the permittee's regulated small MS4. The program must ensure that controls are in place that will prevent or minimize water quality impacts by reasonably mimicking pre-construction runoff conditions on all affected new development projects and by effectively utilizing water quality strategies and technologies on all affected redevelopment projects, to the maximum extent practicable. The permit requires that this program include the following:

> ***A strategy to minimize water quality impacts, by reasonably mimicking pre-construction runoff conditions in affected new development and incorporating water quality protection in affected redevelopment projects to the maximum extent practicable, and include a combination of structural and/or non-structural BMPs appropriate for the permittee's community;***
>
> ***Use of an ordinance or other regulatory mechanism to address post-construction runoff from new development and redevelopment projects to the extent allowable under State or local law;***
>
> ***Means to ensure adequate long-term operation and maintenance of BMPs;***
>
> ***Policies and ordinances that provide requirements and standards to direct growth to identified areas, protect sensitive areas such as wetlands and riparian areas, maintain and/or increase open space (including a dedicated funding source for open space acquisition), provide buffers along sensitive water bodies, minimize impervious surfaces, and minimize disturbance of soils and vegetation;***
>
> ***Policies or ordinances that encourage infill development in higher density urban areas and areas with existing storm sewer infrastructure;***
>
> ***Education programs for developers and the public about project designs that minimize water quality impacts; and***
>
> ***Other measures such as minimization of the percentage of impervious area after development, use of measures to minimize directly connected impervious areas, site designs that provide for integration of a variety of infiltration practices, and source control measures often thought of as good housekeeping, preventive maintenance and spill prevention.***

B. Program Intent

The preamble to the Phase II Rule states that the NPDES permit will require the operator or regulator of a regulated MS4 to (1) develop and implement strategies which include a combination of structural and/or non-structural BMPs appropriate for the community, (2) use an ordinance or other regulatory mechanism to address post-construction runoff, (3) ensure that controls are in place that would minimize water quality impacts, and (4) ensure adequate long-term operation and maintenance of BMPs. EPA went on to say that the post-construction BMPs chosen should (1) be appropriate for the local community, (2) minimize water quality impact, and (3) attempt to maintain pre-development runoff conditions.

Additionally, the Missouri Small MS4 General Permit requires the permittee assess site characteristics at the beginning of the construction phase to ensure adequate planning for stormwater program compliance. The permit states that the purpose of this upfront planning effort is "to arrive at designs and practices that provide for the most effective water quality treatment through infiltration, flow rates, and similar site- design opportunities". The intended result of this planning effort is captured well by a slogan EPA developed, "Slow it Down, Spread it out, Soak it in".

A cornerstone of the Phase II regulation is allowing the MS4 to craft a program that meets these requirements, without dictating "how" these requirements will be achieved. The "how" is outlined in the Plan, and detailed through the operating procedures, ordinances, and rules that the MS4 follows. An outline of the efforts the St. Louis County MS4 co-permittees will take to comply with the Missouri Small MS4 General Permit follows.

1. Develop and implement strategies appropriate for the community

All of the natural watercourses within the Plan Area eventually flow into the Meramec, Missouri, or Mississippi Rivers. Many of the natural watercourses within the Plan Area are affected by the intense urbanization characterized by imperviousness exceeding 25%. Most streams within the Plan Area are used as conduits for conveying stormwater flows from impervious area, and as a result, their ability to support a diversity of aquatic life has been compromised. They have experienced and continue to experience widening, down cutting and stream bank erosion. Also, some natural courses flow through or around levee protected areas and have been modified to minimize risk to those areas.

Several streams within the Plan Area are currently listed on the 303(d) list of impaired waters. Pollutants common to most impaired streams in the Plan Area include bacteria and chloride. Stream bank loss, stream habitat degradation, and sedimentation are of concern throughout the Plan Area.

Both structural and non-structural BMPs have a role in effectively addressing stream impairment and water quality. Plan implementation of structural and non-structural BMPs must involve all the MS4 permittees because each has different regulatory authority. St. Louis County and the municipalities have authority for planning and land use, which are crucial to non-structural BMP implementation. MSD has authority for reviewing storm drainage, including structural BMPs such as bioretention and pervious pavement.

2. Use of ordinances or other regulatory mechanism to address post-construction runoff

St. Louis County and Municipalities with Plan Area

St. Louis County and the municipalities within Plan Area also adopt land use and zoning ordinances to establish requirements that are specific to their community and even each development, as required. There are many planning and zoning strategies that can be utilized to encourage growth in areas that can best support the type of growth desired while maintaining overall integrity of the watershed.

Working in cooperation with St. Louis County government and the municipal governments in the County, the MSD has developed and distributed educational materials on planned growth and watershed protection to the co-permittees in the Plan Area. An educational booklet, "*Planning and Zoning Strategies for Water Quality Protection*", March 2006 was disseminated to all co-permittees, engineers and developers to promote water quality protection in planning and zoning regulations.

The Planning and Zoning booklet identifies the following eight land use strategies that can be used to protect water quality:

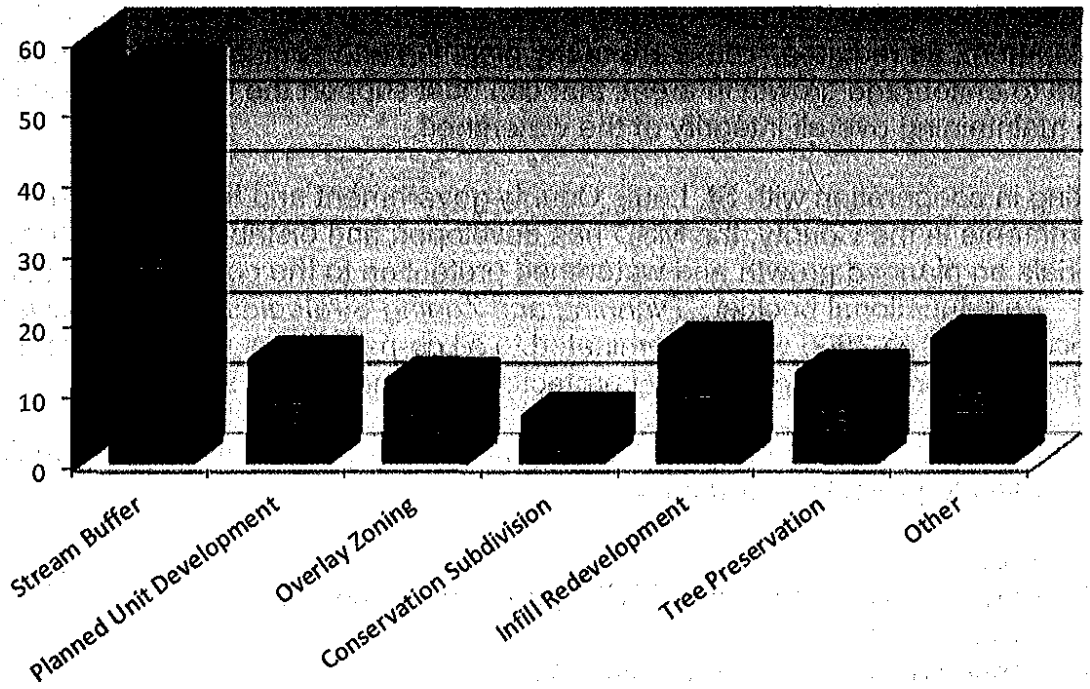
1. Stream buffer,
2. Planned unit development (PUD) performance criteria,
3. Overlay zoning,
4. Conservation subdivision ordinance,
5. Infill redevelopment,
6. Tree preservation,
7. Flood plain protection, and
8. Conservation easement

Of the eight strategies, three clearly meet this goal: planned urban development (PUD) ordinances with water quality based criteria (with standards for stream buffers, open space, and impervious surfaces), overlay zoning requiring better site designs to protect environmentally sensitive areas (like streams, wetlands and flood plains), and stream setbacks with vegetated buffers. Three additional strategies also satisfy the permit requirement: the conservation subdivision ordinance, the infill redevelopment strategy (when the focus and effect protects green space), and the conservation easement strategy (when a dedicated funding source exists and acquired property protects streams, wetlands and flood plain areas).

The tree preservation strategy is not a standalone water quality strategy, but can be a component of a broader strategy focused on protecting natural resources (including urban forests). Also, a flood plain protection strategy that only meets the minimum standards of the National Flood Insurance Program does not satisfy this permit requirement.

All co-permittees have reported adopting at least one land use strategy, and several have adopted two strategies. Nearly all (95 percent) of co-permittees have adopted a stream buffer ordinance. The following chart illustrates the land use strategies being implemented, as of June 2012.

Figure 8.1: Co-permittee reported planning and zoning strategies to protect water quality



To help the St. Louis MS4 ensure that post-construction BMP planning begins early on development projects, the MS4 steering committee developed *Site Design Guidance – Tools for Incorporating Post-Construction Stormwater Quality Protection into Concept Plans and Land Disturbance Permitting, April 17, 2009*. This document presented a process that plan review officials in planning and zoning and public works should use to evaluate whether development plans address MS4 Permit requirements. St. Louis County and the municipalities within the Plan Area must follow the Site Design Guidance document, or an equivalent procedure, to comply with the MS4 permit conditions. MSD assists them with implementing that process, when requested.

Metropolitan St. Louis Sewer District

In the Plan Area, all stormwater facilities and controls on development projects over 1 acre must be reviewed and approved by MSD. MSD requires all such facilities to be provided and designed in accordance with provisions contained in the "Rules and Regulations and Engineering Design Requirements for Sanitary Sewer and Stormwater Drainage Facilities", dated February 2006, as amended. These Rules and Regulations include requirements for BMPs for stormwater control and watershed protection to be incorporated into the project design. These rules and regulations are implemented under the authority of MSD Ordinance 9030, and the Rules and Regulations implementing the Phase II BMPs were adopted by the MSD Board of Trustees in Resolution 2630. Additionally, St. Louis County and each municipality has passed an ordinance or implemented a procedure that requires all applicable development projects comply with Phase II stormwater permit requirements.

The Rules and Regulations include stormwater design criteria for:

- Water quality treatment of the project disturbed area, or equivalent, using the 90th percentile daily rainfall depth or continuous simulation modeling indicating 90% of all annual rainfall is treated by the BMP.
- Reducing runoff volume to pre-construction levels on new development sites. This requirement was specifically added to capture the Phase II permit's requirement to mimic pre-construction runoff conditions and recognizes that runoff volume is an important component of the runoff condition. New development sites include those with less than 20% impervious area and/or where prior land use activities have not impaired the site and utilization of natural processes like infiltration are still possible. A BMP's ability to adequately reduce runoff is assessed based on average annual rainfall or continuous simulation modeling over a typical year. Runoff is defined as water discharged to the MS4 by overflow (bypass) and/or by underdrain piping (e.g., treated water that does not infiltrate).
- Extended detention storage and release of the 1-year 24-hour storm to reduce channel erosion, as appropriate for the site.

MSD applies these water quality design criteria on projects within the Phase II Plan Area that discharge to waters of the state or drainage areas tributary to a stormwater outlet, as indicated in the Outlet Appendix. MSD does not apply water quality requirements on projects tributary to permitted combined sewer overflow outfalls or located within the combined sewer system area.

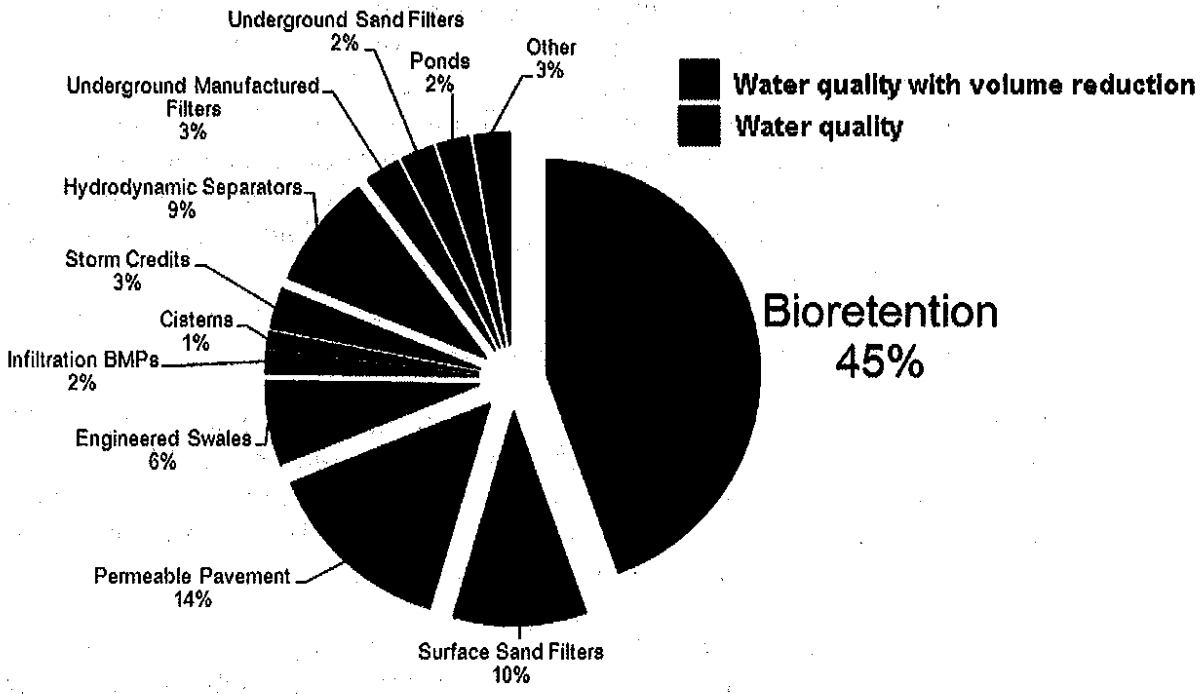
MSD applies the water quality design criteria on projects within the flood control levee districts. Projects located within flood control levee districts may utilize regional water quality plans approved by MSD. These regional plans may adopt a modified 3-pronged approach: at the source, in master channels and in flood storage basin structures, as reviewed and responded to by MDNR in a letter dated May 10, 2011.

MSD will continue to require flood volume detention in the Phase II Plan Area as discussed below, when it believes it is appropriate to do so, although it does not recognize flood volume detention as a water quality strategy.

To be considered an effective BMP for stand-alone treatment of the water quality volume, the BMP shall demonstrate removal of 80% TSS and have an acceptable longevity rate in the field (i.e., be maintainable). MSD maintains an online BMP Toolbox on its website for developers and engineers who submit post-construction BMP plans to MSD and co-permittees. The Toolbox helps navigate a user through the technical and procedural paths to post-construction stormwater BMPs design, installation and maintenance.

Through July 2012, 630 projects representing 1,718 BMPs have been constructed or permitted for construction by MSD. The most frequent of the structural BMPs used is bioretention, representing 45% of the BMPs, followed by permeable pavement representing 14% of the BMPs. In total, over 80% of the BMPs used in site designs utilize a BMP strategy that incorporates a runoff volume reduction benefit in addition to water quality treatment to remove pollutants from runoff. MSD believes this trend is a positive for the region because runoff reduction can help address specific pollutants (e.g., bacteria) as well as channel erosion, and many of these BMPs serve multiple uses (e.g., bioretention that serves as landscaping as well as a BMP).

Figure 8.2: Project BMPs permitted for construction between October 2006 and July 2012



MSD will continue to offer a paid conceptual review service that will evaluate a project's storm water requirements early in the design phase of the project. As needed and as requested by St. Louis County and Plan Area municipalities, MSD also performs unpaid conceptual reviews during the project's zoning and/or concept phase.

MSD will continue to report the number of projects using the paid conceptual review service.

3. Ensuring controls are in place that minimize water quality impacts

MSD, St. Louis County, and the Plan Area municipalities will continue to approve development plans only after ensuring the development meets all applicable requirements. St. Louis County and municipalities enforce ordinances related to land use BMPs in their planning and zoning function. St. Louis County and each municipality has implemented procedures to ensure that all applicable private and public development projects involving stormwater management are reviewed and approved by MSD. MSD enforces sewer and drainage design requirements mandating structural and non-structural post-construction BMPs. MSD will continue to issue permits for and inspect the construction of all structural BMPs.

4. Ensuring adequate long-term operation and maintenance of BMPs

An executed maintenance agreement is required with all projects where BMPs are required to comply with the permit, and where MSD is not performing BMP maintenance. All structural BMPs located on private property (i.e., all parcels that are assigned a locator identification number by the St. Louis County assessor's office) will be maintained by the property owner(s), and MSD will enforce the maintenance through a Maintenance Agreement that is recorded with the property deed. MSD will also require a maintenance agreement be executed for BMPs located within right-of-way and for which MSD is not performing routine maintenance, although these agreements cannot be recorded with the right-of-way property.

MSD maintains responsibility under the Plan to ensure BMPs are maintained and MSD will continue to inspect BMPs to ensure adequate operation. MSD has enforcement authority to ensure owners maintain their post construction BMPs in MSD Ordinance 12559, Article IV, Part C. MSD BMP inspections will be conducted at a minimum of once every three years for each BMP, or an alternate frequency deemed appropriate for the BMP type, and MSD will continue enforcement compliance using MSD Ordinance 12559.

BMP owner education is key to ensuring proper operation and maintenance of BMPs. The third term Plan will address owner education with the goal of gaining acceptance of BMPs in the community, and to explain owners' responsibilities concerning maintenance requirements.

<u>Missouri Department of Transportation</u>

The Missouri Department of Transportation (MODOT) is subject to a MS4 General Operating Permit issued by the Missouri Department of Natural Resources, Water Pollution Control Program. Because MODOT's stormwater discharges are covered under another permit, projects performed by MDOT and its contractors projects will not be subject to the St. Louis County Phase II Stormwater Management Plan.

C. Flood Control

The MSD has been involved with flood control since its inception. The MSD has constructed numerous channel improvement projects to alleviate flooding and erosion, and also constructed many storm sewer projects to alleviate localized street and backyard flooding. These projects are located within the original boundaries of the District where capital improvement projects are supported by ad valorem taxes. Outside the original boundaries, St. Louis County and the municipalities have also constructed channel improvement projects and storm sewer projects. Inadequate culverts and bridges have been replaced by the agencies that are responsible for the road and highway maintenance.

In 2000 the MSD completed a Stormwater System Master Improvement Plan (SSMIP) to provide a comprehensive and coordinated plan for resolving stormwater problems throughout the District. Many flood control projects were identified in the SSMIP, of which a number contained non-structural solutions. Because structural solutions to flooding and erosion problems are often very costly, acquisition of the affected properties is sometimes a more cost-efficient approach. The MSD recently purchased several flood prone houses in the River Des Peres watershed. The SSMIP also identified numerous locations where flood proofing could be a viable alternative to traditional structural flood control methods that may not be suitable or cost effective. The MSD has developed a flood proofing program, and flood proofing is one of the options considered when evaluating stormwater solutions on projects.

The Plan Area has several flood control levee districts along the Missouri River. These include the Monarch – Chesterfield Levee District, the Howard Bend Levee District, Riverport, and the Earth City Levee District.

The local municipalities and St. Louis County have primarily managed floodplain requirements because it is an issue closely related to zoning and land use restrictions. A list of flood prone communities is provided in Table 8.1 from the St. Louis County Flood Insurance Study. These local governments have ordinances that fulfill the minimum requirements of the National Flood Insurance Program administered by FEMA, and some include slightly more restrictive requirements. Most of the municipalities listed are co-permittees and are involved in this Plan. Only ten of the municipalities on this list are exempted from Phase II compliance due to combined sewers or population served.

Floodplain studies are required for new development to insure the new structures are protected from the 100-year flood. MSD requires a floodplain study for any development that is to be in the 100-year floodplain. In addition, a 100-year hydraulic study is required if any watercourse exceeds flows which could be contained in a 60-inch pipe for the 15-year event. MSD Rules and Regulations require the lowest floor of any structure to be at least one foot above the 100-year flood elevation, and the low sill must be two feet above the 100-year flood elevation. Floodplain filling is subject to state or local government restrictions, and thus MSD has no requirements for compensatory storage when development takes place in the floodway fringe. St. Louis County

requires compensatory storage except in the floodplains of the Mississippi, Missouri and Meramec Rivers.

Since the early 1970's, stormwater detention has been required for new development to control flooding of downstream properties. The MSD currently requires stormwater detention for new developments that have a differential runoff of two cubic feet per second or greater between pre- and post-development flow. Detention may also be required when special conditions or problems exist downstream of a new development. The post-developed peak flows are limited so that downstream peak flows and stages are not increased above pre-development conditions for the 2-year and 100-year, 24-hour events.

Table 8.1 Flood-Prone Communities

FLOOD PRONE COMMUNITIES		
Ballwin	Florissant	Olivette
Bella Villa*	Frontenac	Overland
Bellefontaine Neighbors	Grantwood Village*	Pagedale
Bel-Ridge	Green Park	Richmond Heights
Berkeley	Hanley Hills	Riverview
Black Jack, City of	Hazelwood	Rock Hill
Breckenridge Hills	Huntleigh*	Shrewsbury
Brentwood	Jennings	St. Ann
Bridgeton	Kinloch*	St. John
Charlack	Kirkwood	Sunset Hills
Chesterfield	Ladue	Town and Country
Clarkson Valley	Lakeshire	University City**
Clayton	MacKenzie*	Valley Park
Cool Valley	Manchester	Velda Village Hills*
Crestwood	Maplewood*	Webster Groves
Creve Coeur	Maryland Heights	Wellston*
Des Peres	Moline Acres	Westwood*
Ellisville	Northwoods	Wildwood
Fenton	Norwood Court	Winchester
Ferguson	Oakland	St Louis County, Unincorporated Area

* Exempt from Phase II Regulations. See Table 1.1 in Chapter 1 for additional information
** Combined sewer exemption no longer applies, MDNR notified the City on November 8, 2012.

D. Rationale for New Goals

Previous sections of this chapter have dealt with activities carried out by co-permittees in the implementation of the post-construction stormwater program. The goals for this Plan involve ongoing reporting of program measures and significant educational efforts to enhance compliance with these existing programs.

The third term Plan will address several goals related to education, a key element for maintaining an effective post-construction BMP program. In the development community, educational efforts will continue to promote the use of structural and non-structural BMPs and the benefits of stormwater management planning prior to land disturbance. In the third term, MSD will distribute educational material to additional target audiences, including home owner associations, school districts and fire districts. MSD will continue to promote and maintain its on-line post-construction BMP Toolbox that addresses BMP planning, design, and maintenance. To improve the design, selection and performance of BMPs with regard to local water quality impairments (i.e. bacteria and chloride), MSD will review post construction stormwater BMP selection/performance data.

To ensure the proper operation and maintenance of BMPs, education of the public will focus on the responsibilities of homeowners and subdivision trustees and the required maintenance of BMPs. The public understanding of the important role BMPs perform to protect water quality, as well as the expectations of how they perform in managing stormwater, will be key to ensuring the public acceptance of BMPs and ensuring they are well maintained and continue to function properly.

During the second term Plan, a work group reviewed legal impediments to the installation of post-construction BMPs within St. Louis County. Recommendations were assembled in a report titled *Stormwater Best Management Practices Post-Construction Recommendations – Addressing Legal Impediments and Mandated Impervious Areas, February 2011*. This report is a move forward in design innovation and government acceptance of green infrastructure within the Plan Area. It encourages reductions in impervious areas and the use of BMPs in commercial and residential parking areas, in residential streets, and in building site design. The report also provides a model parking ordinance and a model weed ordinance.

In the third term SMWP, MSD will review land use data within the plan area to determine which co-permittees may benefit most from a review of parking ordinances that impact development projects. MSD will discuss findings with the specific co-permittees that appear to benefit most from parking ordinance revisions, and they will be asked to revise their parking ordinances as applicable.

Streets account for a significant portion of the Plan Area environment. In St. Louis, public streets account for over 25% of impervious areas. Many of these streets were constructed without sidewalks, with open drainage, or with street lanes that are narrower than warranted by current traffic load. The MS4 has learned in recent years that implementing post-construction BMPs on these types of projects is challenging. To better address how BMPs can be incorporated into street redevelopment projects, ensure consistent application of design requirements, and address long-term maintenance needs, MSD will coordinate a work group of co-permittees and stakeholders to evaluate parameters and technology. Then intent of the work group is to develop guidance for meeting the "maximum extent practicable" standard for post-construction BMPs within roadway projects where property boundaries are fixed and utilities already exist.

Specific goals for each year of the permit are presented as follows:

Annually

MSD will report the number of post-construction BMPs constructed and approved, and the number of BMPs inspected as part of long term operation and maintenance.

MSD will report the number of developments that are charged for utilizing the conceptual review service.

Year 1

MSD will develop standardized checklists and reporting procedures for post-construction BMP owners to assist in ensuring proper maintenance of the BMPs. Information will be distributed to audiences using the BMP Toolbox website.

MSD will coordinate a work group of co-permittees and consultants to evaluate parameters and technology related to guidance for post-construction BMPs on roadway redevelopment projects within the District.

Year 2

MSD and partners will develop or update educational materials for municipal public works officials, developers, and engineers. The materials will promote the use of non-structural BMPs and the benefits of stormwater management planning prior to land disturbance.

MSD will review land use data and identify the co-permittees that appear to benefit most from review of parking ordinances. MSD will discuss these findings with all co-permittees and develop a list of co-permittees subject to the Year 3 goal to review parking and weed ordinances. Appropriate stakeholders will be included at the Cities' request.

Year 3

MSD will develop educational materials on stormwater BMPs in the community and distribute them to specific audiences. MSD may provide workshops for these specific audiences, as necessary. Examples of specific audiences include homeowner associations, school districts and fire districts.

Municipalities listed under the Year 2 land use data review and St. Louis County will be asked to review the model parking and weed ordinances presented in the *Stormwater Best Management Practices Post-Construction Recommendations – Addressing Legal Impediments and Mandated Impervious Areas, February 2011* report, compare these models to their current ordinances, and consider whether any revision to current ordinances is appropriate. (Only co-permittees that were listed in Year 2 will be required to perform this goal.)

Year 4

MSD will ask the co-permittees listed in Year 2 to consider revising their parking and/or weed ordinances based on the reviews performed in Year 3. Co-permittees will also be asked to report on what actions, if any, they took as a result of the review. (Only co-permittees that were listed in Year 2 will be required to perform this goal.)

Year 5

MSD will review post construction stormwater BMP selection and pollutant removal performance with regard to local water quality impairments, including bacteria and chloride.

CHAPTER 9

Pollution Prevention/Good Housekeeping for Municipal Operations (MCM 6)

A. MS4 Permit Requirements

Section 4.2.6.1 of the general MS4 permit requires the permittee to develop and implement an operations and maintenance program that includes a training component and has the ultimate goal of preventing or reducing pollutant runoff from municipal operations. The program is required to specifically address the following areas:

> ***Maintenance BMPs, maintenance schedules and long term inspection procedures for controls to reduce floatables and other pollutants to the permittee's MS4;***
>
> ***Controls for reducing or eliminating the discharge of pollutants from streets, roads, highways, municipal parking lots, maintenance and storage yards, waste transfer stations, fleet or maintenance shops with outdoor storage areas and salt/sand storage locations and snow disposal areas the permittee operates;***
>
> ***Good housekeeping practices to keep solid waste from entry into waters of the state to the maximum extent practicable;***
>
> ***Adhere to all applicable federal and state regulations concerning underground storage, aboveground storage, and dispensers, including spill prevention, control, and counter measures at all fueling facilities;***
>
> ***Manage RCRA and CERCLA regulated substances according to RCRA and CERCLA regulations when transported, stored, or used for maintenance, cleaning, or repair;***
>
> ***Procedures for the proper storage of all paints, solvents, petroleum products and petroleum waste products (except fuels) so they are not exposed to storm water;***
>
> ***Procedures for the proper disposal of waste removed from the permittee's MS4 and area of jurisdiction, including dredged materials, accumulated sediments, floatables and other debris;***
>
> ***Procedures to ensure that new flood management projects are assessed for incorporation of additional water quality protection devices or practices; and***

Section 4.2.6.1.1 of the general MS4 permit requires the permittee to specifically list all of its municipal operations which are impacted by the above listed requirements.

Section 4.2.6.1.7 of the general MS4 permit requires the permittee, using training materials that are available from EPA, State, or other organizations, to develop employee training to prevent and reduce stormwater pollution from activities such as park and open space maintenance, fleet and building maintenance, new construction and land disturbances and stormwater system maintenance.

B. Stormwater Discharges Associated with Industrial Activity

Section (2)(B)3.F of the Missouri Stormwater Regulations (10 CSR 20-6.200) requires that municipalities obtain separate state NPDES permits for stormwater discharges from certain "industrial" facilities that are municipally owned or operated if the stormwater discharges from those facilities are not already covered under other NPDES permits. Section (1)(B)16 of the regulations provides for a certification of "no exposure" in lieu of a permit if the "industrial" activities are protected from rain, snow, snowmelt and/or runoff and the operator meets certain other requirements.

Section 4.2.6.1.1 of the MS4 permit requires the permittee to include a list of such "industrial" facilities, along with the NPDES stormwater permit number for each facility or a copy of the current NPDES stormwater permit application. The regulations contain an extensive listing of "industrial" facilities subject to this requirement. From that extensive listing, only the following few are typically under municipal ownership and/or operation:

Transportation, including Airports
Landfills
Hazardous Waste Treatment/Storage/Disposal
Vehicle Maintenance Facilities
Vehicle Washing Facilities
Solid Waste Transfer Facilities
Wastewater Treatment Facilities
Recycling Facilities
Yard Waste Compost/Mulch Facilities
Warehousing and Storage Facilities

A separate municipal stormwater permit is only required if stormwater from any of these "industrial" facilities discharges directly to waters of the state and the stormwater discharge is not already covered under another NPDES permit. Each co-permittee will supply the required information for any "industrial" facilities they own or operate as part of their individual MS4 permit applications.

C. Stormwater Conveyance Construction and O&M

The MSD charter authorizes MSD to construct or reconstruct (by contracts or otherwise) any improvements, extensions or additions to provide adequate stormwater drainage. Capital improvements are the structural solutions to alleviate specific drainage problems or to prevent them from occurring in the first place. Typical examples include replacing an undersized culvert to pass greater flows or repairing a channel reach that is suffering from extreme erosion. The MSD presently undertakes a very limited amount of stormwater capital improvement projects that fall into three categories:

- Operation, Maintenance and Construction Improvement (OMCI)
- Replacement/Renewal Projects
- Emergency Projects

1. Operation, Maintenance and Construction Improvement (OMCI) Fund Projects
Certain watersheds in the Plan Area have a specially assessed ad valorem tax used for capital projects that benefit the particular area. These capital improvements are only done in watersheds that requested an OMCI tax. These projects are generally designed and managed by the MSD Engineering Department with private contractors performing the construction. From 2008 to 2010, MSD removed the tax in OMCI areas when it implemented an impervious based stormwater charge meant to cover the maintenance and capital improvement needs of the entire Plan Area. However, when MSD lost the ability to collect this charge under a court ruling, the OMCI tax was reinstated in 2011. See Chapter 11 Section D for additional information about funding stormwater activities.

2. Replacement/Renewal Projects
Over time, drainage infrastructure may become degraded to the point of needing replacement or substantial repair. Typical Replacement/Renewal activities include: routine inlet repair/reconstruction, sewer replacement/rehabilitation, culvert improvements, and improved stream bank repairs. These projects are currently only done within the original boundaries of the District, and they are completed by the MSD Operations Department or private contractors when deemed more appropriate. Various municipalities also have capital improvement programs that include stormwater projects. Some have a sales tax that is dedicated for stormwater improvements.

3. Emergency Projects
The MSD charter explicitly gives MSD maintenance authority over all drainage facilities. Operations and Maintenance (O&M) includes those activities required to run the District stormwater facilities on a daily basis and to keep the drainage system functioning as designed. stormwater O&M includes the following services: operation of flood gate and floodwall pump stations, emergency response to major rainfall or flooding events, inlet cleaning, sewer cleaning, debris removal from culverts and open channels, erosion repair, and complaint response.

4. Detention Basins and Post-construction BMPs
The responsibility for maintenance of detention basins and BMPs is currently placed on the property owner or homeowner associations who have been required by covenant to sign a maintenance agreement.

5. Roadway Culverts
Roadway culverts are currently maintained by the agency or individual responsible for the road. The MSD will provide emergency services to remove significant blockages.

6. Storm Sewers, Inlets, and Catch Basins
Storm sewers within the original boundaries of the District are routinely maintained by the MSD. In the annexed area, the MSD will only provide emergency service, and the routine maintenance is either done by the municipality or is not done at all. The MSD does not maintain Missouri Department of Transportation storm sewers.

7. Improved Channels
The MSD will remove significant obstructions to flow and also undertake measures to assure the structural integrity of the channel sides and bottom. This maintenance includes any fences installed by the MSD that are integral to the improvements.

8. Natural Channels
Natural Channels are not routinely maintained by the MSD, but significant obstructions to flow will be removed. Priority is given to blockages that cause major flooding. The MSD will also undertake emergency control measures when there is a significant threat from flooding or erosion, or to protect its sanitary facilities.

9. Trench Drains, Swales, Roadside Ditches, and Gutters
The MSD does not maintain any of these drainage components. Instead, these items are the responsibility of the property owners or public entity with jurisdiction.

MoDOT has received a statewide MS4 permit, and will be solely responsible for meeting all of the requirements of MCM 6 for its facilities and activities within the Plan Area. These facilities include state and federal roads and highways, including stormwater conveyances located on the right of ways, parking and maintenance facilities for vehicles and equipment, and storage facilities for salt and other materials.

D. Operation and Maintenance Program

The scope of municipal operations varies widely among the 60 entities involved in this Plan. Municipal operations range from very small municipalities, having no municipal facilities other than a few blocks of local streets, to the county government, having responsibility for regional highways, parks, high rise municipal buildings, major construction activities, fleet maintenance operations, airport and all the other various and sundry operations of a major county government. Because of this broad variation in activities, selection of appropriate BMPs to satisfy the permit requirements to the maximum extent practicable will vary considerably among the co-permittees. Training programs will be similarly varied. Each co-permittee has identified and listed their operations that are impacted by the MS4 permit requirements referenced in Section A above and have supplied the required information as part of their MS4 permit application. Implementation of an Operation and Maintenance Program, using the 2005 program model described in the 2007 Plan, has been reported by each co-permittee. Table 9.1 lists a summary of the commonly implemented BMPs applicable to municipal pollution prevention.

Table 9.1 Summary of BMPs Used for Pollution Prevention/Good Housekeeping

BEST MANAGEMENT PRACTICES
Pet Waste Controls
Pooper scooper ordinance
Ordinances addressing pet wastes on owner's property
Provide pet waste signs and stations in public parks, etc.
Vehicle/Equipment Maintenance & Parking
Minimize solvent use
Use safer alternatives & recycled products
Clean up spills promptly & w/minimal use of water
Practice good housekeeping
Properly store & dispose of hazardous wastes
Recycle used oil, antifreeze, batteries, solvents, etc.
Provide & maintain traps for drips from parked equip
Vehicle Washing
Use commercial facilities
On-site, capture, treat & dispose washwater to sanitary sewer
Illegal Dumping Control
Public Education Programs
Ordinance & enforcement against illegal dumping
Install/maintain structural controls for trash at outfalls
Recycling Facilities
Control & properly dispose runoff
Practice good housekeeping
Landscaping & Lawn Care
Employ planning & design using natural property conditions
Utilize soil analyses
Select plants appropriate to the region
Use non-turf plantings wherever possible
Irrigate efficiently
Use mulches & compost effectively
Minimize use of fertilizers, herbicides & pesticides
Pest Control
Employ integrated pest management program for municipal facilities
Perform Street/Parking Lot Cleaning
Road & Bridge Maintenance
Calibrate deicer applicators to prevent over-application
Minimize maintenance activities during wet weather
Capture paint/rust particles during cleaning/painting
Perform Storm Drain System Cleaning
Properly Manage Municipal Swim Pool Backwash/Drainage
Materials Management
Use Alternatives to Toxic Substance
Properly Store Hazardous Substances
Safely Store Road Salt & Other Deicing Materials
Have a Spill Prevention & Control Program
Maintain Regular Material Inventories
Identify hazardous & non-hazardous substances
Properly label all containers
Note materials requiring special handling/storage/disposal
Employee Education/Training
Provide education and training in pollution prevention

1. General Housekeeping and Operation and Maintenance
This is the largest category of municipal operations since it incorporates general practices that can apply to most municipal operations, from custodial activities in municipal offices to operation and maintenance activities in shops, on streets and at satellite facilities. BMPs, under this category include those dealing with materials management and storage, e.g. salt, compost, etc., safe material substitutions, spill plans, establishment of standard O&M procedures, scheduling, community regulation, record keeping and housekeeping practices in general. Under community regulation, model ordinance language to address various solid waste issues such as trash, litter, and pet waste was also included in the model program. Some of the BMPs in this category will apply to every co-permittee.

2. Vehicle/Equipment Repair and Maintenance Operations
In addition to the applicable practices from general category #1, BMPs under this category address such things as preventative maintenance and drainage from fleet parking areas. Many of the small municipal co-permittees do not engage in these operations and will not need to address them within their programs. The BMPs in this category will apply to MSD, St. Louis County and those municipal co-permittees that engage in such activities.

3. Vehicle/Equipment Washing
BMPs under this category address drainage from washing areas and use of commercial facilities. As in category #2, many of the small municipal co-permittees do not engage in these operations and will not need to address them within their programs. The BMPs in this category will apply to MSD, St. Louis County and those municipal co-permittees that have vehicles/equipment that is washed.

4. Facility Repair, Remodeling and Construction
Repair, remodeling, and construction activities at municipal facilities can generate wastes similar to those identified in MCM 4 for construction and land disturbance activities. BMPs under this category address erosion and sediment control, minimization of impervious areas and the applicable general practices from housekeeping and O&M practices. MSD, St. Louis County, and several of the larger municipal co-permittees routinely engage in such activities. Even the smallest co-permittee has the potential to engage in such activity. The BMPs in this category can apply to every co-permittee.

5. Cleaning and Maintenance of Roadways, Highways, Bridges, and Parking Facilities
Each of the co-permittees has some responsibility for roadway maintenance. Only St. Louis County is involved with highway maintenance. The responsibilities of the other co-permittees vary considerably, depending on their size and the extent of their infrastructure. BMPs under this category address such things as pavement cleaning, deicing material storage and use, erosion, and sediment control and capture of pollutants during maintenance work. Some of the BMPs in this category will apply to every co-permittee.

6. Maintenance of Parks, Green Spaces, Trails, and Landscaping
Except for some of the smaller municipalities all of the co-permittees have responsibilities under this category. These responsibilities vary greatly from maintaining only a small green space around a village hall to maintenance of regional parks and public recreation areas. BMPs under this category address such things as good planning and design, integrated pest management, effective irrigation and smart usage of fertilizers, herbicides and pesticides. The BMPs in this category will apply to MSD, St. Louis County and those municipal co-permittees that have such land areas to maintain.

7. Cleaning and Maintenance of Drainage Channels, Storm Sewers, and Inlet Structures.
The MSD has the major responsibility for this activity within the Plan Area. MSD cleaning operations for enclosed conveyances typically involve flushing to a point of collection and use of a vactor truck to remove the materials for proper disposal. Other co-permittees are responsible only for public stormwater conveyances that have not been dedicated to MSD. These include conveyances that do not meet MSD standards for acceptance, conveyances that are contained entirely within a municipal complex or facility area and crossroad culverts under municipal roadways. Such conveyances remain the responsibility of the owner/operator co-permittee. BMPs under this category address such things as proper scheduling and employment of non-polluting cleaning methods. The BMPs in this category will apply primarily to MSD but will also apply to a lesser extent to many of the co-permittees.

8. Operation and Maintenance of Recycling Facilities
Only a small number of the co-permittees currently operate permanent recycling facilities where citizens can drop off recyclable materials such as glass, plastic, paper and similar items. A greater number of co-permittees operate facilities for recycling of landscape wastes (leaves, clippings, tree trimmings, etc.), from municipal operations or collections. These facilities process such materials into mulch and/or compost which is then used for municipal operations as well as made available to the community's citizens. BMPs under this category address such things as proper physical siting to minimize stormwater contact and routing of any runoff to proper disposal. The BMPs in this category will only apply to those co-permittees that operate recycling or composting facilities.

9. Water Quality Impact Assessment of Flood Management Projects
Responsibilities for this activity fall most heavily upon MSD, St. Louis County and those municipal co-permittees bordering the major rivers or located in the lower reaches of major watersheds. However, all co-permittees, even the smaller municipal co-permittees, can be involved in managing localized flooding situations when using their funds for stormwater projects. BMPs under this category address procedures to review new and existing flood management programs/facilities to minimize impacts on water quality. The BMPs in this category will apply, to a greater or lesser extent, to many of the co-permittees.

E. Municipal Employee Training Program

The MS4 permit requires that the operation and maintenance program include a training component. The education and training of municipal employees is necessary to effectively implement this program. The training of municipal employees was employed early in the Phase II process under the first term Plan to accomplish immediate benefits through municipal good housekeeping. MSD continues to provide annual refresher training on BMPs for the operation and maintenance program. Training addresses specific issues as needed. For example, in response to a 2011 MDNR audit statement that salt and mulch storage is a top concern, salt and mulch storage BMPs were a focus at the following municipal operation training events. MSD also makes other information available to co-permittees, including a training DVD and a "Working Together to Manage Stormwater Pollution" brochure available for employees and the public summarizing the BMPs implemented under the program.

Many of the larger co-permittees have developed in-house training geared to their specific needs and activities. Co-permittees are required to keep records and track their training activities to document and ensure that all current employees received initial training applicable to their job responsibilities and that new or re-assigned employees receive training applicable to their new job responsibilities within a specified period of time after employment. Provisions will be included for refresher training or training in new procedures to ensure employee knowledge and skills are maintained and updated.

Materials produced for distribution to the public under MCM 1 are also provided to municipal employees engaged in the types of activities to which those materials apply. Municipal employees are encouraged to actively participate in the public education efforts and public involvement activities discussed under MCM 1 and 2.

F. Trash and Pet Waste

Under the Plan, traditional municipal functions dealing with trash, litter and pet waste were addressed through a specific initial effort, and then included as part of the operation and maintenance program. Co-permittees evaluated their trash and pet waste control ordinances, and the need to modify or pass new ordinances. Model ordinance language was developed and submitted to co-permittees for implementation to address the need. The model ordinance language has also been incorporated into the good housekeeping provisions of the operation and maintenance program model. Those co-permittees that lacked adequate ordinances amended existing ordinances or adopted new ones under the first permit term.

In November 2009, MSD and St. Louis County developed and distributed a guidance document titled *Identifying and Addressing Solid Waste Problem Areas due to Illegal Dumping and Littering* which provides instruction and tools on how to identify problem areas due to reoccurring illegal dumping, clean-up efforts, and how to prevent sites that have been cleaned-up to returning back to problems areas.

To further address pet waste, the Plan requires co-permittees to post pet waste signs in parks.

G. De-icing Operations

To address chloride levels in streams due to winter salt usage as a priority pollutant, the Plan focuses on winter salt usage and storage BMPs. In the second term Plan, numerous activities to address chloride were implemented. A work group was formed in 2008 and developed the salt usage report forms that co-permittees use to collect and report salt usage data. In 2009, MSD and the City of West Des Moines Publics Works staff hosted a Winter Maintenance Salt Usage workshop for the co-permittees. During the 2011 MSD BMP municipal operation training session, an expert spoke on the benefits of using fabric structure systems for salt storage. In 2011, all co-permittees were mailed a brochure about the benefits of using fabric structure systems for salt storage. Through the 2010 – 2012 winter seasons, local area radio stations played 60 second public service announcements on sensible winter salt usage. A short video about sensible salt application is available on the MSD web site. In June, 2012, using the salt usage data reported by the co-permittees, MSD and St. Louis County developed and distributed a report titled *Winter De-icing in the Stormwater Phase II St. Louis County Plan Area - Salt Usage Evaluation and Best Management Practices*. The report encouraged co-permittees to implement BMPs by municipalities that have accurately reported the lowest salt usage application rate (pounds of salt used per lane mile). The BMPs practiced by municipalities were found to be recommended by professional groups, including the Federal Highway Administration, The Salt Institute, American Public Works Association, and The National Cooperative Highway Research Program. The salt usage section of the report concluded that co-permittees salt usage application rates are decreasing. To address a 2011 MDNR audit comment that salt storage is a number one priority, the salt report also provided salt storage BMPs.

H. Rationale for New Goals

As described earlier, all co-permittees have reported achieving an operation and maintenance program under the first term Plan goal by implementing applicable elements of the February 2005 dated *Operation and Maintenance Program* model template for co-permittees. To support co-permittees on maintaining their programs, MSD will ask co-permittees to review and update their operation and maintenance programs, as needed. MSD will first organize a work group to update the *Operation and Maintenance Program* model template based on more recent guidance material published on how municipal pollution prevention/good housekeeping practices can be used to address water quality issues. This update will also address a 2011 MDNR audit report recommendation and provide additional information on ways to improve stormwater quality on municipal property using green infrastructure and low impact development. Part of the work group efforts will be to develop a staged inspection training workshop to assist co-permittees to meet the Permit's long term inspection requirement in Section 4.2.6.1.2. The program will use the municipal facility inspection checklist developed and distributed to co-permittees in the second term Plan. This

checklist will also be added to the *Operation and Maintenance Program* model template update.

Trash and litter in our communities and the stormwater system is still a priority pollutant under this plan. During the second term Plan, a municipal work group developed a guidance document titled *Identifying and addressing Solid Waste Problem Areas due to Illegal Dumping and Littering* that included a menu of approaches to address problem areas for illegal solid waste disposal. Clean-up days are addressed in this guidance as a successful approach in ridding communities of trash and litter. MSD, St. Louis County, municipalities and the Missouri Stream Team program have provided Plan Area communities assistance (i.e., providing trash dumpsters, gloves, bags, and tools) with clean-up efforts. To promote continue successful clean-up activities and also assist co-permittees to meet the goal of participating in an annual clean-up event in MCM 2, MSD and St. Louis County will update the Problem Area guidance document to include a checklist on how to host a clean-up event. A new goal to promote the updated guidance document and train co-permittees on the checklist will be implemented.

St. Louis County and municipalities began tracking and reporting winter salt usage in the first year of the second term Plan to address elevated chloride levels in the Plan Area Streams. Forms were developed to track and report snow and ice removal methodologies from roadways: such as product (i.e., salt) usage per lane mile, the application equipment and method used, and the application rate(s) selected and the selection methodology used. During the second term Plan, reported data was evaluated and revealed decreasing application rates and a decreasing trend in chloride levels in streams. Addressing winter salt usage in the third term will continue to be tracked and reported along with goals to evaluate and update BMP training and perform a data evaluation report. The US EPA recognizes winter salt application tracking and reporting as an ideal MCM 6 goal on their web site.

In the February 2005 dated *Operation and Maintenance Program* model template, Chapter 5 recommends municipalities consider designing municipal facilities for "Low Impact Development" to reduce the volume and rate of stormwater runoff from impervious areas to improve water quality. Examples of such projects could be a porous sidewalk or rain garden. MSD and partners have also provided numerous training opportunities promoting low impact development and green infrastructure since the operation and maintenance model was implemented. The Missouri Department of Natural Resources recently published and promoted the *Missouri Guide to Green Infrastructure*, that provides municipalities green infrastructure implementation guidance and sustainable benefits of green infrastructure. In response to these efforts, MSD will survey the number of co-permittees that have implemented BMP projects at their municipal facilities that reduce the volume and rate of stormwater runoff. MSD will share the survey information and provide resource information, such as funding sources, with the co-permittees.

In the second term Plan, MSD and partners distributed short educational information and case studies on pollution prevention and stormwater runoff reduction BMPs to the

co-permittees. As the number of both structural and non-structural BMPs in the area grow, sharing BMP design considerations, costs, lessons learned and maintenance information is key. Therefore, MSD will continue to distribute BMP educational and case study information.

Pet waste is one of many bacteria pollutant sources in stormwater run-off. Residents and municipalities are both responsible for ensuring that pet owners pick up after their pets and properly dispose of the waste. Pet owners must pick-up their pet waste and Municipalities must enforce pet waste ordinances. Co-permittees have implemented a variety of BMPs to address pet waste in the Plan Area since the first term Plan; Brochures and pet waste ordinances were addressed in the first term Plan and pet waste signs and radio public service announcements were addressed in the second term Plan. The *2012 MSD Stormwater Education Survey* reveals a 7% increase in dog ownership and 2% decrease in picking up after dog waste on walks since the 2007 survey. To continue addressing pet waste, the Planning Committee agreed to specifically address pet waste stations as a goal. A pet waste station is a recommended BMP in the February 2005 dated *Operation and Maintenance Program* model template, Chapter 7. Other MS4s throughout the country address pet waste stations as a BMP and the US EPA recognizes identifying the number of pet waste stations as a worthy MS4 Phase II program measurable goal. MSD will implement a new goal to survey municipality and St. Louis County parks with pet waste stations and distribute pet waste station BMP resource information.

Specific goals for each year of the permit are presented as follows

Annually

MSD and partners will identify and develop educational information or a case study, and distribute to co-permittees to encourage implementation of BMPs.

Training in BMPs will continue as refresher seminars and workshops, and as BMP introduction for new employees as co-permittees implement their ongoing employee training programs. MSD will provide BMP refresher workshops for the co-permittees.

Co-permittees will report on the number of employees trained.

Co-permittees will inspect their facilities to ensure implementation of BMPs and report the number of inspections annually. Inspection findings will be incorporated into the co-permittee's program review and employee training program.

Municipalities and St. Louis County will report salt usage per lane mile (as actual or estimated), the application equipment and method used, and application rate(s) selected and the selection methodology used in snow and ice removal from roadways. Municipalities and St. Louis County will report the number of winter storms in each season, the total salt usage in tons, and the total lane miles of roadway maintained.

Year 1

MSD and St. Louis County will update the November 2009 guidance document titled *Identifying and addressing Solid Waste Problem Areas due to Illegal Dumping and Littering* to include a checklist on how to host a clean-up event.

Year 2

A municipal work group will be organized to update the February 2005 dated *Operation and Maintenance Program* model template for co-permittees.

MSD will take the lead, and invite St. Louis County and partners, such as Missouri Stream Team, to hold one training workshop for co-permittees on how to host a clean-up event.

Year 3

MSD will distribute the revised Operation and Maintenance Program model template and ask co-permittees to review and consider the need to update their operation and maintenance programs.

MSD will survey the number of co-permittee BMP projects that reduce the volume and rate of stormwater runoff implemented at municipal-owned facilities. The survey will include both BMPs required under MCM 5 and voluntary type BMPs.

A work group will be formed to evaluate, and update as applicable, the guidance for municipalities tracking snow and ice removal methodologies from roadways: such as product (i.e., salt) usage per lane mile, the application equipment and method used, and the application rate(s) selected and the selection methodology used. Consideration will be given to include salt application training with a focus on application rates.

Year 4

MSD will develop and distribute a report on municipal operations BMP projects that reduce the volume and rate of stormwater runoff and report number of projects implemented at municipal-owned facilities. The survey will include both BMPs required under MCM 5 and voluntary projects.

MSD and St. Louis County will evaluate data on salt usage per lane mile, application equipment and method, and application rate goals used in snow and ice removal from roadways, and distribute a report of the evaluation that makes recommendations for best practices.

MSD will develop and conduct a staged inspection training workshop for municipalities to improve implementation of their Phase II inspection programs.

Year 5

MSD will survey municipality and St. Louis County parks with pet waste stations and distribute pet waste station BMP resource information.

CHAPTER 10

Record Keeping and Reporting

A. MS4 Permit Requirements

Several sections of the general MS4 permit contain requirements pertaining to permittee record keeping and reporting. These requirements, as listed below, apply to each of the 60 co-permittees in the St. Louis County Plan Area.

Section 4.1 requires the permittee to designate individuals responsible for the stormwater management program. This section also requires the permittee to inspect any structures that function to prevent pollution of stormwater or to remove pollutants from stormwater and of the permittee's area of jurisdiction in general to ensure that any BMPs are continually implemented and effective.

Section 4.4 requires the permittee to do an annual review of the permittee's stormwater management program in conjunction with preparation of the annual report required under section 5.3. The permittee may update the program subject to the following procedures as specified in the permit:

Changes adding (but not subtracting or replacing) components, controls or requirements to the Plan may be made at any time upon written notification to the MDNR.

Changes replacing an ineffective or infeasible BMP specifically identified in the Plan with an alternate BMP may be requested at any time with the following information to be supplied to the MDNR:

1. An analysis of why the BMP is ineffective or infeasible (including cost prohibitive),
2. Expectations on the effectiveness of the replacement BMP, and
3. An analysis of why the replacement BMP is expected to achieve the goals of the BMP to be replaced.

Section 5.1.1 requires the permittee to evaluate program compliance, the appropriateness of identified BMPs, and progress toward achieving identified measurable goals.

Section 5.2 requires the permittee to retain records of all activities requiring record keeping by this Plan.

Section 5.3 requires the permittee to submit annual reports to the MDNR by July 28 of each year of the permit term. The reports must include:

The status of the permittee's compliance with permit conditions, an assessment of the appropriateness of the identified BMPs, progress towards achieving the statutory goal of reducing the discharge of pollutants to the maximum extent practicable and the measurable goals for each of the MCMs;

Results of information collected and analyzed, if any, during the reporting period, including monitoring data used to assess the success of the program at reducing the discharge of pollutants to the maximum extent practicable;

A summary of the stormwater activities the permittee plans to undertake during the next reporting cycle (including an implementation schedule);

Proposed changes to the permittee's Plan, including changes to any BMPs or any identified measurable goals that apply to the program elements; and

Notice that the permittee is relying on another government entity to satisfy some of the permittee's permit obligations (if applicable).

B. Record Keeping

Each co-permittee will designate, on the co-permittee's individual permit application, an individual in overall charge of stormwater management activities within the co-permittee's area of jurisdiction. That individual will be responsible for ensuring that:

- All elements of this Plan, pertaining to the identified co-permittee, are effectively implemented;
- Required inspections are made;
- Required records are kept; and
- Information required for inclusion in reports to MDNR is provided to the coordinating authority (MSD) upon request or as scheduled.

The permit specifies certain actions, such as inspections, which each co-permittee must perform. In addition, this Plan identifies actions that the co-permittees are committed to take in order to comply with the requirements of the Phase II Stormwater Regulations and the terms and conditions of the MS4 permit. Measurable goals and time frames for achieving those goals have been established. Accurate and timely record keeping by each co-permittee is essential in order to document the timeliness and effectiveness of committed actions, to demonstrate compliance with the permit requirements and to provide the basis for the annual reports. Co-permittees must maintain documentation regarding the implementation of programs and the maintenance of the programs under the MS4 permit. Records are required to be maintained by the co-permittee for a minimum of three years.

Following are examples of the types of actions for which records should be kept. This listing is not all inclusive:

- Inspections as required by Section 4.1.10 of the permit (Record dates, areas inspected, personnel involved, findings, follow-up actions, etc.). Each co-permittee must conduct inspections within its area of jurisdiction for the activities for which it is responsible under this Plan.
- Annual program evaluations as required by Section 4.4 of the permit (Record evaluation method and results. If changes are proposed in the Plan, record the reasoning behind the changes).
- Public information efforts under MCM 1 (Record dates, activity such as brochure distribution, speaking event, etc.; type and number of people reached, milestones in web site development, web site hits, results of public knowledge surveys; etc.).
- Public involvement efforts under MCM 2 (Record milestones in public involvement activity dates, nature of activities; applicable statistics such as numbers of volunteers, numbers of people reached, quantities of waste collected or removed, miles of stream or road cleaned, number of inlets marked, pet pledge cards signed; etc.).
- Illicit discharge detection and elimination efforts under MCM 3 (Record statistics such as miles of streams surveyed, number of illicit discharge investigations initiated, number of stream problems identified; results of investigations and problem identification; etc.)
- Construction site stormwater control efforts under MCM 4 (Record milestones in co-permittee program development, program modifications/adoptions; statistics such as the number of permits issued; etc.).
- Post-construction stormwater management in new development and redevelopment efforts under MCM 5 (Record milestones in review and modification of existing regulations, and MSD approval of BMPs; ensuring the operation and maintenance responsibilities for residential structural BMPs; etc.).
- Pollution prevention/good housekeeping for municipal operations efforts under MCM 6 (Record milestones in review and modification of existing ordinances, training dates, locations and subject matter of training sessions; statistics such as numbers of training sessions held, numbers of employees trained/refreshed; etc.).

C. Reporting

As the coordinating authority for the Plan Area, the Metropolitan St. Louis Sewer District will compile the information provided by the individual co-permittees to satisfy the permit's annual review, program evaluation and annual report requirements. The District's Division of Environmental Compliance (DEC) will be responsible for coordinating this activity and preparing and submitting the reports to MDNR.

The MSD DEC will develop appropriate standardized forms that co-permittees can use to supply required information.

The MSD DEC will develop schedules for submittal of information required for reporting purposes, including the annual reports.

CHAPTER 11

BMP Goals, Measurements, and Responsibilities

A. Purpose

The purpose of this chapter is to summarize in one convenient location within this Plan the various BMPs and goals selected each year of the permit period to comply with requirements of the six MCMs. The entity within the Plan Area responsible for implementation is also included. BMPs that are implemented as ongoing programs list the permit year as "all" indicating the goal will be implemented in each year of the permit. The information contained in this chapter summarizes what has been presented in narrative format in each of the Chapters on MCMs for the convenience of readers.

B. BMP Implementation Information

MCM 1: Public Education and Outreach

Permit Year	BMP Goal Selected	Measurement Method	Responsibility
All	a. MSD will distribute educational materials on a relevant topic throughout the District using bill inserts (distributed to all customers) or cable (distributed to all subscribing households) or other mass media.	Message delivered	MSD
	b. MSD will report the number of brochures and other educational materials distributed to improve water quality.	Number distributed	MSD
	c. MSD will report the number of presentations on water quality and nonpoint source pollution education.	Number presentations	MSD
	d. MSD will maintain its web site with educational materials on stormwater impacts and ways to improve water quality, and will report the number of Phase II web page visits.	Number web visits	MSD
1	No new goals planned	-	-

CONTINUE MCM 1

Permit Year	BMP Goal Selected	Measurement Method	Responsibility
2	A work group will be formed to evaluate nonpoint source pollution education in schools. The evaluation will consider past efforts, and may include a survey to determine the number of schools and students reached and how. Findings and recommendations to enhance education efforts will be established.	Evaluation performed	MSD
3	A work group will be formed to review and update the existing inventory of educational materials to improve water quality.	Materials updated	MSD
4	MSD will develop specific water quality messages for co-permittees that are particularly relevant to the area.	Message developed	MSD
5	a. MSD will ask co-permittees to develop and maintain a web site, or link to a regional web site, with educational resources on stormwater impacts and ways to improve water quality.	Web sites developed	Co-permittees
	b. The specific co-permittee water quality messages developed by MSD in Year 4 will be distributed within the population, or co-permittees may also develop their own messages.	Message delivered	Co-permittees
	c. To test the public's knowledge of stormwater issues a questionnaire will be developed and a telephone survey conducted. The information will be used to analyze the impact of MSD's educational activities on making the public more aware of stormwater quality issues and needs. Effective actions will be continued but subject matter may be revised	Number of responses	MSD

MCM 2: Public Involvement and Participation

Permit Year	BMP Goal Selected	Measurement Method	Responsibility
All	a. MSD will report on the number of volunteer presentations supported.	Number supported	MSD
	b. MSD will report on the number of storm drain marking projects supported.	Number supported	MSD
	c. MSD will report on the number of volunteer neighborhood and stream clean-ups supported.	Number supported	MSD
	d. St. Louis County will report on the amount of household hazardous waste collected.	Waste volume	St. Louis County
	e. MSD will organize with partner organizations one or more annual stream or neighborhood clean-up events to cover the Plan Area. Each co-permittee will participate with a planned event, or participate in their own stream or neighborhood clean-up activity in the community.	Number of events and waste volume	Co-permittees
	f. Report on public participation activities to promote stormwater management public involvement programs that reduce the volume and/or rate of discharges of stormwater.	Number of participation activities	MSD
1	A work group will be formed to identify and develop a list of incentives and awards (i.e., certifications, yard signs, nursery coupons for native plants), and other ways citizens and organizations can participate in the MS4 program.	Participation activities identified	MSD
2	Distribute a report listing incentives and awards (i.e., certifications, yard signs, nursery coupons for native plants) and other ways citizens and organizations can participate in the MS4 program	Report distributed	MSD
3	No new goals planned	-	-
4	No new goals planned	-	-

CONTINUE MCM 2

Permit Year	BMP Goal Selected	Measurement Method	Responsibility
5	MSD, supported by citizen volunteers, will publish a report of their activities, including outcomes and recommendations for future volunteer activities.	Report prepared and published	MSD

MCM 3: ILLICIT DISCHARGE DETECTION AND ELIMINATION

Permit Year	BMP Goal Selected	Measurement Method	Responsibility
All	a. Survey 1,380 miles of area streams for illicit discharge over permit term, averaging 280 miles per year over 5 years. MSD will report stream miles inspected, the findings of the inspection, and the actions taken.	Miles surveyed	MSD
	b. MSD will inspect outdoor waste handling areas at restaurants and other facilities as part of the interceptor/grease trap inspections, and report the numbers of inspections and violations.	Inspections performed	MSD
	c. MSD will distribute illicit stormwater discharges brochure to the industrial customers inspected by the pretreatment unit each year.	Brochures distributed	MSD
	d. MSD will report IDD and waste finding reports to co-permittees to improve communications in detecting and eliminating illicit discharges. Reports will include stream miles inspected, the findings of the inspections, and the MSD actions taken within the co-permittee boundaries.	Reports distributed	MSD
1	No new goals planned	-	-
2	No new goals planned	-	-

CONTINUE MCM 3

Permit Year	BMP Goal Selected	Measurement Method	Responsibility
3	a. MSD in coordination with St. Louis County will develop a brochure to address individual sewage disposal systems. The brochure will describe the elements of an individual sewage disposal system, how it operates, homeowner maintenance responsibilities, signs of a malfunctioning systems, enforcement, and resource information.	Brochure developed	MSD
	b. Identify sources that are tracking individual sewage disposal system data, including, but not limited to installations, repairs, and enforcement actions will be implemented.	Sources identified	MSD
4	MSD, partners, and co-permittees will distribute the brochure to address individual sewage disposal systems. Distribution may include web site posting.	Brochure distributed	Co-permittees
5	No new goals planned	-	-

MCM 4 CONSTRUCTION SITE STORMWATER RUNOFF CONTROL

Permit Year	BMP Goal Selected	Measurement Method	Responsibility
All	a. Municipalities and St. Louis County will report permits issued by name and area disturbed. This information was requested by MDNR for coordination to ensure land disturbance program compliance.	Annual Report	Municipalities & St. Louis County
	b. Municipalities and St. Louis County will report the number of formal, written notices of violation and further enforcement actions taken, and the companies they were taken against.	Annual Report	Municipalities & St. Louis County
1	MSD and St. Louis County will develop and conduct one staged inspection training workshop for municipalities to improve implementation of their Phase II land disturbance programs.	Workshop provided	St. Louis County and MSD

CONTINUE MCM 4

Permit Year	BMP Goal Selected	Measurement Method	Responsibility
2	No new goals planned	-	-
3	MSD and St. Louis County will provide educational program or training for developers and construction company employees, engineers, contractors, or local inspectors on sediment and erosion control BMPs, and evaluate training effectiveness.	Program or training sessions provided	MSD and St. Louis County
4	No new goals planned	-	-
5	No new goals planned	-	-

MCM 5: POST-CONSTRUCTION STORMWATER MANAGEMENT

Permit Year	BMP Goal Selected	Measurement Method	Responsibility
All	a. MSD will report the number of post-construction BMPs constructed and approved, and the number of BMPs inspected as part of long term operation and maintenance.	Number of BMPs installed and inspected	MSD
	b. MSD will report the number of developments that are charged for utilizing the conceptual review service.	Number of reviews	MSD
1	a. MSD will develop standardized checklists and reporting procedures for post-construction BMP owners to assist in ensuring proper maintenance of the BMPs. Information will be distributed to audiences using the BMP Toolbox website.	Material developed	MSD
	b. MSD will coordinate a work group of co-permittees and consultants to evaluate parameters and technology related to guidance for post-construction BMPs on roadway redevelopment projects within the District.	Evaluation complete	MSD
2	a. MSD and partners will develop or update educational materials for municipal public works officials, developers, and engineers. The materials will promote the use of non-structural BMPs and the benefits of stormwater management planning prior to land disturbance.	Material distributed	MSD

CONTINUE MCM 5

Permit Year	BMP Goal Selected	Measurement Method	Responsibility
	b. MSD will review land use data and identify the co-permittees that appear to benefit most from review of parking ordinances. MSD will discuss these findings with all co-permittees and develop a list of co-permittees subject to the Year 3 goal to review parking and weed ordinances. Appropriate stakeholders will be included at the Cities' request.	Assessment completed	MSD
3	a. MSD will develop educational materials on stormwater BMPs in the community and distribute them to specific audiences. MSD may provide workshops for these specific audiences, as necessary. Examples of specific audiences include homeowner associations, school districts and fire districts.	Material distributed	MSD
	b. Municipalities listed under the Year 2 land use data review and St. Louis County will be asked to review the model parking and weed ordinances presented in the *Stormwater Best Management Practices Post-Construction Recommendations – Addressing Legal Impediments and Mandated Impervious Areas, February 2011* report, compare these models to their current ordinances, and consider whether any revision to current ordinances is appropriate. (Only co-permittees that were listed in Year 2 will be required to perform this goal.)	Review completed	Listed Municipalities and St. Louis County
4	MSD will ask the co-permittees listed in Year 2 to consider revising their parking and/or weed ordinances based on the reviews performed in Year 3. Co-permittees will also be asked to report on what actions, if any, they took as a result of the review. (Only co-permittees that were listed in Year 2 will be required to perform this goal).	Actions Reported	Listed Municipalities and St. Louis County
5	MSD will review post construction stormwater BMP selection and pollutant removal performance with regard to local water quality impairments, including bacteria and chloride.	Review completed	MSD

MCM 6 Pollution Prevention/Good Housekeeping for Municipal Operations

Permit Year	BMP Goal Selected	Measurement Method	Responsibility
All	a. MSD and partners will identify and develop educational information or a case study, and distribute to co-permittees to encourage implementation of BMPs.	Information distributed	MSD
	b. Training in BMPs will continue as refresher seminars and workshops, and as BMP introduction for new employees as co-permittees implement their ongoing employee training programs. MSD will provide BMP refresher workshops for the co-permittees.	Workshops provided	MSD
	c. Co-permittees will report on the number of employees trained.	Employees Trained	Co-permittees
	d. Co-permittees will inspect their facilities to ensure implementation of BMPs and report the number of inspections annually. Inspection findings will be incorporated into the co-permittee's program review and employee training program.	Inspections performed	Co-permittees
	e. Municipalities and St. Louis County will report salt usage per lane mile (as actual or estimated), the application equipment and method used, and application rate(s) selected and the selection methodology used in snow and ice removal from roadways. Municipalities and St. Louis County will report the number of winter storms in each season, the total salt usage in tons, and the total lane miles of roadway maintained	Amounts and BMPs reported	Municipalities and St. Louis County
1	MSD and St. Louis County will update the November 2009 guidance document titled *Identifying and addressing Solid Waste Problem Areas due to Illegal Dumping and Littering* to include a checklist on how to host a clean-up event.	Document updated	MSD and St. Louis County

CONTINUE MCM 6

Permit Year	BMP Goal Selected	Measurement Method	Responsibility
2	a. A municipal work group will be organized to update the February 2005 dated *Operation and Maintenance Program* model template for co-permittees.	Model template updated	MSD
	b. MSD will take the lead, and invite St. Louis County and partners, such as Missouri Stream Team, to hold one training workshop for co-permittees on how to host a clean-up event.	Workshop provided	MSD
3	a. MSD will distribute the revised Operation and Maintenance Program model template and ask co-permittees to review and consider the need to update their operation and maintenance programs.	Model template distributed	MSD
	b. MSD will survey the number of co-permittee BMP projects that reduce the volume and rate of stormwater runoff implemented at municipal-owned facilities. The survey will include both BMPs required under MCM 5 and voluntary type BMPs.	Survey completed	MSD
	c. A work group will be formed to evaluate, and update as applicable, the guidance for municipalities tracking snow and ice removal methodologies from roadways: such as product (i.e., salt) usage per lane mile, the application equipment and method used, and the application rate(s) selected and the selection methodology used. Consideration will be given to include salt application training with a focus on application rates.	Evaluation completed	MSD

CONTINUE MCM 6

Permit Year	BMP Goal Selected	Measurement Method	Responsibility
4	a. MSD will develop and distribute a report on municipal operations BMP projects that reduce the volume and rate of stormwater runoff and report number of projects implemented at municipal-owned facilities. The survey will include both BMPs required under MCM 5 and voluntary projects.	Report distributed	MSD
	b. MSD and St. Louis County will evaluate data on salt usage per lane mile, application equipment and method, and application rate goals used in snow and ice removal from roadways, and distribute a report of the evaluation that makes recommendations for best practices.	Report distributed	MSD and St. Louis County
	c. MSD will develop and conduct a staged inspection training workshop for municipalities to improve implementation of their Phase II inspection programs.	Workshop provided	MSD
5	MSD will survey municipality and St. Louis County parks with pet waste stations and distribute pet waste station BMP resource information.	Survey completed	MSD

C. Effectiveness of BMPs

It is considered by the Planning Committee that the BMP goals and measurements identified in this chapter comply with the requirements of the Phase II Regulations and that when implemented the pollution of stormwater in the Plan Area will be prevented to the maximum extent practicable.

D. Funding

The Metropolitan St. Louis Sewer District remains committed to permit compliance and continuing to act as coordinating authority implementing the phase II Plan. However, funding the Plan is a challenge and due to specific legislation explained in this section, MSD no longer provides certain stormwater management services required under the permit to specific areas covered under the phase II MS4 permit.

In the first term Plan, MSD referenced that an impervious charge could generate funds to support implementation of the Plan. As reported in the Year 5 report of the first term MS4 Annual Report, the MSD's Board of Trustees adopted Ordinance 12560 on December 13, 2007, which established a schedule of Stormwater User Charges based on the area of impervious surfaces on property. All properties within MSD's boundaries were billed a monthly charge of $0.12 per 100 square feet of impervious area starting March 1, 2008, which was later increased to $0.14 per 100 square feet. With the implementation of a new stormwater impervious charge, the OMCI tax collected in some taxing districts was reduced to zero in 2008. In the Year 1 report of the second term annual report MDNR Addendum report, MSD identified that 100% of future funding would come from the stormwater impervious fee.

However, in Year 3 of the second term annual report, MSD reported an interruption in MSD's stormwater funding. First, Missouri House Bill 661 was passed by the General Assembly and signed by the Governor. House Bill 661 limited MSD's ability to charge certain properties for stormwater services. Therefore, on August 28, 2009, when House Bill 661 went into effect, MSD ceased the stormwater user charge billing of approximately 3600 properties to comply with the law. MSD also submitted a letter dated August 31, 2009 to the Director of the Missouri Department of Natural Resources stating MSD would not be able to perform plan review, permitting, and inspection of development projects to ensure compliance with stormwater quality requirements under MCM 5 on the affected parcels.

Secondly, on July 9, 2010, Circuit Judge Dan Dildine ruled against MSD in the case of Zweig, et. al. vs. MSD. The suit was filed in St. Louis County Circuit Court by Dr. William Zweig and others on behalf of a class of ratepayers over the validity of MSD's impervious stormwater user charge under Missouri's Hancock Amendment. The judgment meant MSD would lose its ability to collect funds for stormwater services based upon the impervious fee. MSD appealed the Circuit Court ruling. The MSD Board of Trustees suspended the collection of the impervious charge for stormwater services in August 2010. As a result, the previous funding mechanisms, a system of flat charges and property taxes both district-wide and in taxing sub-districts, was reinstated. The Missouri Court of Appeals agreed in part with the Circuit Court ruling of 2010. MSD has recently requested that the Missouri Supreme Court hear the case. A final resolution is still pending at the time this Plan was written.

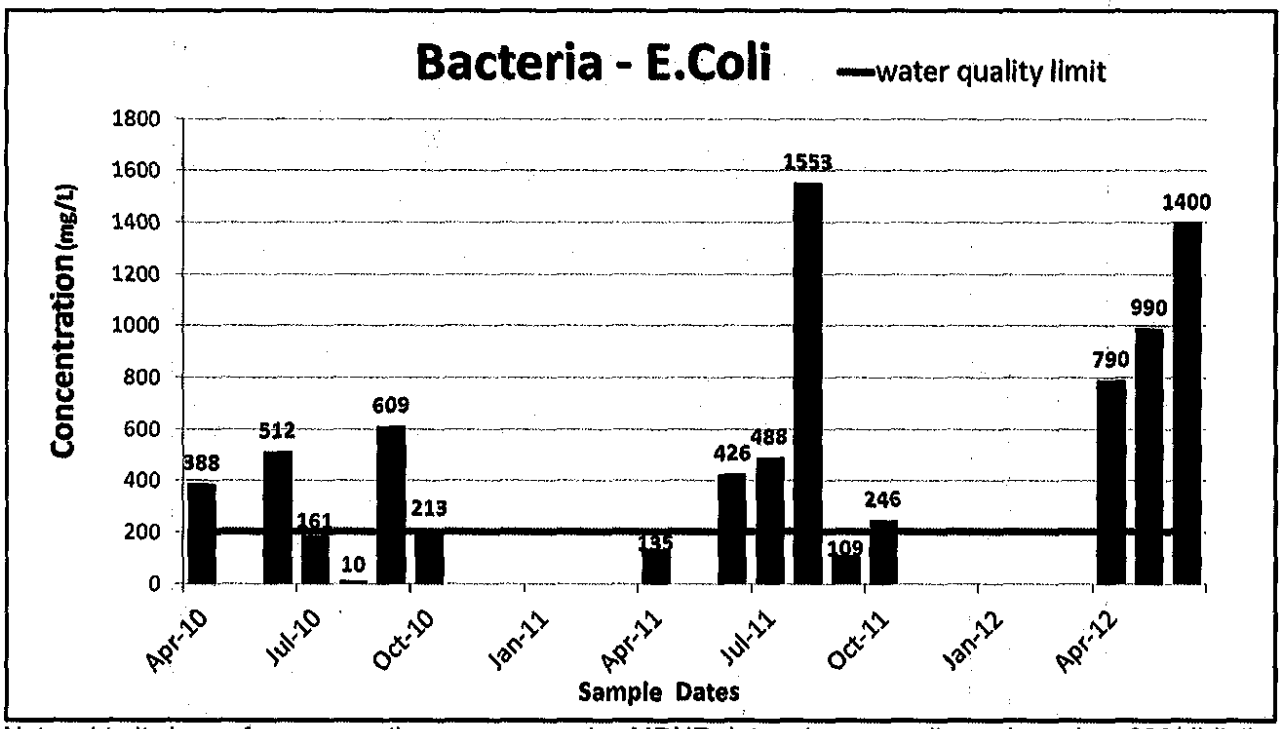
APPENDICES
Water Quality

Sample Summary and Statistics

Antire Creek near Lewis Rd

Begin Date	End Date	Parameter Description	Units	Count	Min	Max	Average
10-Jun-09	06-Jun-12	Temperature, water, degrees Celsius	°C	37	2	24	13.93
10-Jun-09	06-Jun-12	Dissolved oxygen, water, unfiltered, milligrams per liter	mg/L	37	4.31	13.8	8.33
10-Jun-09	06-Jun-12	Chemical oxygen demand, high level, water, unfiltered, milligrams per liter	mg/L	37	2	40	13.16
10-Jun-09	06-Jun-12	pH, water, unfiltered, field, standard units	SU	26	6	9	7.19
22-Feb-11	06-Jun-12	Residue, total nonfilterable, milligrams per liter	mg/L	15	0.5	57	8.77
06-Jun-11	06-Jun-12	Ammonia, water, filtered, milligrams per liter as nitrogen	mg/L as N	13	0.025	0.0758	0.03
22-Feb-11	06-Dec-11	Ammonia plus organic nitrogen, water, unfiltered, milligrams per liter as nitrogen	mg/L	9	1.5	1.5	1.5
22-Feb-11	06-Dec-11	Nitrate plus nitrite, water, unfiltered, milligrams per liter as nitrogen	mg/L as	9	0.277	0.72	0.5
22-Feb-11	06-Dec-11	Phosphorus, water, unfiltered, milligrams per liter as phosphorus	mg/L	9	0.125	0.489	0.17
05-Apr-11	06-Dec-11	Orthophosphate, water, filtered, milligrams per liter as phosphorus	mg/L as P	8	0.054	0.478	0.13
10-Jun-09	06-Dec-11	Hardness, water, milligrams per liter as calcium carbonate	mg/L	31	164.4	344	287.66
10-Jun-09	06-Dec-11	Cadmium, water, filtered, micrograms per liter	µg/L	30	0.00015	0.15	0.06
10-Jun-09	06-Dec-11	Chromium, water, filtered, micrograms per liter	µg/L	31	0.003	3	1.2
10-Jun-09	06-Dec-11	Copper, water, filtered, micrograms per liter	µg/L	31	0.0012	5.8	0.63
10-Jun-09	06-Dec-11	Iron, water, filtered, micrograms per liter	µg/L	31	0.03	40	12.93
10-Jun-09	06-Dec-11	Lead, water, filtered, micrograms per liter	µg/L	31	0.00045	4.9	0.32
10-Jun-09	06-Dec-11	Nickel, water, filtered, micrograms per liter	µg/L	31	0.0135	13.5	5.38
10-Jun-09	06-Dec-11	Zinc, water, filtered, micrograms per liter	µg/L	31	0.0105	58	9.09
10-Jun-09	06-Oct-09	Fecal coliform, M-FC MF (0.7 micron) method, water, colonies per 100 milliliters	cfu/100 mL	6	59	2000	858.17
10-Jun-09	06-Jun-12	Fecal streptococci, m-enterococcus MF method, water, colonies per 100 milliliters	cfu/100mL	23	9	6100	1018.78
13-Apr-10	06-Jun-12	Escherichia coli, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	17	10	1553	485.76
10-Jun-09	06-Jun-12	Chloride, water, unfiltered, milligrams per liter	mg/L	37	11	103	34.46
13-Apr-10	04-Oct-11	Enterococci, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	14	20	1076	281.5

Antire Creek



Note – Limit shown for comparative purposes only. MDNR determines compliance based on 303(d) listing methodology

Sample Summary and Statistics

Aubuchon Creek at Charbonier Rd

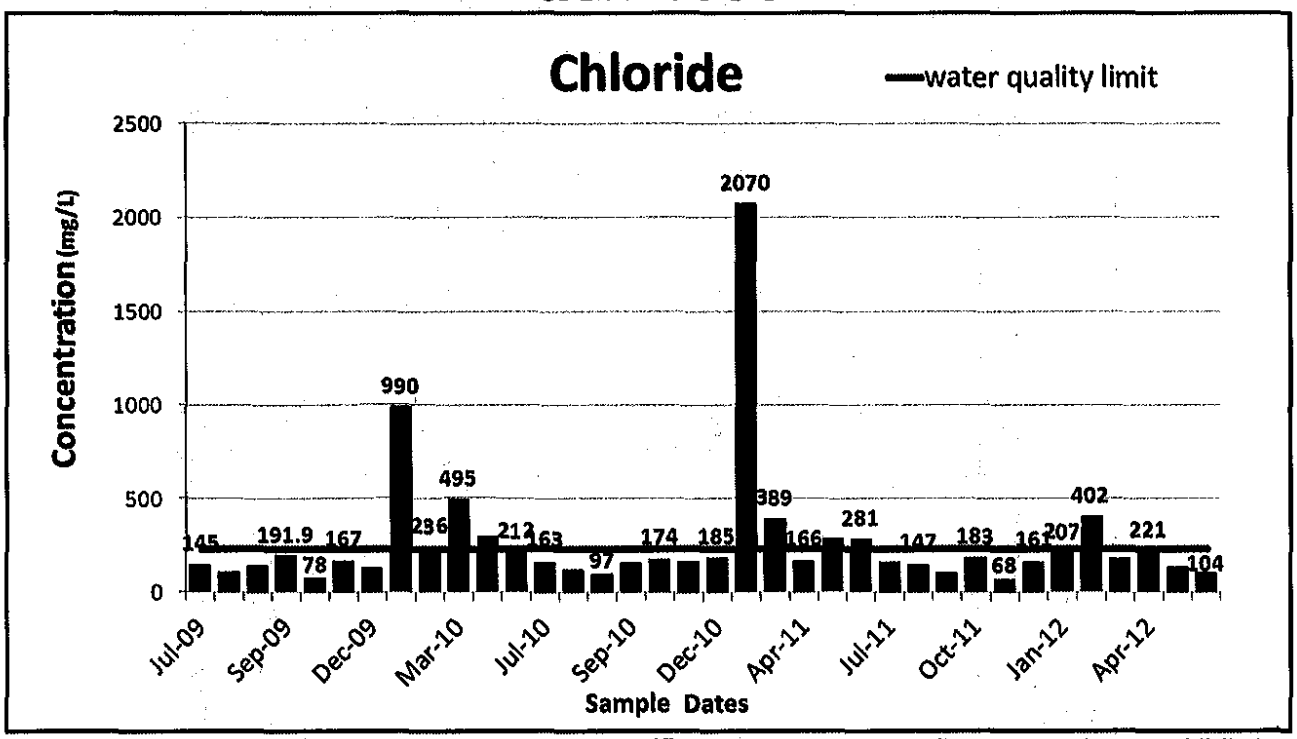
Begin Date	End Date	Parameter Description	Units	Count	Min	Max	Average
22-Jul-09	18-Jun-12	Temperature, water, degrees Celsius	°C	36	1	26	13.46
22-Jul-09	18-Jun-12	Dissolved oxygen, water, unfiltered, milligrams per liter	mg/L	36	3.9	14	8.64
22-Jul-09	18-Jun-12	Chemical oxygen demand, high level, water, unfiltered, milligrams per liter	mg/L	36	6	84	29.36
22-Jul-09	18-Jun-12	pH, water, unfiltered, field, standard units	SU	26	6.3	8.7	7.58
15-Feb-11	18-Jun-12	Residue, total nonfilterable, milligrams per liter	mg/L	17	2	237	39.06
16-May-11	18-Jun-12	Ammonia, water, filtered, milligrams per liter as nitrogen	mg/L as N	14	0.025	0.149	0.09
15-Feb-11	19-Dec-11	Ammonia plus organic nitrogen, water, unfiltered, milligrams per liter as nitrogen	mg/L	11	1.5	3.92	1.94
15-Feb-11	19-Dec-11	Nitrate plus nitrite, water, unfiltered, milligrams per liter as nitrogen	mg/L as	11	0.1	0.89	0.41
15-Feb-11	19-Dec-11	Phosphorus, water, unfiltered, milligrams per liter as phosphorus	mg/L	11	0.125	0.535	0.28
09-Mar-11	19-Dec-11	Orthophosphate, water, filtered, milligrams per liter as phosphorus	mg/L as P	10	0.04	0.307	0.15
22-Jul-09	19-Dec-11	Hardness, water, milligrams per liter as calcium carbonate	mg/L	30	60	688	482.71
22-Jul-09	19-Dec-11	Cadmium, water, filtered, micrograms per liter	µg/L	30	0.00015	0.15	0.06
22-Jul-09	19-Dec-11	Chromium, water, filtered, micrograms per liter	µg/L	30	0.003	3	1.2
22-Jul-09	19-Dec-11	Copper, water, filtered, micrograms per liter	µg/L	30	0.0012	29.7	1.9
22-Jul-09	19-Dec-11	Iron, water, filtered, micrograms per liter	µg/L	30	0.03	188	26.1
22-Jul-09	19-Dec-11	Lead, water, filtered, micrograms per liter	µg/L	30	0.00045	0.45	0.18
22-Jul-09	19-Dec-11	Nickel, water, filtered, micrograms per liter	µg/L	30	0.0135	13.5	5.41
22-Jul-09	19-Dec-11	Zinc, water, filtered, micrograms per liter	µg/L	30	0.0105	50	7.01
22-Jul-09	23-Sep-09	Fecal coliform, M-FC MF (0.7 micron) method, water, colonies per 100 milliliters	cfu/100 mL	4	660	1600	1057.5
22-Jul-09	18-Jun-12	Fecal streptococci, m-enterococcus MF method, water, colonies per 100 milliliters	cfu/100mL	19	150	33000	5430
04-May-10	18-Jun-12	Escherichia coli, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	15	189	13000	3577.67
22-Jul-09	18-Jun-12	Chloride, water, unfiltered, milligrams per liter	mg/L	36	28	1260	143.83
04-May-10	17-Oct-11	Enterococci, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	13	98	36294	5866.23

Sample Summary and Statistics

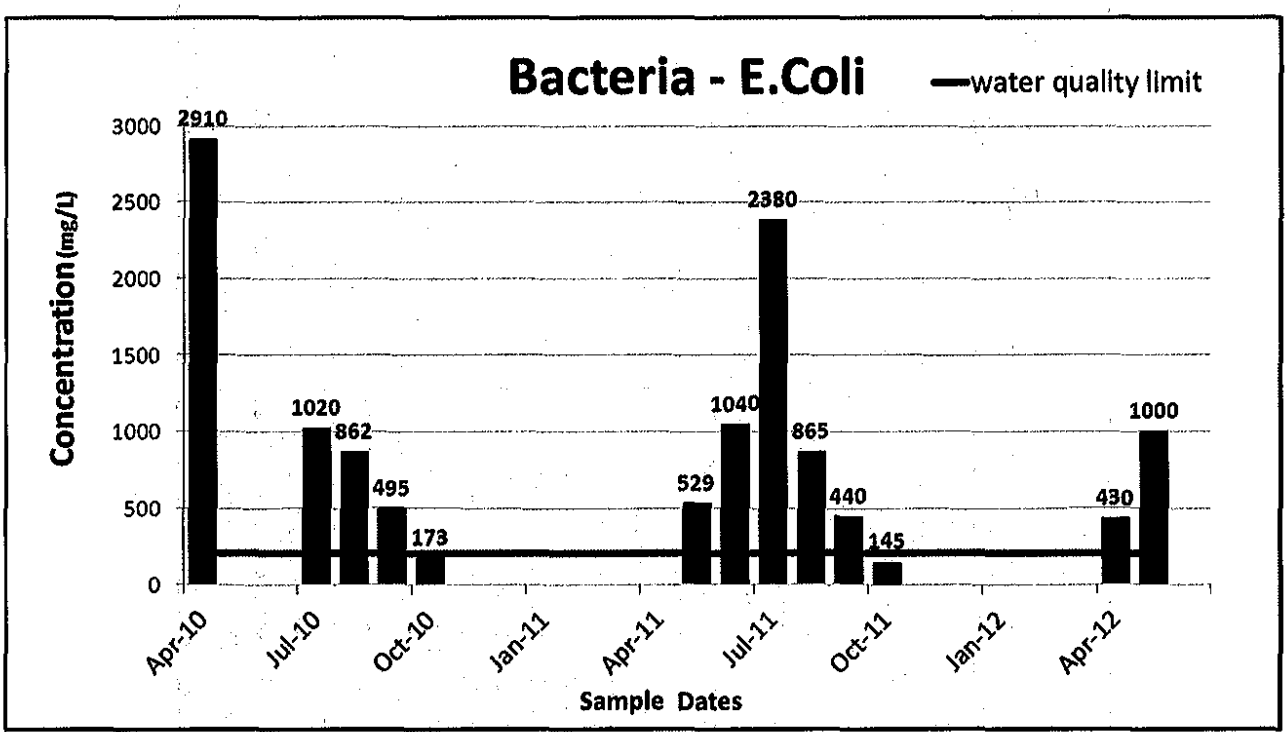
Black Creek at Manchester Rd

Begin Date	End Date	Parameter Description	Units	Count	Min	Max	Average
07-Jul-09	12-Jun-12	Temperature, water, degrees Celsius	°C	36	1	27	15.12
07-Jul-09	12-Jun-12	Dissolved oxygen, water, unfiltered, milligrams per liter	mg/L	36	3.33	14	7.53
07-Jul-09	12-Jun-12	Chemical oxygen demand, high level, water, unfiltered, milligrams per liter	mg/L	36	15	189	38.42
07-Jul-09	12-Jun-12	pH, water, unfiltered, field, standard units	SU	26	6	8	7.19
08-Feb-11	12-Jun-12	Residue, total nonfilterable, milligrams per liter	mg/L	17	0.5	123	14.44
09-May-11	12-Jun-12	Ammonia, water, filtered, milligrams per liter as nitrogen	mg/L as N	13	0.025	0.237	0.11
08-Feb-11	12-Dec-11	Ammonia plus organic nitrogen, water, unfiltered, milligrams per liter as nitrogen	mg/L	10	1.5	3.92	1.74
08-Feb-11	12-Dec-11	Nitrate plus nitrite, water, unfiltered, milligrams per liter as nitrogen	mg/L as	11	0.343	1.57	0.88
08-Feb-11	12-Dec-11	Phosphorus, water, unfiltered, milligrams per liter as phosphorus	mg/L	11	0.125	0.25	0.14
07-Mar-11	12-Dec-11	Orthophosphate, water, filtered, milligrams per liter as phosphorus	mg/L as P	10	0.015	0.17	0.08
07-Jul-09	12-Dec-11	Hardness, water, milligrams per liter as calcium carbonate	mg/L	30	184.8	600	337.12
07-Jul-09	12-Dec-11	Cadmium, water, filtered, micrograms per liter	µg/L	30	0.00015	0.15	0.06
07-Jul-09	12-Dec-11	Chromium, water, filtered, micrograms per liter	µg/L	30	0.003	30	2.1
07-Jul-09	12-Dec-11	Copper, water, filtered, micrograms per liter	µg/L	30	0.0012	34.2	1.73
07-Jul-09	12-Dec-11	Iron, water, filtered, micrograms per liter	µg/L	30	0.03	72	13.43
07-Jul-09	12-Dec-11	Lead, water, filtered, micrograms per liter	µg/L	30	0.00045	1.1	0.2
07-Jul-09	12-Dec-11	Nickel, water, filtered, micrograms per liter	µg/L	30	0.0135	13.5	5.41
07-Jul-09	12-Dec-11	Zinc, water, filtered, micrograms per liter	µg/L	30	0.0105	54	10.18
07-Jul-09	07-Oct-09	Fecal coliform, M-FC MF (0.7 micron) method, water, colonies per 100 milliliters	cfu/100 mL	5	460	55000	12310
07-Jul-09	12-Jun-12	Fecal streptococci, m-enterococcus MF method, water, colonies per 100 milliliters	cfu/100mL	22	36	84000	6450.27
07-Apr-10	12-Jun-12	Escherichia coli, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	16	145	20000	2102.06
07-Jul-09	12-Jun-12	Chloride, water, unfiltered, milligrams per liter	mg/L	36	68	2070	264.44
07-Apr-10	10-Oct-11	Enterococci, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	14	63	3450	1110.86

Black Creek



Note – Limit shown for comparative purposes only. MDNR determines compliance based on 303(d) listing methodology



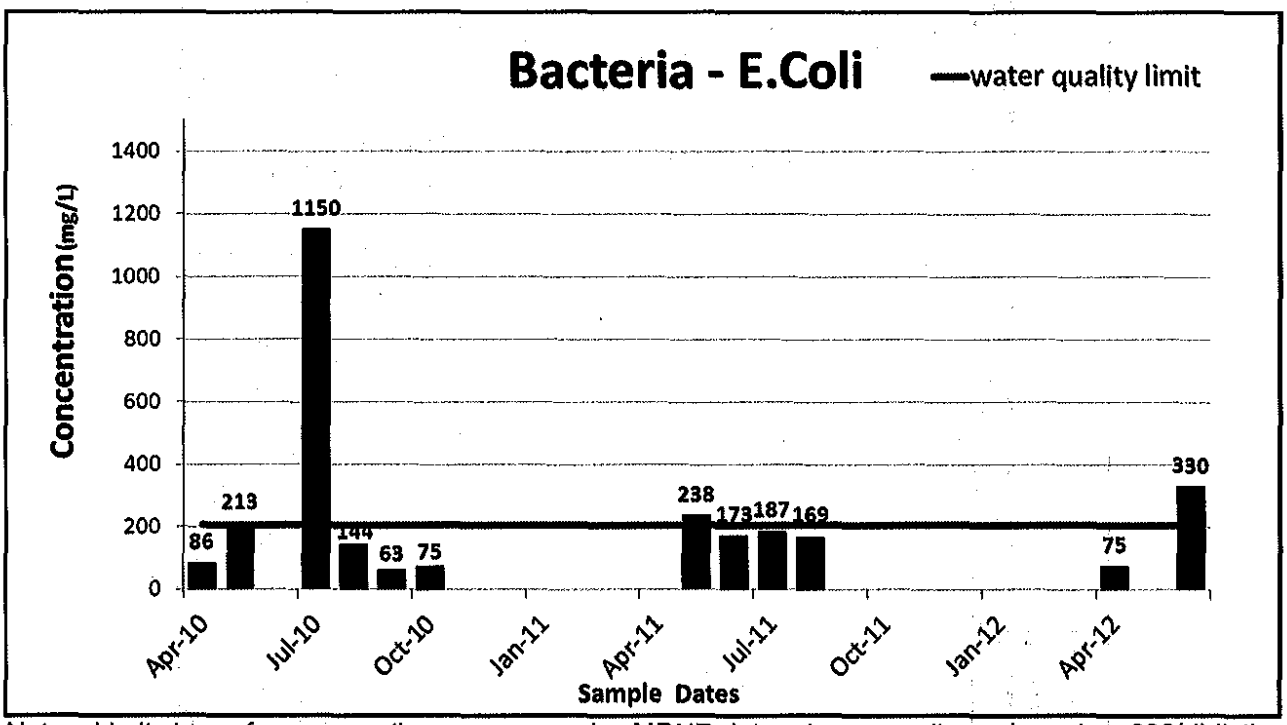
Note – Limit shown for comparative purposes only. MDNR determines compliance based on 303(d) listing methodology

Sample Summary and Statistics

Bonhomme Creek at Baxter Rd

Begin Date	End Date	Parameter Description	Units	Count	Min	Max	Average
02-Jun-09	13-Jun-12	Temperature, water, degrees Celsius	°C	35	1	28	14.63
02-Jun-09	13-Jun-12	Dissolved oxygen, water, unfiltered, milligrams per liter	mg/L	35	6.1	15.1	8.74
02-Jun-09	13-Jun-12	Chemical oxygen demand, high level, water, unfiltered, milligrams per liter	mg/L	35	4	64	21.34
02-Jun-09	13-Jun-12	pH, water, unfiltered, field, standard units	SU	25	5.8	8.1	7.21
24-Feb-11	13-Jun-12	Residue, total nonfilterable, milligrams per liter	mg/L	14	0.5	43	14.68
10-May-11	13-Jun-12	Ammonia, water, filtered, milligrams per liter as nitrogen	mg/L as N	12	0.025	0.101	0.06
24-Feb-11	14-Dec-11	Ammonia plus organic nitrogen, water, unfiltered, milligrams per liter as nitrogen	mg/L	9	1.5	1.5	1.5
24-Feb-11	14-Dec-11	Nitrate plus nitrite, water, unfiltered, milligrams per liter as nitrogen	mg/L as	9	0.1	1.65	0.88
24-Feb-11	14-Dec-11	Phosphorus, water, unfiltered, milligrams per liter as phosphorus	mg/L	9	0.125	0.875	0.28
08-Mar-11	14-Dec-11	Orthophosphate, water, filtered, milligrams per liter as phosphorus	mg/L as P	8	0.01	0.24	0.09
02-Jun-09	14-Dec-11	Hardness, water, milligrams per liter as calcium carbonate	mg/L	29	94	353.2	239.57
02-Jun-09	14-Dec-11	Cadmium, water, filtered, micrograms per liter	µg/L	29	0.00015	0.4	0.07
02-Jun-09	14-Dec-11	Chromium, water, filtered, micrograms per liter	µg/L	29	0.003	3	1.28
02-Jun-09	14-Dec-11	Copper, water, filtered, micrograms per liter	µg/L	29	0.0012	11.8	0.99
02-Jun-09	14-Dec-11	Iron, water, filtered, micrograms per liter	µg/L	29	0.03	67	14.44
02-Jun-09	14-Dec-11	Lead, water, filtered, micrograms per liter	µg/L	29	0.00045	0.45	0.19
02-Jun-09	14-Dec-11	Nickel, water, filtered, micrograms per liter	µg/L	29	0.0135	13.5	5.75
02-Jun-09	14-Dec-11	Zinc, water, filtered, micrograms per liter	µg/L	29	0.0105	72	9.96
02-Jun-09	12-Oct-09	Fecal coliform, M-FC MF (0.7 micron) method, water, colonies per 100 milliliters	cfu/100 mL	6	120	2200	840.67
02-Jun-09	13-Jun-12	Fecal streptococci, m-enterococcus MF method, water, colonies per 100 milliliters	cfu/100mL	19	45	9200	1530.79
19-Apr-10	13-Jun-12	Escherichia coli, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	12	63	1150	241.92
02-Jun-09	13-Jun-12	Chloride, water, unfiltered, milligrams per liter	mg/L	35	19	214	93.03
19-Apr-10	08-Aug-11	Enterococci, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	11	31	9800	1629.91

Bonhomme



Note – Limit shown for comparative purposes only. MDNR determines compliance based on 303(d) listing methodology

Sample Summary and Statistics

Caulks Creek at Wildhorse Creek Rd

Begin Date	End Date	Parameter Description	Units	Count	Min	Max	Average
14-Jul-09	13-Jun-12	Temperature, water, degrees Celsius	°C	35	3	22.5	13.95
14-Jul-09	13-Jun-12	Dissolved oxygen, water, unfiltered, milligrams per liter	mg/L	35	5.62	12	8
14-Jul-09	13-Jun-12	Chemical oxygen demand, high level, water, unfiltered, milligrams per liter	mg/L	35	4	85	20.31
14-Jul-09	13-Jun-12	pH, water, unfiltered, field, standard units	SU	26	6	7.9	7.13
24-Feb-11	13-Jun-12	Residue, total nonfilterable, milligrams per liter	mg/L	16	0.5	29	10.72
10-May-11	13-Jun-12	Ammonia, water, filtered, milligrams per liter as nitrogen	mg/L as N	14	0.025	0.092	0.04
24-Feb-11	14-Dec-11	Ammonia plus organic nitrogen, water, unfiltered, milligrams per liter as nitrogen	mg/L	11	1.5	3.36	1.67
24-Feb-11	14-Dec-11	Nitrate plus nitrite, water, unfiltered, milligrams per liter as nitrogen	mg/L as	11	0.41	2.3175	1.6
24-Feb-11	14-Dec-11	Phosphorus, water, unfiltered, milligrams per liter as phosphorus	mg/L	11	0.125	0.275	0.14
08-Mar-11	14-Dec-11	Orthophosphate, water, filtered, milligrams per liter as phosphorus	mg/L as P	10	0.03	0.12	0.07
14-Jul-09	14-Dec-11	Hardness, water, milligrams per liter as calcium carbonate	mg/L	29	114	355.6	259.37
14-Jul-09	14-Dec-11	Cadmium, water, filtered, micrograms per liter	µg/L	29	0.00015	0.15	0.06
14-Jul-09	14-Dec-11	Chromium, water, filtered, micrograms per liter	µg/L	29	0.003	3	1.24
14-Jul-09	14-Dec-11	Copper, water, filtered, micrograms per liter	µg/L	29	0.0012	6.8	0.69
14-Jul-09	14-Dec-11	Iron, water, filtered, micrograms per liter	µg/L	29	0.03	120	15.54
14-Jul-09	14-Dec-11	Lead, water, filtered, micrograms per liter	µg/L	29	0.00045	0.45	0.19
14-Jul-09	14-Dec-11	Nickel, water, filtered, micrograms per liter	µg/L	29	0.0135	13.5	5.6
14-Jul-09	14-Dec-11	Zinc, water, filtered, micrograms per liter	µg/L	29	0.0105	10.5	4.36
14-Jul-09	12-Oct-09	Fecal coliform, M-FC MF (0.7 micron) method, water, colonies per 100 milliliters	cfu/100 mL	5	190	5600	1596
14-Jul-09	13-Jun-12	Fecal streptococci, m-enterococcus MF method, water, colonies per 100 milliliters	cfu/100mL	20	100	49000	4541.25
19-Apr-10	13-Jun-12	Escherichia coli, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	14	41	6490	1179.71
14-Jul-09	13-Jun-12	Chloride, water, unfiltered, milligrams per liter	mg/L	35	26	262	109.71
19-Apr-10	11-Oct-11	Enterococci, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	13	74	4880	1391.31

Sample Summary and Statistics

Coldwater Creek at Hwy 367

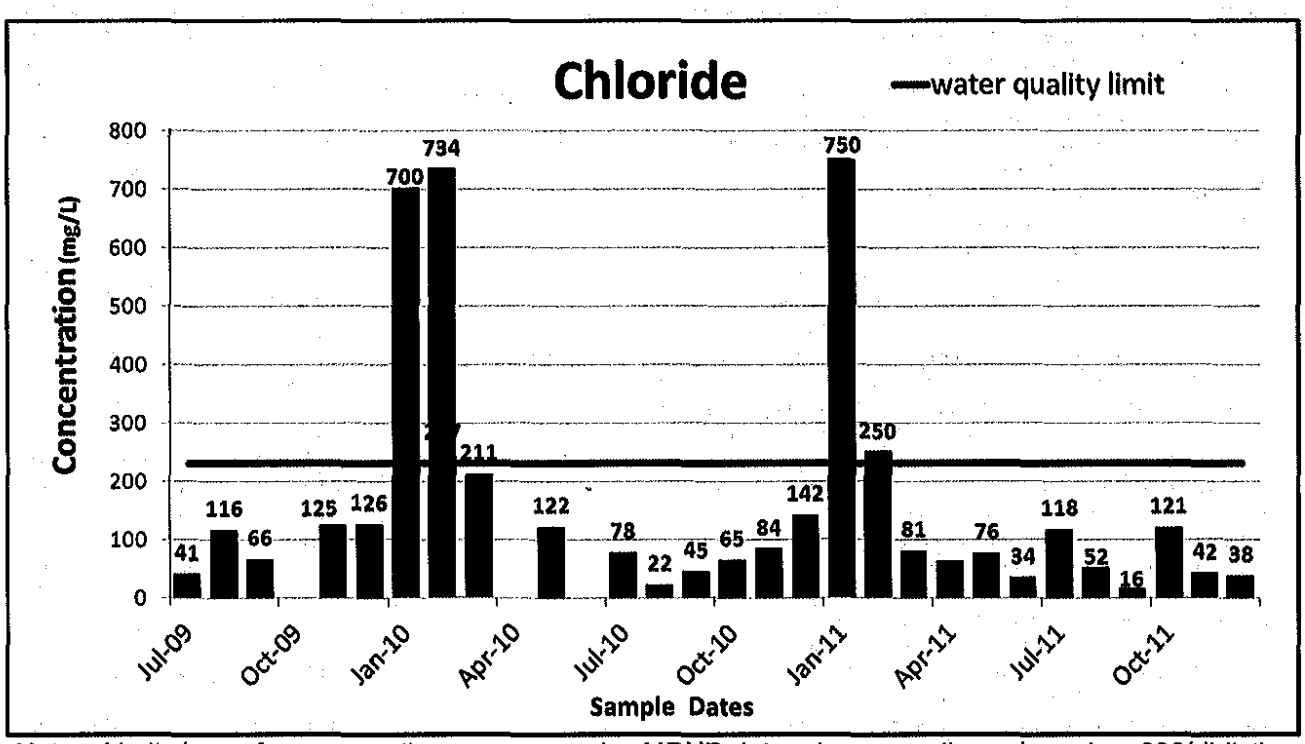
Begin Date	End Date	Parameter Description	Units	Count	Min	Max	Average
22-Jul-09	19-Dec-11	Temperature, water, degrees Celsius	°C	30	1	26	13.51
22-Jul-09	19-Dec-11	Dissolved oxygen, water, unfiltered, milligrams per liter	mg/L	30	5.6	14	8.12
22-Jul-09	19-Dec-11	Chemical oxygen demand, high level, water, unfiltered, milligrams per liter	mg/L	30	6	92	34.53
22-Jul-09	19-Dec-11	pH, water, unfiltered, field, standard units	SU	20	6.1	8.7	7.45
15-Feb-11	19-Dec-11	Residue, total nonfilterable, milligrams per liter	mg/L	11	8	287	47.73
16-May-11	19-Dec-11	Ammonia, water, filtered, milligrams per liter as nitrogen	mg/L as N	8	0.025	0.243	0.13
15-Feb-11	19-Dec-11	Ammonia plus organic nitrogen, water, unfiltered, milligrams per liter as nitrogen	mg/L	11	1.5	5.6	2.21
15-Feb-11	19-Dec-11	Nitrate plus nitrite, water, unfiltered, milligrams per liter as nitrogen	mg/L as	11	0.1	0.76	0.48
15-Feb-11	19-Dec-11	Phosphorus, water, unfiltered, milligrams per liter as phosphorus	mg/L	11	0.125	1	0.3
09-Mar-11	19-Dec-11	Orthophosphate, water, filtered, milligrams per liter as phosphorus	mg/L as P	10	0.015	0.542	0.15
22-Jul-09	19-Dec-11	Hardness, water, milligrams per liter as calcium carbonate	mg/L	30	70.8	539.2	260.23
22-Jul-09	19-Dec-11	Cadmium, water, filtered, micrograms per liter	µg/L	30	0.00015	0.15	0.06
22-Jul-09	19-Dec-11	Chromium, water, filtered, micrograms per liter	µg/L	30	0.003	3	1.2
22-Jul-09	19-Dec-11	Copper, water, filtered, micrograms per liter	µg/L	30	0.0012	334.2	16.17
22-Jul-09	19-Dec-11	Iron, water, filtered, micrograms per liter	µg/L	30	0.03	30	12.05
22-Jul-09	19-Dec-11	Lead, water, filtered, micrograms per liter	µg/L	30	0.00045	18.4	0.93
22-Jul-09	19-Dec-11	Nickel, water, filtered, micrograms per liter	µg/L	30	0.0135	13.5	5.41
22-Jul-09	19-Dec-11	Zinc, water, filtered, micrograms per liter	µg/L	30	0.0105	350	21.11
22-Jul-09	18-Jan-11	Aluminum, water, filtered, micrograms per liter	µg/L	19	0.0645	129	44.16
22-Jul-09	23-Sep-09	Fecal coliform, M-FC MF (0.7 micron) method, water, colonies per 100 milliliters	cfu/100 mL	4	220	1300	632.5
22-Jul-09	17-Oct-11	Fecal streptococci, m-enterococcus MF method, water, colonies per 100 milliliters	cfu/100mL	16	110	64000	6315.5
04-May-10	17-Oct-11	Escherichia coli, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	12	86	24200	4210.17
22-Jul-09	19-Dec-11	Chloride, water, unfiltered, milligrams per liter	mg/L	30	16	750	155.73
04-May-10	17-Oct-11	Enterococci, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	13	52	36294	4481.08

Sample Summary and Statistics

Coldwater Creek near Black Jack, MO

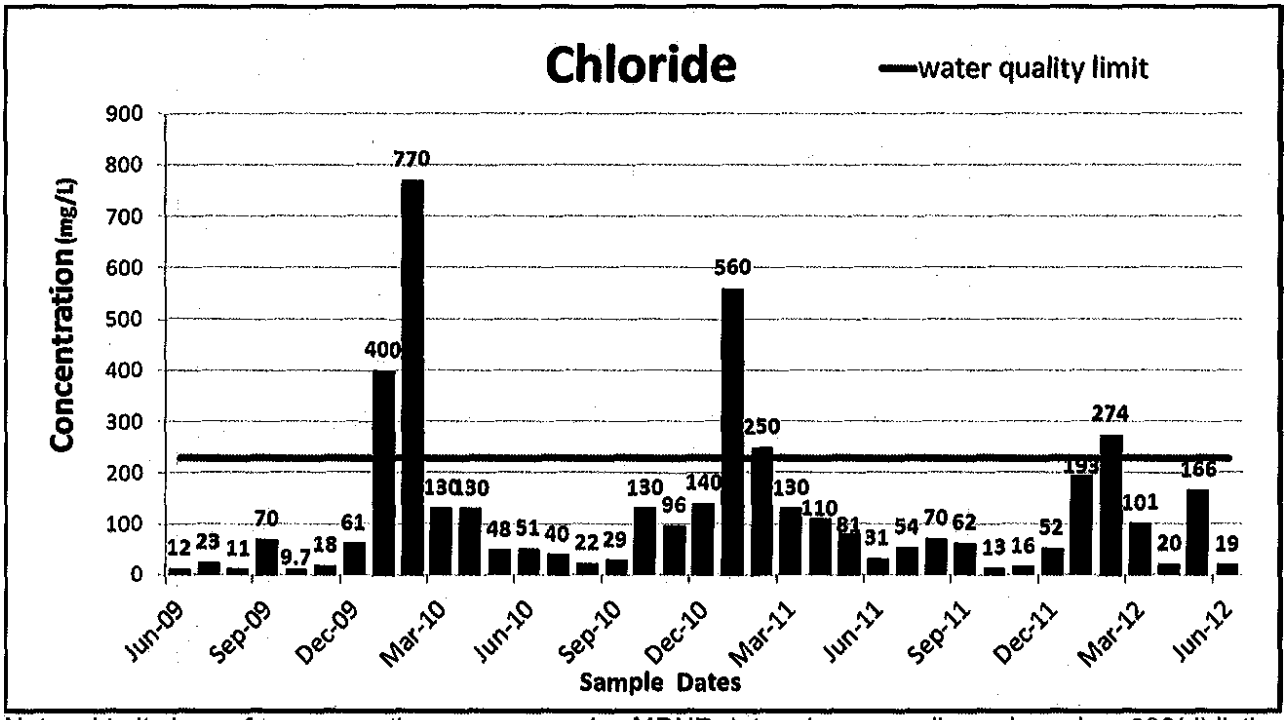
Begin Date	End Date	Parameter Description	Units	Count	Min	Max	Average
16-Jun-09	18-Jun-12	Temperature, water, degrees Celsius	°C	37	-0.11	30.42	14.76
16-Jun-09	13-Dec-11	Discharge, instantaneous, cubic feet per second	cfs	31	1.27	2440	158.76
16-Jun-09	13-Dec-11	Specific conductance, water, unfiltered, field, microsiemens per centimeter at 25 degrees Celsius	uS/cm at 25 °C	31	110	3006	764
16-Jun-09	18-Jun-12	Dissolved oxygen, water, unfiltered, milligrams per liter	mg/L	37	4.02	12.54	7.62
16-Jun-09	18-Jun-12	Chemical oxygen demand, high level, water, unfiltered, milligrams per liter	mg/L	37	1.6	89	23.56
16-Jun-09	18-Jun-12	pH, water, unfiltered, field, standard units	SU	37	6.83	8.17	7.68
16-Jun-09	18-Jun-12	Residue, total nonfilterable, milligrams per liter	mg/L	37	4	1200	63.59
18-Jan-11	13-Dec-11	Total nitrogen, water, unfiltered, milligrams per liter	mg/L	12	0.00115	2.5	0.86
16-Jun-09	18-Jun-12	Ammonia, water, filtered, milligrams per liter as nitrogen	mg/L as N	25	0.0075	0.125	0.05
18-Jan-11	13-Dec-11	Ammonia, water, unfiltered, milligrams per liter as nitrogen	mg/L	12	0.0075	0.67	0.15
16-Jun-09	14-Dec-10	Nitrite, water, filtered, milligrams per liter as nitrogen	mg/L as N	19	0.001	0.18	0.03
16-Jun-09	14-Dec-10	Nitrate, water, filtered, milligrams per liter as nitrogen	mg/L as N	19	0.1	1.1	0.48
16-Jun-09	13-Dec-11	Ammonia plus organic nitrogen, water, unfiltered, milligrams per liter as nitrogen	mg/L	31	0.56	2.8	0.93
18-Jan-11	13-Dec-11	Nitrate plus nitrite, water, unfiltered, milligrams per liter as nitrogen	mg/L as	12	0.2	0.82	0.44
16-Jun-09	14-Dec-10	Nitrate plus nitrite, water, filtered, milligrams per liter as nitrogen	mg/L as N	19	0.11	1.2	0.51
16-Jun-09	13-Dec-11	Phosphorus, water, unfiltered, milligrams per liter as phosphorus	mg/L	31	0.05	1.1	0.24
16-Jun-09	13-Dec-11	Orthophosphate, water, filtered, milligrams per liter as phosphorus	mg/L as P	31	0.0025	0.41	0.13
16-Jun-09	13-Dec-11	Hardness, water, milligrams per liter as calcium carbonate	mg/L	31	37.9	540	201.51
16-Jun-09	14-Dec-10	Calcium, water, filtered, milligrams per liter	mg/L	19	11	100	46.63
16-Jun-09	14-Dec-10	Magnesium, water, filtered, milligrams per liter	mg/L	19	2.4	35	15.76
16-Jun-09	14-Dec-10	Chloride, water, filtered, milligrams per liter	mg/L	19	9.7	770	115.3
16-Jun-09	14-Dec-10	Arsenic, water, filtered, micrograms per liter	µg/L	19	1.3	3.5	2.19
16-Jun-09	14-Dec-10	Arsenic, water, unfiltered, micrograms per liter	µg/L	19	1.8	8.5	2.71
16-Jun-09	14-Dec-10	Beryllium, water, filtered, micrograms per liter	µg/L	19	0.006	0.06	0.01
16-Jun-09	14-Dec-10	Beryllium, water, unfiltered, recoverable, micrograms per liter	µg/L	19	0.006	0.78	0.07
16-Jun-09	13-Dec-11	Cadmium, water, filtered, micrograms per liter	µg/L	31	0.00395	0.11	0.03
16-Jun-09	14-Dec-10	Cadmium, water, unfiltered, micrograms per liter	µg/L	19	0.02	0.92	0.1
16-Jun-09	13-Dec-11	Chromium, water, filtered, micrograms per liter	µg/L	31	0.77	16	3.94
16-Jun-09	14-Dec-10	Chromium, water, unfiltered, recoverable, micrograms per liter	µg/L	19	1.8	130	12.21
16-Jun-09	13-Dec-11	Copper, water, filtered, micrograms per liter	µg/L	31	1.4	8.5	3.09
16-Jun-09	14-Dec-10	Copper, water, unfiltered, recoverable, micrograms per liter	µg/L	19	2.7	36	6.62
16-Jun-09	14-Dec-10	Iron, water, unfiltered, recoverable, micrograms per liter	µg/L	19	160	21000	1930.53
16-Jun-09	13-Dec-11	Iron, water, filtered, micrograms per liter	µg/L	31	5.6	400	77.37
16-Jun-09	13-Dec-11	Lead, water, filtered, micrograms per liter	µg/L	31	0.0016	0.93	0.17
16-Jun-09	14-Dec-10	Lead, water, unfiltered, recoverable, micrograms per liter	µg/L	19	0.34	51	4.77
16-Jun-09	14-Dec-10	Manganese, water, unfiltered, recoverable, micrograms per liter	µg/L	19	63	1100	258.68
16-Jun-09	14-Dec-10	Manganese, water, filtered, micrograms per liter	µg/L	19	27	720	160.05
16-Jun-09	13-Dec-11	Nickel, water, filtered, micrograms per liter	µg/L	31	1.5	6.8	4.22
16-Jun-09	14-Dec-10	Nickel, water, unfiltered, recoverable, micrograms per liter	µg/L	19	3.1	30	7.06
16-Jun-09	14-Dec-10	Silver, water, filtered, micrograms per liter	µg/L	19	0.00475	0.18	0.03
16-Jun-09	14-Dec-10	Silver, water, unfiltered, recoverable, micrograms per liter	µg/L	19	0.00475	0.14	0.04
16-Jun-09	13-Dec-11	Zinc, water, filtered, micrograms per liter	µg/L	31	0.0095	12	4.15
16-Jun-09	14-Dec-10	Zinc, water, unfiltered, recoverable, micrograms per liter	µg/L	19	4.6	160	22.52
16-Jun-09	14-Dec-10	Aluminum, water, unfiltered, recoverable, micrograms per liter	µg/L	19	99	15000	1403.11
16-Jun-09	14-Dec-10	Aluminum, water, filtered, micrograms per liter	µg/L	19	1.8	140	38.53
16-Jun-09	13-Dec-11	Selenium, water, filtered, micrograms per liter	µg/L	31	0.46	4	1.76
16-Jun-09	14-Dec-10	Selenium, water, unfiltered, micrograms per liter	µg/L	19	0.33	6.2	2.01
16-Jun-09	15-Dec-09	Fecal coliform, M-FC MF (0.45 micron) method, water, colonies per 100 milliliters	cfu/100mL	7	240	182000	45377.14
12-Apr-11	18-Jun-12	Fecal streptococci, m-enterococcus MF method, water, colonies per 100 milliliters	cfu/100mL	10	90	78000	14438.9
19-Jan-10	18-Jun-12	Escherichia coli, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	22	20	38700	3825.64
16-Jun-09	14-Dec-10	Mercury, water, unfiltered, recoverable, micrograms per liter	µg/L	19	0.0155	0.22	0.04
16-Jun-09	15-Dec-09	Escherichia coli, modified m-TEC MF method, water, colonies per 100 milliliters	cfu/100mL	7	160	92000	20531.43
18-Jan-11	18-Jun-12	Chloride, water, unfiltered, milligrams per liter	mg/L	18	13	560	122.33
19-Jan-10	18-Oct-11	Enterococci, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	19	20	92100	7807.53

Coldwater Creek, Hwy 367



Note – Limit shown for comparative purposes only. MDNR determines compliance based on 303(d) listing methodology

Coldwater Creek, near Black Jack



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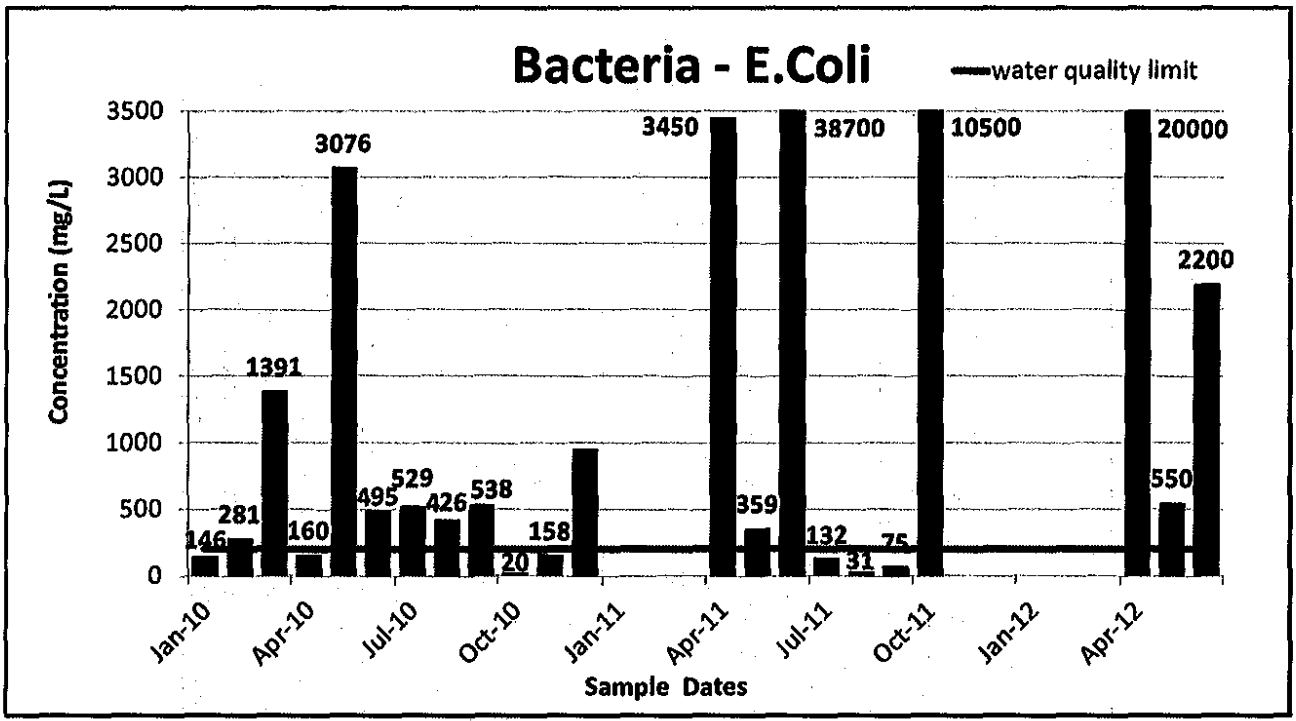


Note – Limit shown for comparative purposes only. MDNR determines compliance based on 303(d) listing methodology

Sample Summary and Statistics

Cowmire Creek at Aubochon Rd

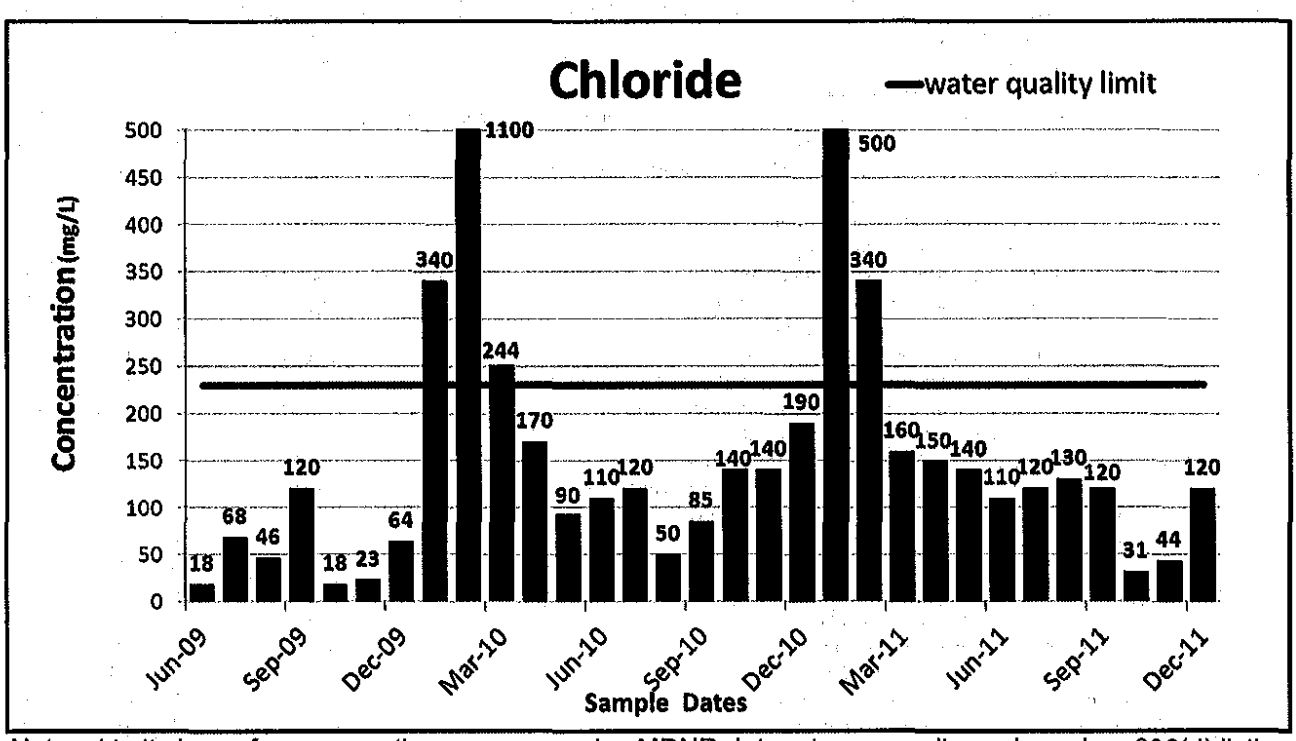
Begin Date	End Date	Parameter Description	Units	Count	Min	Max	Average
22-Jul-09	18-Jun-12	Temperature, water, degrees Celsius	°C	32	1	26.5	13.48
22-Jul-09	18-Jun-12	Dissolved oxygen, water, unfiltered, milligrams per liter	mg/L	33	1	16.6	7.63
22-Jul-09	18-Jun-12	Chemical oxygen demand, high level, water, unfiltered, milligrams per liter	mg/L	32	19	63	37.53
22-Jul-09	18-Jun-12	pH, water, unfiltered, field, standard units	SU	24	6.6	8.6	7.6
15-Feb-11	18-Jun-12	Residue, total nonfilterable, milligrams per liter	mg/L	16	7	149	37.69
16-May-11	18-Jun-12	Ammonia, water, filtered, milligrams per liter as nitrogen	mg/L as N	13	0.025	0.18	0.11
15-Feb-11	19-Dec-11	Ammonia plus organic nitrogen, water, unfiltered, milligrams per liter as nitrogen	mg/L	10	1.5	3.92	1.74
15-Feb-11	19-Dec-11	Nitrate plus nitrite, water, unfiltered, milligrams per liter as nitrogen	mg/L as	10	0.1	0.99	0.36
15-Feb-11	19-Dec-11	Phosphorus, water, unfiltered, milligrams per liter as phosphorus	mg/L	10	0.125	0.448	0.17
09-Mar-11	19-Dec-11	Orthophosphate, water, filtered, milligrams per liter as phosphorus	mg/L as P	8	0.03	0.111	0.07
22-Jul-09	19-Dec-11	Hardness, water, milligrams per liter as calcium carbonate	mg/L	26	140	2904.4	476.96
22-Jul-09	19-Dec-11	Cadmium, water, filtered, micrograms per liter	µg/L	26	0.00015	0.15	0.06
22-Jul-09	19-Dec-11	Chromium, water, filtered, micrograms per liter	µg/L	26	0.003	3	1.27
22-Jul-09	19-Dec-11	Copper, water, filtered, micrograms per liter	µg/L	26	0.0012	58.7	3
22-Jul-09	19-Dec-11	Iron, water, filtered, micrograms per liter	µg/L	26	0.03	120	16.21
22-Jul-09	19-Dec-11	Lead, water, filtered, micrograms per liter	µg/L	26	0.00045	0.45	0.19
22-Jul-09	19-Dec-11	Nickel, water, filtered, micrograms per liter	µg/L	26	0.0135	13.5	5.72
22-Jul-09	19-Dec-11	Zinc, water, filtered, micrograms per liter	µg/L	26	0.0105	610	29.98
22-Jul-09	23-Sep-09	Fecal coliform, M-FC MF (0.7 micron) method, water, colonies per 100 milliliters	cfu/100 mL	4	1300	4100	2350
22-Jul-09	18-Jun-12	Fecal streptococci, m-enterococcus MF method, water, colonies per 100 milliliters	cfu/100mL	16	110	52000	5918.12
04-May-10	18-Jun-12	Escherichia coli, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	12	107	24200	5262.5
22-Jul-09	18-Jun-12	Chloride, water, unfiltered, milligrams per liter	mg/L	32	72	1640	251.12
04-May-10	17-Oct-11	Enterococci, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	10	86	36294	9055.7

Sample Summary and Statistics

Creve Coeur Creek near Creve Coeur, MO

Begin Date	End Date	Parameter Description	Units	Count	Min	Max	Average
16-Jun-09	13-Dec-11	Temperature, water, degrees Celsius	°C	31	0.37	27.98	13.99
17-May-11	13-Dec-11	Discharge, cubic feet per second	cfs	4	8.4	112	42.35
16-Jun-09	13-Sep-11	Discharge, instantaneous, cubic feet per second	cfs	27	1.5	1730	135.31
16-Jun-09	13-Dec-11	Specific conductance, water, unfiltered, field, microsiemens per centimeter at 25 degrees Celsius	uS/cm at 25 °C	31	217	3921	997.97
16-Jun-09	13-Dec-11	Dissolved oxygen, water, unfiltered, milligrams per liter	mg/L	31	4.22	14.35	8.07
16-Jun-09	13-Dec-11	Chemical oxygen demand, high level, water, unfiltered, milligrams per liter	mg/L	31	1.6	82	18.22
16-Jun-09	13-Dec-11	pH, water, unfiltered, field, standard units	SU	31	6.92	8.17	7.63
16-Jun-09	13-Dec-11	Residue, total nonfilterable, milligrams per liter	mg/L	31	2	500	57.94
18-Jan-11	13-Dec-11	Total nitrogen, water, unfiltered, milligrams per liter	mg/L	12	0.75	1.5	1.05
16-Jun-09	14-Dec-10	Ammonia, water, filtered, milligrams per liter as nitrogen	mg/L as N	19	0.0022	0.26	0.07
18-Jan-11	13-Dec-11	Ammonia, water, unfiltered, milligrams per liter as nitrogen	mg/L	12	0.029	0.22	0.09
16-Jun-09	14-Dec-10	Nitrite, water, filtered, milligrams per liter as nitrogen	mg/L as N	19	0.001	0.1	0.02
16-Jun-09	14-Dec-10	Nitrate, water, filtered, milligrams per liter as nitrogen	mg/L as N	19	0.06	1.4	0.5
16-Jun-09	13-Dec-11	Ammonia plus organic nitrogen, water, unfiltered, milligrams per liter as nitrogen	mg/L	31	0.54	1.9	0.96
18-Jan-11	13-Dec-11	Nitrate plus nitrite, water, unfiltered, milligrams per liter as nitrogen	mg/L as	12	0.28	0.66	0.5
16-Jun-09	14-Dec-10	Nitrate plus nitrite, water, filtered, milligrams per liter as nitrogen	mg/L as N	19	0.061	1.45	0.53
16-Jun-09	13-Dec-11	Phosphorus, water, unfiltered, milligrams per liter as phosphorus	mg/L	31	0.05	0.64	0.2
16-Jun-09	13-Dec-11	Orthophosphate, water, filtered, milligrams per liter as phosphorus	mg/L as P	31	0.01	0.21	0.1
16-Jun-09	13-Dec-11	Hardness, water, milligrams per liter as calcium carbonate	mg/L	31	57	430	239.74
16-Jun-09	14-Dec-10	Calcium, water, filtered, milligrams per liter	mg/L	19	17	120	63.84
16-Jun-09	14-Dec-10	Magnesium, water, filtered, milligrams per liter	mg/L	19	3.7	26	15.31
16-Jun-09	14-Dec-10	Chloride, water, filtered, milligrams per liter	mg/L	19	18	1100	165.05
16-Jun-09	14-Dec-10	Arsenic, water, filtered, micrograms per liter	µg/L	19	1	4.1	2.36
16-Jun-09	14-Dec-10	Arsenic, water, unfiltered, micrograms per liter	µg/L	19	1.4	5.3	2.86
16-Jun-09	14-Dec-10	Beryllium, water, filtered, micrograms per liter	µg/L	19	0.00065	0.04	0.02
16-Jun-09	14-Dec-10	Beryllium, water, unfiltered, recoverable, micrograms per liter	µg/L	19	0.006	0.41	0.06
16-Jun-09	13-Dec-11	Cadmium, water, filtered, micrograms per liter	µg/L	31	0.00395	0.18	0.05
16-Jun-09	14-Dec-10	Cadmium, water, unfiltered, micrograms per liter	µg/L	19	0.01	0.23	0.06
16-Jun-09	13-Dec-11	Chromium, water, filtered, micrograms per liter	µg/L	31	0.99	23	4.76
16-Jun-09	14-Dec-10	Chromium, water, unfiltered, recoverable, micrograms per liter	µg/L	19	1.4	25	5.65
16-Jun-09	13-Dec-11	Copper, water, filtered, micrograms per liter	µg/L	31	1.5	11	3.46
16-Jun-09	14-Dec-10	Copper, water, unfiltered, recoverable, micrograms per liter	µg/L	19	2.3	14	5.39
16-Jun-09	14-Dec-10	Iron, water, unfiltered, recoverable, micrograms per liter	µg/L	19	220	9300	1816.32
16-Jun-09	13-Dec-11	Iron, water, filtered, micrograms per liter	µg/L	31	6.5	410	76.66
16-Jun-09	13-Dec-11	Lead, water, filtered, micrograms per liter	µg/L	31	0.0016	0.5	0.09
16-Jun-09	14-Dec-10	Lead, water, unfiltered, recoverable, micrograms per liter	µg/L	19	0.26	13	2.19
16-Jun-09	14-Dec-10	Manganese, water, unfiltered, recoverable, micrograms per liter	µg/L	19	85	700	304.47
16-Jun-09	14-Dec-10	Manganese, water, filtered, micrograms per liter	µg/L	19	74	680	215.37
16-Jun-09	13-Dec-11	Nickel, water, filtered, micrograms per liter	µg/L	31	2.4	9.6	5.26
16-Jun-09	14-Dec-10	Nickel, water, unfiltered, recoverable, micrograms per liter	µg/L	19	4.2	16	7.15
16-Jun-09	14-Dec-10	Silver, water, filtered, micrograms per liter	µg/L	19	0.00475	0.1	0.02
16-Jun-09	14-Dec-10	Silver, water, unfiltered, recoverable, micrograms per liter	µg/L	19	0.00475	0.4	0.09
16-Jun-09	13-Dec-11	Zinc, water, filtered, micrograms per liter	µg/L	31	0.0095	68	6.33
16-Jun-09	14-Dec-10	Zinc, water, unfiltered, recoverable, micrograms per liter	µg/L	19	3.7	42	15.09
16-Jun-09	14-Dec-10	Aluminum, water, unfiltered, recoverable, micrograms per liter	µg/L	19	140	9200	1284.21
16-Jun-09	14-Dec-10	Aluminum, water, filtered, micrograms per liter	µg/L	19	0.03	250	53.81
16-Jun-09	13-Dec-11	Selenium, water, filtered, micrograms per liter	µg/L	31	0.49	7.2	1.86
16-Jun-09	14-Dec-10	Selenium, water, unfiltered, micrograms per liter	µg/L	19	0.46	6.9	2.14
16-Jun-09	15-Dec-09	Fecal coliform, M-FC MF (0.45 micron) method, water, colonies per 100 milliliters	cfu/100mL	7	210	50000	15298.57
12-Apr-11	18-Oct-11	Fecal streptococci, m-enterococcus MF method, water, colonies per 100 milliliters	cfu/100mL	7	63	30000	5734.71
19-Jan-10	18-Oct-11	Escherichia coli, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	19	10	32800	2405.05
16-Jun-09	14-Dec-10	Mercury, water, unfiltered, recoverable, micrograms per liter	µg/L	19	0.0155	0.1	0.02
16-Jun-09	15-Dec-09	Escherichia coli, modified m-TEC MF method, water, colonies per 100 milliliters	cfu/100mL	7	70	38000	9904.29
18-Jan-11	13-Dec-11	Chloride, water, unfiltered, milligrams per liter	mg/L	12	29	500	163.58
19-Jan-10	18-Oct-11	Enterococci, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	19	10	32600	3006

Creve Coeur Creek, near Creve Coeur



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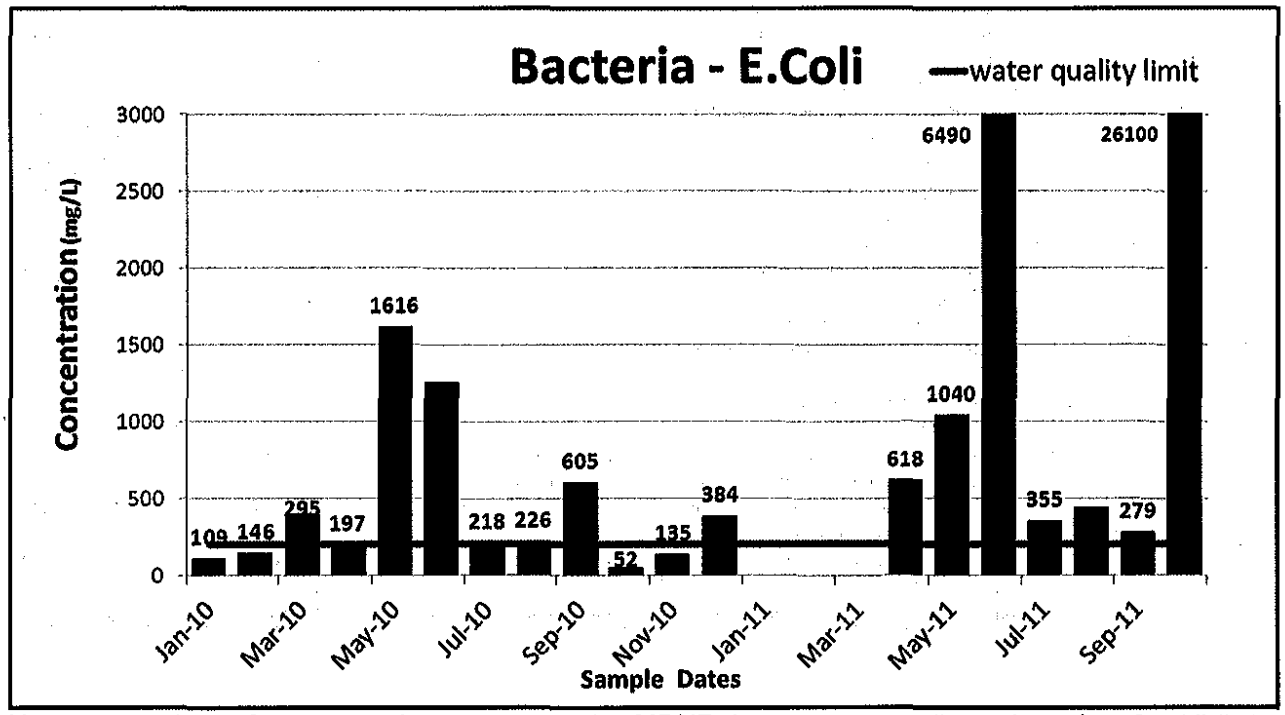


Note – Limit shown for comparative purposes only. MDNR determines compliance based on 303(d) listing methodology

Sample Summary and Statistics

Creve Couer Creek at Maryland Heights Exp

Begin Date	End Date	Parameter Description	Units	Count	Min	Max	Average
15-Nov-10	13-Jun-12	Temperature, water, degrees Celsius	°C	20	1	30	14.45
15-Nov-10	13-Jun-12	Dissolved oxygen, water, unfiltered, milligrams per liter	mg/L	20	5.5	14.6	8.56
15-Nov-10	13-Jun-12	Chemical oxygen demand, high level, water, unfiltered, milligrams per liter	mg/L	20	19	68	31.65
10-May-11	13-Jun-12	pH, water, unfiltered, field, standard units	SU	14	7.2	8.6	8.01
09-Feb-11	13-Jun-12	Residue, total nonfilterable, milligrams per liter	mg/L	16	2	107	31.19
10-May-11	13-Jun-12	Ammonia, water, filtered, milligrams per liter as nitrogen	mg/L as N	14	0.025	0.289	0.07
09-Feb-11	14-Dec-11	Ammonia plus organic nitrogen, water, unfiltered, milligrams per liter as nitrogen	mg/L	11	1.5	3.36	1.67
09-Feb-11	14-Dec-11	Nitrate plus nitrite, water, unfiltered, milligrams per liter as nitrogen	mg/L as	11	0.1	3.89	0.54
09-Feb-11	14-Dec-11	Phosphorus, water, unfiltered, milligrams per liter as phosphorus	mg/L	11	0.125	0.125	0.12
08-Mar-11	14-Dec-11	Orthophosphate, water, filtered, milligrams per liter as phosphorus	mg/L as P	10	0.01	0.087	0.03
15-Nov-10	14-Dec-11	Hardness, water, milligrams per liter as calcium carbonate	mg/L	14	154.8	436.4	210.94
15-Nov-10	14-Dec-11	Cadmium, water, filtered, micrograms per liter	µg/L	14	0.00015	0.00015	0
15-Nov-10	14-Dec-11	Chromium, water, filtered, micrograms per liter	µg/L	14	0.003	0.005	0
15-Nov-10	14-Dec-11	Copper, water, filtered, micrograms per liter	µg/L	14	0.0012	0.0027	0
15-Nov-10	14-Dec-11	Iron, water, filtered, micrograms per liter	µg/L	14	0.03	0.5062	0.07
15-Nov-10	14-Dec-11	Lead, water, filtered, micrograms per liter	µg/L	14	0.00045	0.00045	0
15-Nov-10	14-Dec-11	Nickel, water, filtered, micrograms per liter	µg/L	14	0.0135	0.02	0.02
15-Nov-10	14-Dec-11	Zinc, water, filtered, micrograms per liter	µg/L	14	0.0105	0.0544	0.02
26-Apr-11	13-Jun-12	Fecal streptococci, m-enterococcus MF method, water, colonies per 100 milliliters	cfu/100mL	10	9	310	132.4
10-May-11	13-Jun-12	Escherichia coli, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	8	10	228	51.5
15-Nov-10	13-Jun-12	Chloride, water, unfiltered, milligrams per liter	mg/L	20	60	277	113.1
26-Apr-11	11-Oct-11	Enterococci, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	7	10	189	101

Sample Summary and Statistics

Creve Couer Creek I at Missouri R. WWTP

Begin Date	End Date	Parameter Description	Units	Count	Min	Max	Average
02-Jun-09	04-Oct-10	Temperature, water, degrees Celsius	°C	15	2	27	17.13
02-Jun-09	04-Oct-10	Dissolved oxygen, water, unfiltered, milligrams per liter	mg/L	15	5.1	14	8.24
02-Jun-09	04-Oct-10	Chemical oxygen demand, high level, water, unfiltered, milligrams per liter	mg/L	15	21	47	33.67
02-Jun-09	03-May-10	pH, water, unfiltered, field, standard units	SU	13	6.5	8.6	7.75
02-Jun-09	04-Oct-10	Hardness, water, milligrams per liter as calcium carbonate	mg/L	15	119.6	396.4	200.4
02-Jun-09	04-Oct-10	Cadmium, water, filtered, micrograms per liter	µg/L	15	0.00015	0.15	0.11
02-Jun-09	04-Oct-10	Chromium, water, filtered, micrograms per liter	µg/L	15	0.003	3	2.33
02-Jun-09	04-Oct-10	Copper, water, filtered, micrograms per liter	µg/L	15	0.0012	160.8	11.85
02-Jun-09	04-Oct-10	Iron, water, filtered, micrograms per liter	µg/L	15	0.03	99	34.28
02-Jun-09	04-Oct-10	Lead, water, filtered, micrograms per liter	µg/L	15	0.00045	6.1	0.73
02-Jun-09	04-Oct-10	Nickel, water, filtered, micrograms per liter	µg/L	15	0.0135	13.5	10.5
02-Jun-09	04-Oct-10	Zinc, water, filtered, micrograms per liter	µg/L	15	0.0105	142	18.4
02-Jun-09	12-Oct-09	Fecal coliform, M-FC MF (0.7 micron) method, water, colonies per 100 milliliters	cfu/100 mL	7	5	2700	468.29
02-Jun-09	04-Oct-10	Fecal streptococci, m-enterococcus MF method, water, colonies per 100 milliliters	cfu/100mL	10	45	1500	397.5
19-Apr-10	04-Oct-10	Escherichia coli, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	4	5	20	11.25
02-Jun-09	04-Oct-10	Chloride, water, unfiltered, milligrams per liter	mg/L	15	31	248	120
19-Apr-10	04-Oct-10	Enterococci, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	4	5	243	94.5

Sample Summary and Statistics

Creve Couer Creek II at Creve Coeur Mill Rd

Begin Date	End Date	Parameter Description	Units	Count	Min	Max	Average
10-Jun-09	14-Dec-11	Temperature, water, degrees Celsius	°C	31	1	27.3	15.27
10-Jun-09	14-Dec-11	Dissolved oxygen, water, unfiltered, milligrams per liter	mg/L	31	2.4	13	6.92
10-Jun-09	14-Dec-11	Chemical oxygen demand, high level, water, unfiltered, milligrams per liter	mg/L	31	20	61	32.71
10-Jun-09	14-Dec-11	pH, water, unfiltered, field, standard units	SU	21	5.7	7.9	7.22
09-Feb-11	14-Dec-11	Residue, total nonfilterable, milligrams per liter	mg/L	10	8	42	21.2
10-May-11	14-Dec-11	Ammonia, water, filtered, milligrams per liter as nitrogen	mg/L as N	8	0.0826	0.283	0.17
09-Feb-11	14-Dec-11	Ammonia plus organic nitrogen, water, unfiltered, milligrams per liter as nitrogen	mg/L	11	1.5	3.36	1.67
09-Feb-11	14-Dec-11	Nitrate plus nitrite, water, unfiltered, milligrams per liter as nitrogen	mg/L as	11	0.312	1.32	0.73
09-Feb-11	14-Dec-11	Phosphorus, water, unfiltered, milligrams per liter as phosphorus	mg/L	11	0.125	0.298	0.15
08-Mar-11	14-Dec-11	Orthophosphate, water, filtered, milligrams per liter as phosphorus	mg/L as P	10	0.015	0.17	0.1
10-Jun-09	14-Dec-11	Hardness, water, milligrams per liter as calcium carbonate	mg/L	31	115.2	528	294.68
10-Jun-09	14-Dec-11	Cadmium, water, filtered, micrograms per liter	µg/L	31	0.00015	0.15	0.06
10-Jun-09	14-Dec-11	Chromium, water, filtered, micrograms per liter	µg/L	31	0.003	3	1.26
10-Jun-09	14-Dec-11	Copper, water, filtered, micrograms per liter	µg/L	31	0.0012	795.5	26.25
10-Jun-09	14-Dec-11	Iron, water, filtered, micrograms per liter	µg/L	31	0.03	245	24.17
10-Jun-09	14-Dec-11	Lead, water, filtered, micrograms per liter	µg/L	31	0.00045	34.6	1.29
10-Jun-09	14-Dec-11	Nickel, water, filtered, micrograms per liter	µg/L	31	0.0135	13.5	5.67
10-Jun-09	14-Dec-11	Zinc, water, filtered, micrograms per liter	µg/L	31	0.0105	670	26.09
10-Jun-09	12-Oct-09	Fecal coliform, M-FC MF (0.7 micron) method, water, colonies per 100 milliliters	cfu/100 mL	6	150	8600	2116.67
10-Jun-09	11-Oct-11	Fecal streptococci, m-enterococcus MF method, water, colonies per 100 milliliters	cfu/100mL	18	73	21000	2300.89
19-Apr-10	11-Oct-11	Escherichia coli, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	12	10	6130	1161.08
10-Jun-09	14-Dec-11	Chloride, water, unfiltered, milligrams per liter	mg/L	31	25	1010	163.29
19-Apr-10	11-Oct-11	Enterococci, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	13	41	14100	1479.62

Sample Summary and Statistics

Deer Creek at Big Bend Blvd

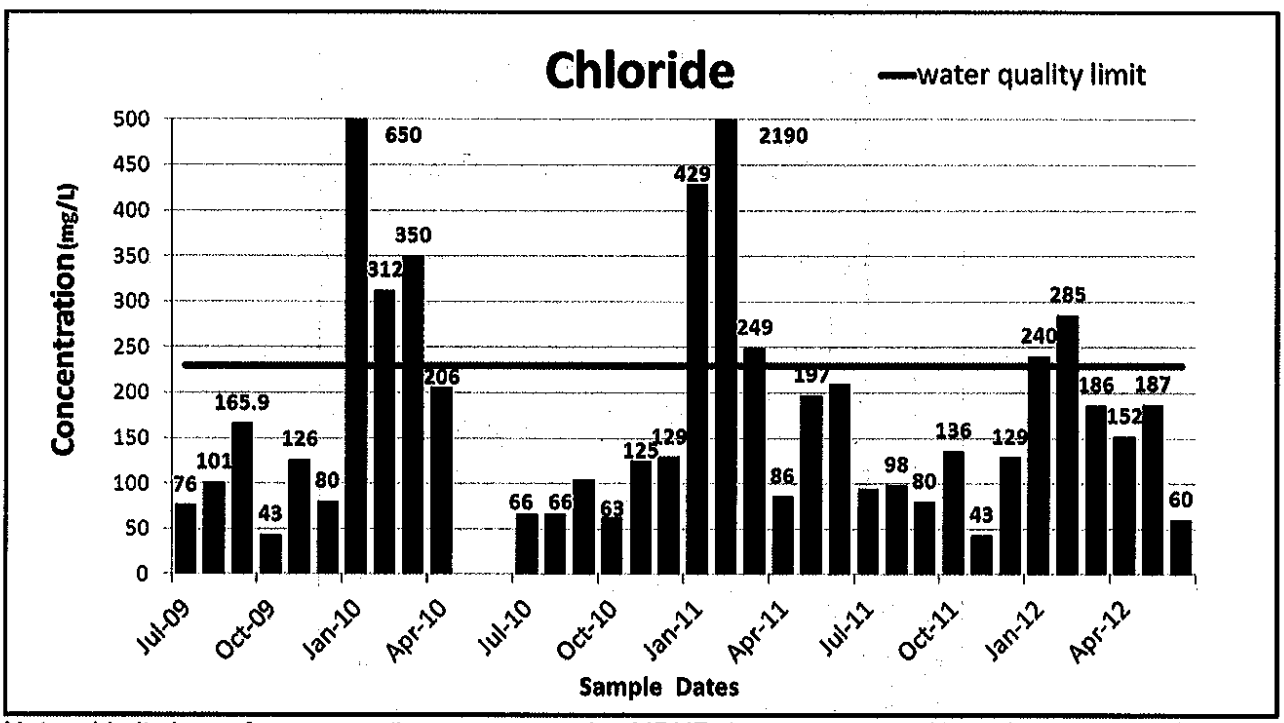
Begin Date	End Date	Parameter Description	Units	Count	Min	Max	Average
07-Jul-09	12-Jun-12	Temperature, water, degrees Celsius	°C	37	1	27	14.94
07-Jul-09	12-Jun-12	Dissolved oxygen, water, unfiltered, milligrams per liter	mg/L	37	4.44	13	7.58
07-Jul-09	12-Jun-12	Chemical oxygen demand, high level, water, unfiltered, milligrams per liter	mg/L	37	15	102	36.89
07-Jul-09	12-Jun-12	pH, water, unfiltered, field, standard units	SU	26	6.2	8.2	7.25
08-Feb-11	12-Jun-12	Residue, total nonfilterable, milligrams per liter	mg/L	17	0.5	288	27.74
09-May-11	12-Jun-12	Ammonia, water, filtered, milligrams per liter as nitrogen	mg/L as N	13	0.1	1.46	0.38
08-Feb-11	12-Dec-11	Ammonia plus organic nitrogen, water, unfiltered, milligrams per liter as nitrogen	mg/L	10	1.5	3.92	2.11
08-Feb-11	12-Dec-11	Nitrate plus nitrite, water, unfiltered, milligrams per liter as nitrogen	mg/L as	11	0.41	1.45	0.84
08-Feb-11	12-Dec-11	Phosphorus, water, unfiltered, milligrams per liter as phosphorus	mg/L	11	0.125	0.274	0.15
07-Mar-11	12-Dec-11	Orthophosphate, water, filtered, milligrams per liter as phosphorus	mg/L as P	10	0.041	0.2	0.11
07-Jul-09	12-Dec-11	Hardness, water, milligrams per liter as calcium carbonate	mg/L	31	141	480	293.66
07-Jul-09	12-Dec-11	Cadmium, water, filtered, micrograms per liter	µg/L	31	0.00015	0.15	0.06
07-Jul-09	12-Dec-11	Chromium, water, filtered, micrograms per liter	µg/L	31	0.003	3	1.16
07-Jul-09	12-Dec-11	Copper, water, filtered, micrograms per liter	µg/L	31	0.0012	122.3	4.49
07-Jul-09	12-Dec-11	Iron, water, filtered, micrograms per liter	µg/L	31	0.03	115	18.65
07-Jul-09	12-Dec-11	Lead, water, filtered, micrograms per liter	µg/L	31	0.00045	3.4	0.27
07-Jul-09	12-Dec-11	Nickel, water, filtered, micrograms per liter	µg/L	31	0.0135	13.5	5.24
07-Jul-09	12-Dec-11	Zinc, water, filtered, micrograms per liter	µg/L	31	0.0105	229	19.17
07-Jul-09	07-Oct-09	Fecal coliform, M-FC MF (0.7 micron) method, water, colonies per 100 milliliters	cfu/100 mL	5	340	25000	6332
07-Jul-09	12-Jun-12	Fecal streptococci, m-enterococcus MF method, water, colonies per 100 milliliters	cfu/100mL	22	36	28000	3253
07-Apr-10	12-Jun-12	Escherichia coli, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	16	41	24000	2159.06
07-Jul-09	12-Jun-12	Chloride, water, unfiltered, milligrams per liter	mg/L	37	43	2190	215.56
07-Apr-10	10-Oct-11	Enterococci, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	14	10	3870	901.21

Sample Summary and Statistics

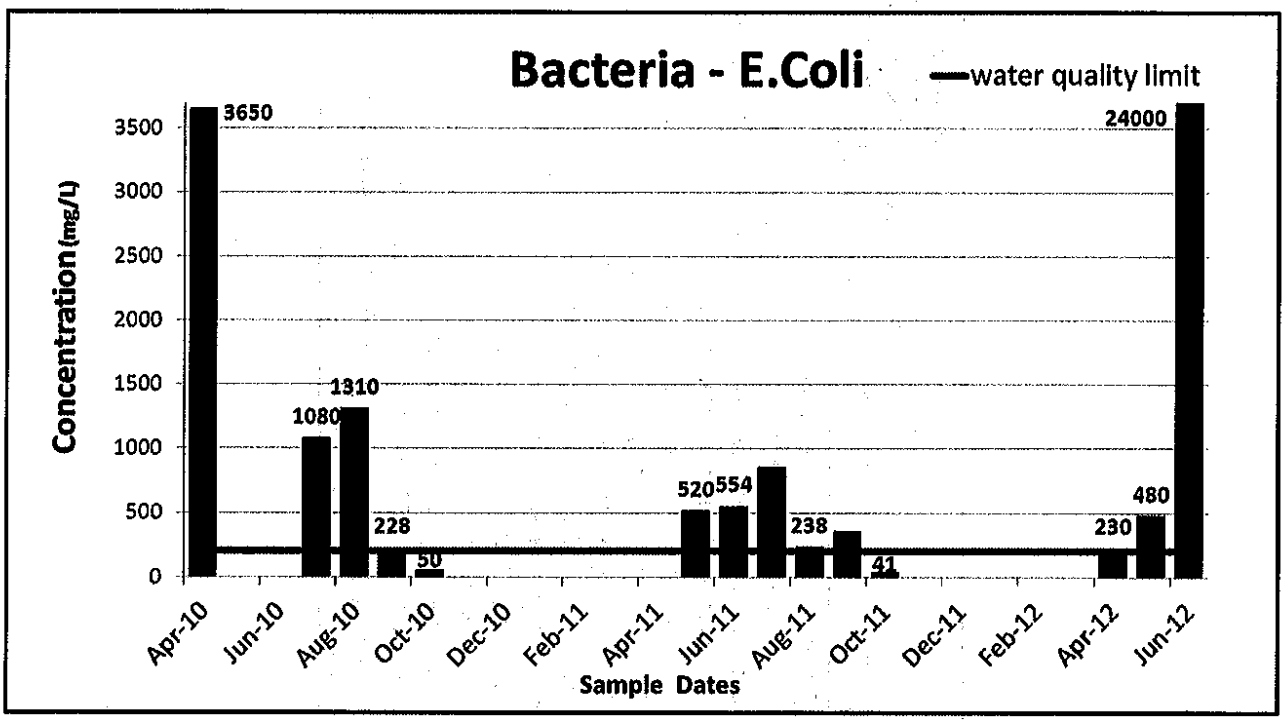
Deer Creek at Brechenridge Industrial Ct

Begin Date	End Date	Parameter Description	Units	Count	Min	Max	Average
02-Jun-09	02-Jun-09	Temperature, water, degrees Celsius	°C	1	25	25	25
02-Jun-09	02-Jun-09	Dissolved oxygen, water, unfiltered, milligrams per liter	mg/L	1	5.7	5.7	5.7
02-Jun-09	02-Jun-09	Chemical oxygen demand, high level, water, unfiltered, milligrams per liter	mg/L	1	27	27	27
02-Jun-09	02-Jun-09	pH, water, unfiltered, field, standard units	SU	1	8.2	8.2	8.2
02-Jun-09	02-Jun-09	Hardness, water, milligrams per liter as calcium carbonate	mg/L	1	311.2	311.2	311.2
02-Jun-09	02-Jun-09	Cadmium, water, filtered, micrograms per liter	µg/L	1	0.05	0.05	0.05
02-Jun-09	02-Jun-09	Chromium, water, filtered, micrograms per liter	µg/L	1	1	1	1
02-Jun-09	02-Jun-09	Copper, water, filtered, micrograms per liter	µg/L	1	1.2	1.2	1.2
02-Jun-09	02-Jun-09	Iron, water, filtered, micrograms per liter	µg/L	1	64	64	64
02-Jun-09	02-Jun-09	Lead, water, filtered, micrograms per liter	µg/L	1	0.15	0.15	0.15
02-Jun-09	02-Jun-09	Nickel, water, filtered, micrograms per liter	µg/L	1	4.5	4.5	4.5
02-Jun-09	02-Jun-09	Zinc, water, filtered, micrograms per liter	µg/L	1	37	37	37
02-Jun-09	02-Jun-09	Fecal coliform, M-FC MF (0.7 micron) method, water, colonies per 100 milliliters	cfu/100 mL	1	270	270	270
02-Jun-09	02-Jun-09	Fecal streptococci, m-enterococcus MF method, water, colonies per 100 milliliters	cfu/100mL	1	420	420	420
02-Jun-09	02-Jun-09	Chloride, water, unfiltered, milligrams per liter	mg/L	1	108	108	108

Deer Creek, near Big Bend



Note – Limit shown for comparative purposes only. MDNR determines compliance based on 303(d) listing methodology



Note – Limit shown for comparative purposes only. MDNR determines compliance based on 303(d) listing methodology

Sample Summary and Statistics

Engelholm Creek at Kingsland

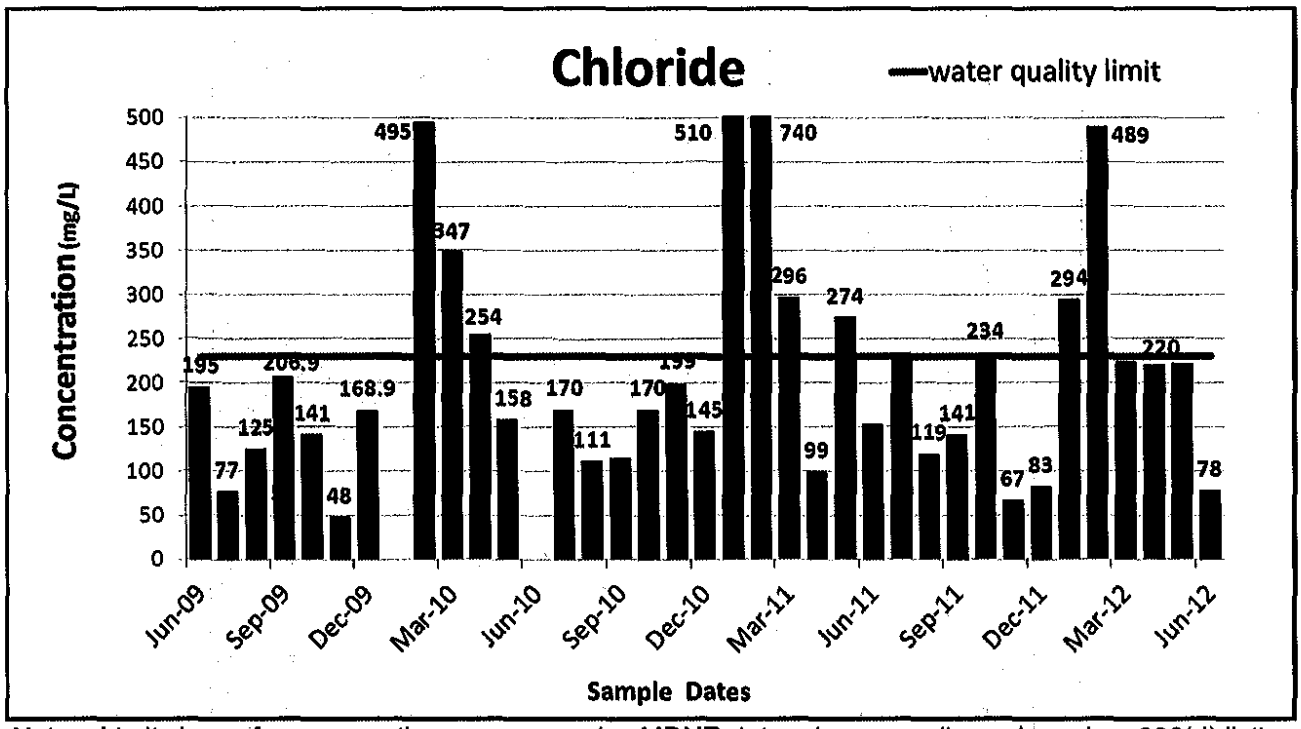
Begin Date	End Date	Parameter Description	Units	Count	Min	Max	Average
07-Jul-09	12-Jun-12	Temperature, water, degrees Celsius	°C	37	1	30	15.02
07-Jul-09	12-Jun-12	Dissolved oxygen, water, unfiltered, milligrams per liter	mg/L	37	4	15.5	7.84
07-Jul-09	12-Jun-12	Chemical oxygen demand, high level, water, unfiltered, milligrams per liter	mg/L	37	11	113	34.32
07-Jul-09	12-Jun-12	pH, water, unfiltered, field, standard units	SU	26	6.4	7.92	7.35
08-Feb-11	12-Jun-12	Residue, total nonfilterable, milligrams per liter	mg/L	17	3	107	27.82
09-May-11	12-Jun-12	Ammonia, water, filtered, milligrams per liter as nitrogen	mg/L as N	13	0.06	0.404	0.17
08-Feb-11	12-Dec-11	Ammonia plus organic nitrogen, water, unfiltered, milligrams per liter as nitrogen	mg/L	10	1.5	1.5	1.5
08-Feb-11	12-Dec-11	Nitrate plus nitrite, water, unfiltered, milligrams per liter as nitrogen	mg/L as	11	0.232	1.1	0.73
08-Feb-11	12-Dec-11	Phosphorus, water, unfiltered, milligrams per liter as phosphorus	mg/L	11	0.125	0.36	0.17
07-Mar-11	12-Dec-11	Orthophosphate, water, filtered, milligrams per liter as phosphorus	mg/L as P	10	0.015	0.259	0.14
07-Jul-09	12-Dec-11	Hardness, water, milligrams per liter as calcium carbonate	mg/L	31	162	448	290.21
07-Jul-09	12-Dec-11	Cadmium, water, filtered, micrograms per liter	µg/L	31	0.00015	0.15	0.06
07-Jul-09	12-Dec-11	Chromium, water, filtered, micrograms per liter	µg/L	31	0.003	3	1.16
07-Jul-09	12-Dec-11	Copper, water, filtered, micrograms per liter	µg/L	31	0.0012	8	0.79
07-Jul-09	12-Dec-11	Iron, water, filtered, micrograms per liter	µg/L	31	0.03	60	12.62
07-Jul-09	12-Dec-11	Lead, water, filtered, micrograms per liter	µg/L	31	0.00045	1	0.19
07-Jul-09	12-Dec-11	Nickel, water, filtered, micrograms per liter	µg/L	31	0.0135	13.5	5.24
07-Jul-09	12-Dec-11	Zinc, water, filtered, micrograms per liter	µg/L	31	0.0105	69	11.4
07-Jul-09	07-Oct-09	Fecal coliform, M-FC MF (0.7 micron) method, water, colonies per 100 milliliters	cfu/100 mL	5	170	650	410
07-Jul-09	12-Jun-12	Fecal streptococci, m-enterococcus MF method, water, colonies per 100 milliliters	cfu/100mL	22	330	35000	4310.77
07-Apr-10	12-Jun-12	Escherichia coli, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	16	318	20000	4736.5
07-Jul-09	12-Jun-12	Chloride, water, unfiltered, milligrams per liter	mg/L	37	41	940	140.73
07-Apr-10	10-Oct-11	Enterococci, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	14	187	8160	3273.64

Sample Summary and Statistics

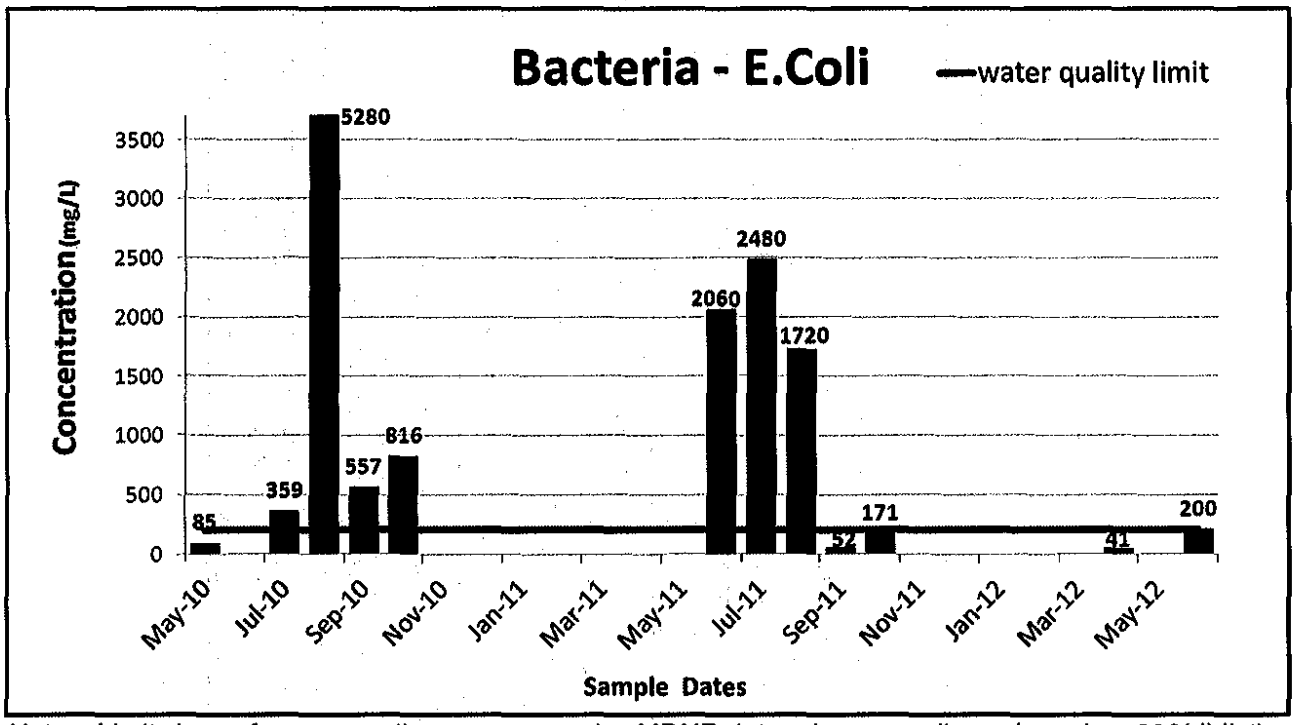
Fee Fee Creek at Creve Coeur Mill Rd

Begin Date	End Dates	Parameter Description	Units	Count	Min	Max	Average
02-Jun-09	13-Jun-12	Temperature, water, degrees Celsius	°C	37	1	28	15.02
02-Jun-09	13-Jun-12	Dissolved oxygen, water, unfiltered, milligrams per liter	mg/L	37	4.1	14.5	7.93
02-Jun-09	13-Jun-12	Chemical oxygen demand, high level, water, unfiltered, milligrams per liter	mg/L	37	20	61	33.76
02-Jun-09	13-Jun-12	pH, water, unfiltered, field, standard units	SU	27	6.2	8.1	7.58
24-Feb-11	13-Jun-12	Residue, total nonfilterable, milligrams per liter	mg/L	16	0.5	42	13.59
10-May-11	13-Jun-12	Ammonia, water, filtered, milligrams per liter as nitrogen	mg/L as N	14	0.025	0.188	0.09
24-Feb-11	14-Dec-11	Ammonia plus organic nitrogen, water, unfiltered, milligrams per liter as nitrogen	mg/L	11	1.5	3.92	1.72
24-Feb-11	14-Dec-11	Nitrate plus nitrite, water, unfiltered, milligrams per liter as nitrogen	mg/L as	11	0.1	0.88	0.56
24-Feb-11	14-Dec-11	Phosphorus, water, unfiltered, milligrams per liter as phosphorus	mg/L	11	0.125	0.307	0.14
08-Mar-11	14-Dec-11	Orthophosphate, water, filtered, milligrams per liter as phosphorus	mg/L as P	10	0.015	0.15	0.09
02-Jun-09	14-Dec-11	Hardness, water, milligrams per liter as calcium carbonate	mg/L	31	107.2	531.2	325.28
02-Jun-09	14-Dec-11	Cadmium, water, filtered, micrograms per liter	µg/L	31	0.00015	0.15	0.06
02-Jun-09	14-Dec-11	Chromium, water, filtered, micrograms per liter	µg/L	31	0.003	3	1.2
02-Jun-09	14-Dec-11	Copper, water, filtered, micrograms per liter	µg/L	31	0.0012	14.9	1.1
02-Jun-09	14-Dec-11	Iron, water, filtered, micrograms per liter	µg/L	31	0.03	181	19.07
02-Jun-09	14-Dec-11	Lead, water, filtered, micrograms per liter	µg/L	31	0.00045	0.45	0.18
02-Jun-09	14-Dec-11	Nickel, water, filtered, micrograms per liter	µg/L	31	0.0135	13.5	5.38
02-Jun-09	14-Dec-11	Zinc, water, filtered, micrograms per liter	µg/L	31	0.0105	39	7.76
02-Jun-09	12-Oct-09	Fecal coliform, M-FC MF (0.7 micron) method, water, colonies per 100 milliliters	cfu/100 mL	6	91	13000	3423.5
02-Jun-09	13-Jun-12	Fecal streptococci, m-enterococcus MF method, water, colonies per 100 milliliters	cfu/100mL	21	20	18000	1845.38
19-Apr-10	13-Jun-12	Escherichia coli, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	13	41	5280	1110.85
02-Jun-09	13-Jun-12	Chloride, water, unfiltered, milligrams per liter	mg/L	37	48	740	216.02
19-Apr-10	11-Oct-11	Enterococci, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	13	20	24196	2630

Fee Fee Creek



Note – Limit shown for comparative purposes only. MDNR determines compliance based on 303(d) listing methodology



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Sample Summary and Statistics

Fenton Creek at Hwy 141

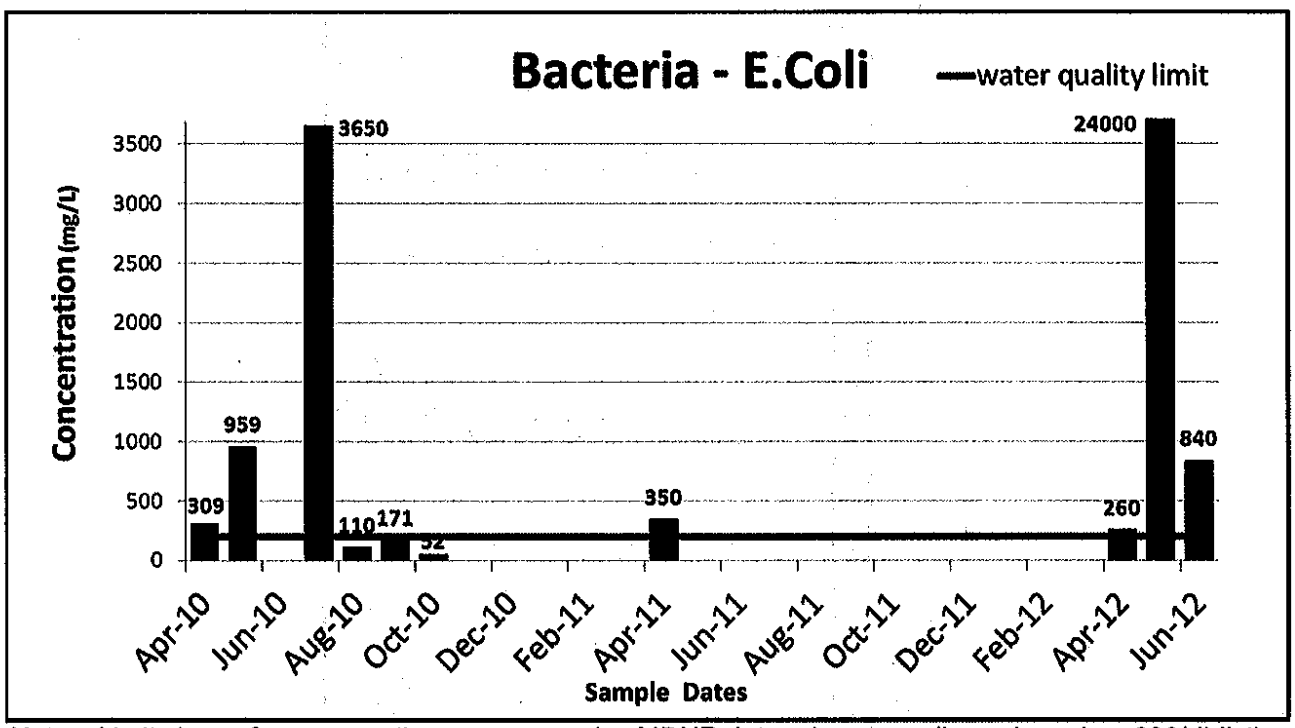
Begin Date	End Date	Parameter Description	Units	Count	Min	Max	Average
12-Apr-10	04-Jun-12	Temperature, water, degrees Celsius	°C	20	2	27	14.18
12-Apr-10	04-Jun-12	Dissolved oxygen, water, unfiltered, milligrams per liter	mg/L	20	5.5	12.39	8.99
12-Apr-10	04-Jun-12	Chemical oxygen demand, high level, water, unfiltered, milligrams per liter	mg/L	20	2	42	22.05
12-Apr-10	04-Jun-12	pH, water, unfiltered, field, standard units	SU	9	6.9	8.2	7.84
16-Feb-11	04-Jun-12	Residue, total nonfilterable, milligrams per liter	mg/L	10	0.5	27	9.75
05-Dec-11	04-Jun-12	Ammonia, water, filtered, milligrams per liter as nitrogen	mg/L as N	7	0.025	0.279	0.12
16-Feb-11	05-Dec-11	Ammonia plus organic nitrogen, water, unfiltered, milligrams per liter as nitrogen	mg/L	4	1.5	1.5	1.5
16-Feb-11	05-Dec-11	Nitrate plus nitrite, water, unfiltered, milligrams per liter as nitrogen	mg/L as	4	0.53	0.86	0.71
16-Feb-11	05-Dec-11	Phosphorus, water, unfiltered, milligrams per liter as phosphorus	mg/L	4	0.125	0.125	0.12
01-Mar-11	05-Dec-11	Orthophosphate, water, filtered, milligrams per liter as phosphorus	mg/L as P	3	0.03	0.055	0.05
12-Apr-10	05-Dec-11	Hardness, water, milligrams per liter as calcium carbonate	mg/L	14	140	532	414.97
12-Apr-10	05-Dec-11	Cadmium, water, filtered, micrograms per liter	µg/L	14	0.00015	0.15	0.02
12-Apr-10	05-Dec-11	Chromium, water, filtered, micrograms per liter	µg/L	14	0.003	3	0.43
12-Apr-10	05-Dec-11	Copper, water, filtered, micrograms per liter	µg/L	14	0.0012	23.6	1.77
12-Apr-10	05-Dec-11	Iron, water, filtered, micrograms per liter	µg/L	14	0.03	30	4.31
12-Apr-10	05-Dec-11	Lead, water, filtered, micrograms per liter	µg/L	14	0.00045	0.45	0.06
12-Apr-10	05-Dec-11	Nickel, water, filtered, micrograms per liter	µg/L	14	0.0135	13.5	1.94
12-Apr-10	05-Dec-11	Zinc, water, filtered, micrograms per liter	µg/L	14	0.0105	32	3.05
12-Apr-10	04-Jun-12	Fecal streptococci, m-enterococcus MF method, water, colonies per 100 milliliters	cfu/100mL	11	45	220000	41422.73
12-Apr-10	04-Jun-12	Escherichia coli, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	11	52	24000	2797.73
12-Apr-10	04-Jun-12	Chloride, water, unfiltered, milligrams per liter	mg/L	21	30	431	165.71
12-Apr-10	06-Apr-11	Enterococci, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	8	52	24196	3390.12

Sample Summary and Statistics

Fenton Creek at Winter Co. Park

Begin Date	End Date	Parameter Description	Units	Count	Min	Max	Average
28-Jul-09	17-Mar-10	Temperature, water, degrees Celsius	°C	10	2	23	12.6
28-Jul-09	17-Mar-10	Dissolved oxygen, water, unfiltered, milligrams per liter	mg/L	10	6.4	13.4	9.78
28-Jul-09	17-Mar-10	Chemical oxygen demand, high level, water, unfiltered, milligrams per liter	mg/L	10	13	33	20.5
28-Jul-09	17-Mar-10	pH, water, unfiltered, field, standard units	SU	10	6.1	7.7	6.98
28-Jul-09	17-Mar-10	Hardness, water, milligrams per liter as calcium carbonate	mg/L	10	200	568	463.28
28-Jul-09	17-Mar-10	Cadmium, water, filtered, micrograms per liter	µg/L	10	0.15	0.15	0.15
28-Jul-09	17-Mar-10	Chromium, water, filtered, micrograms per liter	µg/L	10	3	3	3
28-Jul-09	17-Mar-10	Copper, water, filtered, micrograms per liter	µg/L	10	1.2	1.2	1.2
28-Jul-09	17-Mar-10	Iron, water, filtered, micrograms per liter	µg/L	10	30	163	43.3
28-Jul-09	17-Mar-10	Lead, water, filtered, micrograms per liter	µg/L	10	0.45	4.5	0.86
28-Jul-09	17-Mar-10	Nickel, water, filtered, micrograms per liter	µg/L	10	13.5	13.5	13.5
28-Jul-09	17-Mar-10	Zinc, water, filtered, micrograms per liter	µg/L	10	10.5	35	12.95
28-Jul-09	21-Oct-09	Fecal coliform, M-FC MF (0.7 micron) method, water, colonies per 100 milliliters	cfu/100 mL	5	230	1400	552
28-Jul-09	21-Oct-09	Fecal streptococci, m-enterococcus MF method, water, colonies per 100 milliliters	cfu/100mL	5	500	1400	910
28-Jul-09	17-Mar-10	Chloride, water, unfiltered, milligrams per liter	mg/L	10	55	229	144.59

Fenton Creek



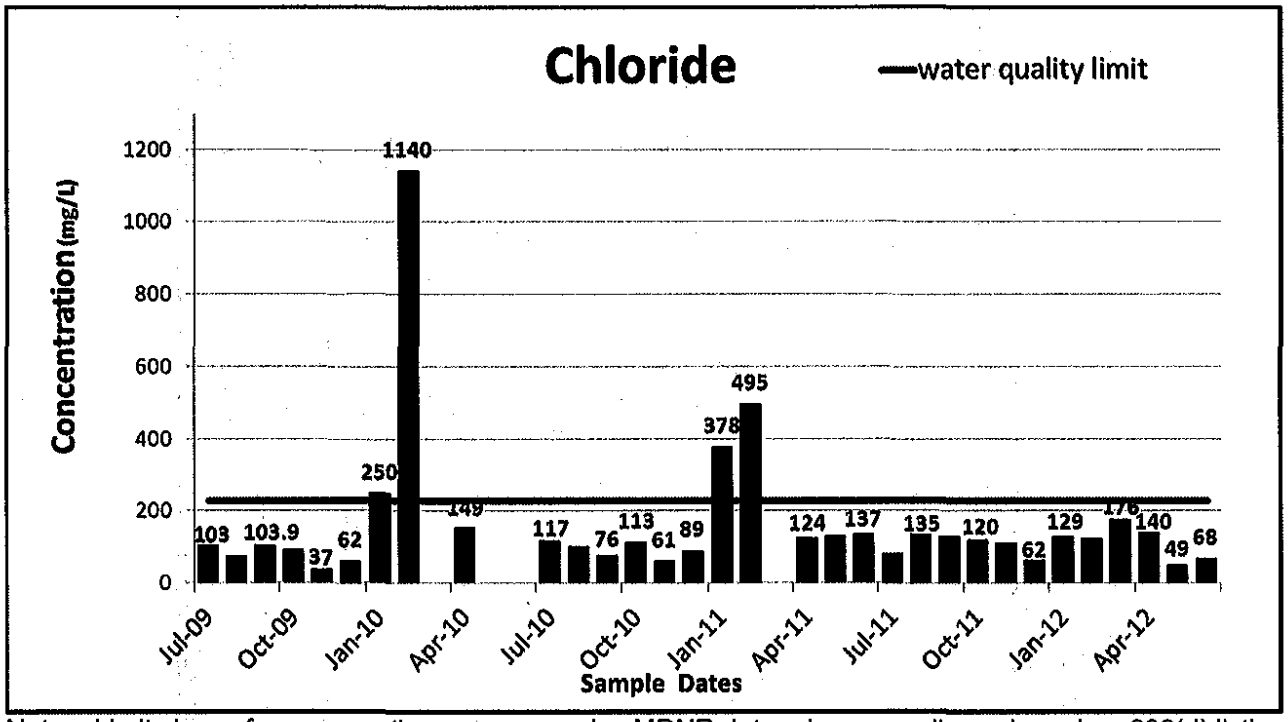
Note – Limit shown for comparative purposes only. MDNR determines compliance based on 303(d) listing methodology

Sample Summary and Statistics

Fishpot Creek at Vance Rd

Begin Date	End Date	Parameter Description	Units	Count	Min	Max	Average
29-Jul-09	06-Jun-12	Temperature, water, degrees Celsius	°C	36	4	24	13.94
29-Jul-09	06-Jun-12	Dissolved oxygen, water, unfiltered, milligrams per liter	mg/L	36	6	10.9	7.93
29-Jul-09	06-Jun-12	Chemical oxygen demand, high level, water, unfiltered, milligrams per liter	mg/L	36	7	43	20.03
29-Jul-09	06-Jun-12	pH, water, unfiltered, field, standard units	SU	26	6.3	8	7.18
22-Feb-11	06-Jun-12	Residue, total nonfilterable, milligrams per liter	mg/L	16	1	15	5.12
17-May-11	06-Jun-12	Ammonia, water, filtered, milligrams per liter as nitrogen	mg/L as N	14	0.025	0.0768	0.03
22-Feb-11	06-Dec-11	Ammonia plus organic nitrogen, water, unfiltered, milligrams per liter as nitrogen	mg/L	10	1.5	1.5	1.5
22-Feb-11	06-Dec-11	Nitrate plus nitrite, water, unfiltered, milligrams per liter as nitrogen	mg/L as	10	0.29	2.19	1.34
22-Feb-11	06-Dec-11	Phosphorus, water, unfiltered, milligrams per liter as phosphorus	mg/L	10	0.125	0.125	0.12
05-Apr-11	06-Dec-11	Orthophosphate, water, filtered, milligrams per liter as phosphorus	mg/L as P	9	0.053	0.1	0.08
29-Jul-09	06-Dec-11	Hardness, water, milligrams per liter as calcium carbonate	mg/L	30	2.8	473.2	273.17
29-Jul-09	06-Dec-11	Cadmium, water, filtered, micrograms per liter	µg/L	29	0.00015	0.15	0.06
29-Jul-09	06-Dec-11	Chromium, water, filtered, micrograms per liter	µg/L	30	0.003	3	1.2
29-Jul-09	06-Dec-11	Copper, water, filtered, micrograms per liter	µg/L	30	0.0012	10.6	0.98
29-Jul-09	06-Dec-11	Iron, water, filtered, micrograms per liter	µg/L	30	0.03	30	12.02
29-Jul-09	06-Dec-11	Lead, water, filtered, micrograms per liter	µg/L	30	0.00045	0.45	0.18
29-Jul-09	06-Dec-11	Nickel, water, filtered, micrograms per liter	µg/L	30	0.0135	13.5	5.41
29-Jul-09	06-Dec-11	Zinc, water, filtered, micrograms per liter	µg/L	30	0.0105	80	8.28
29-Jul-09	05-Jan-11	Aluminum, water, filtered, micrograms per liter	µg/L	20	0.0645	64.5	38.73
29-Jul-09	06-Oct-09	Fecal coliform, M-FC MF (0.7 micron) method, water, colonies per 100 milliliters	cfu/100 mL	4	180	58000	14745
29-Jul-09	06-Jun-12	Fecal streptococci, m-enterococcus MF method, water, colonies per 100 milliliters	cfu/100mL	22	27	20000	2279.18
06-Apr-10	06-Jun-12	Escherichia coli, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	18	52	4600	748.06
29-Jul-09	06-Jun-12	Chloride, water, unfiltered, milligrams per liter	mg/L	36	37	1140	154.94
06-Apr-10	04-Oct-11	Enterococci, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	15	31	2910	766.27

Fishpot Creek



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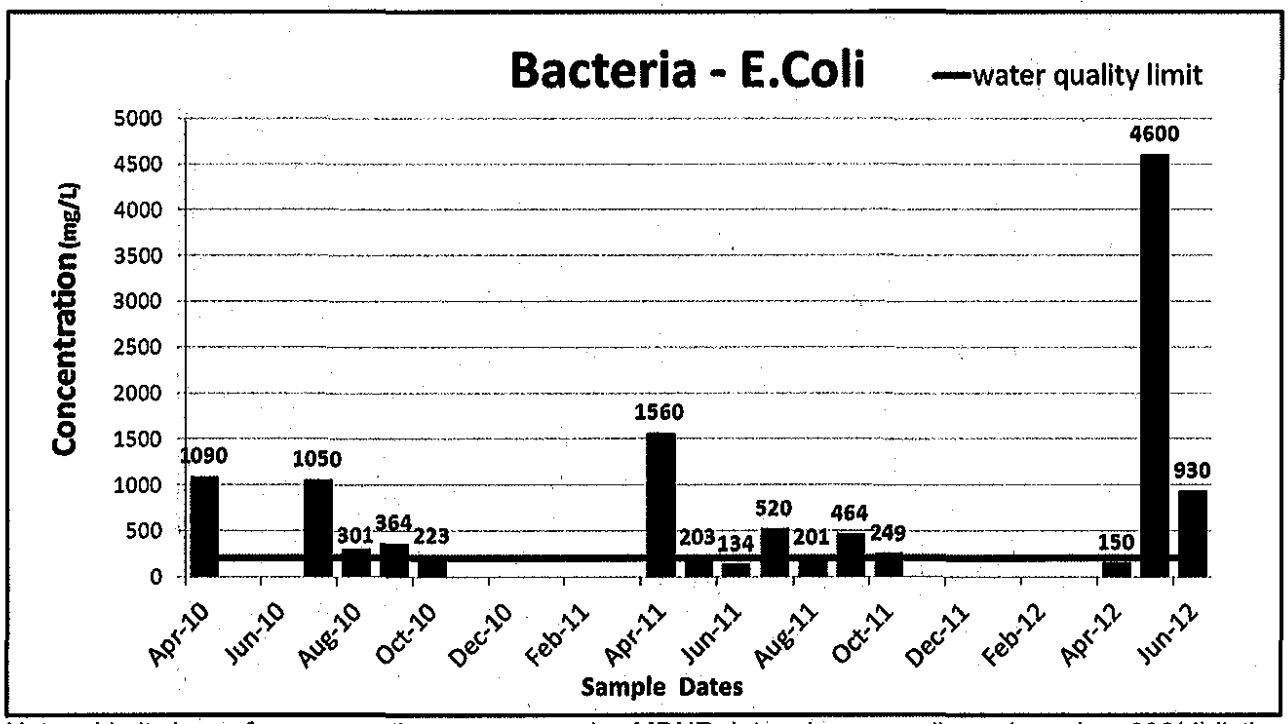


Note – Limit shown for comparative purposes only. MDNR determines compliance based on 303(d) listing methodology

Sample Summary and Statistics

Grand Glaize Creek at Marshall Rd

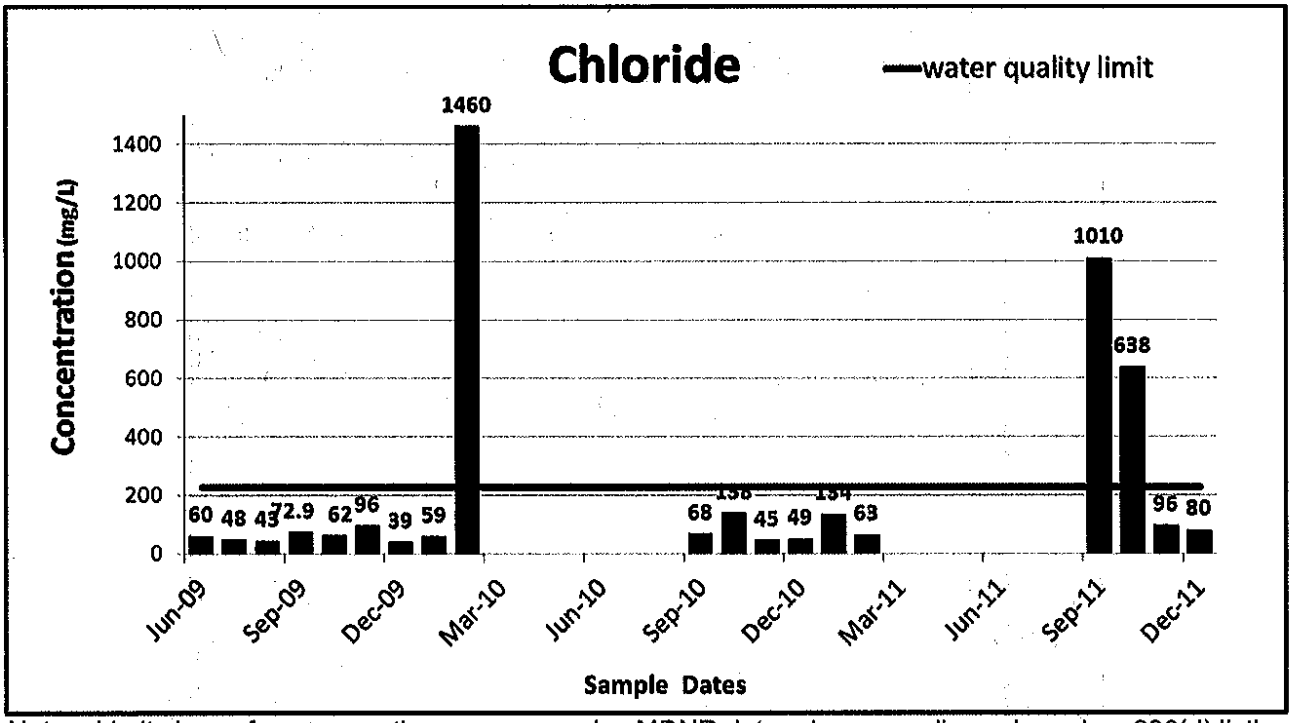
Begin Date	End Date	Parameter Description	Units	Count	Min	Max	Average
10-Jun-09	06-Dec-11	Temperature, water, degrees Celsius	°C	20	3	27	13.38
10-Jun-09	06-Dec-11	Dissolved oxygen, water, unfiltered, milligrams per liter	mg/L	20	5.7	13.3	8.74
10-Jun-09	06-Dec-11	Chemical oxygen demand, high level, water, unfiltered, milligrams per liter	mg/L	20	16	109	37.55
10-Jun-09	06-Dec-11	pH, water, unfiltered, field, standard units	SU	14	6	8	7.23
22-Feb-11	06-Dec-11	Residue, total nonfilterable, milligrams per liter	mg/L	5	4	32	12.2
07-Sep-11	06-Dec-11	Ammonia, water, filtered, milligrams per liter as nitrogen	mg/L as N	4	0.025	0.185	0.09
22-Feb-11	06-Dec-11	Ammonia plus organic nitrogen, water, unfiltered, milligrams per liter as nitrogen	mg/L	5	1.5	3.36	1.87
22-Feb-11	06-Dec-11	Nitrate plus nitrite, water, unfiltered, milligrams per liter as nitrogen	mg/L as	5	0.1	0.449	0.34
22-Feb-11	06-Dec-11	Phosphorus, water, unfiltered, milligrams per liter as phosphorus	mg/L	5	0.125	0.125	0.12
07-Sep-11	06-Dec-11	Orthophosphate, water, filtered, milligrams per liter as phosphorus	mg/L as P	4	0.01	0.047	0.03
10-Jun-09	06-Dec-11	Hardness, water, milligrams per liter as calcium carbonate	mg/L	20	81.2	574	235.58
10-Jun-09	06-Dec-11	Cadmium, water, filtered, micrograms per liter	µg/L	20	0.00015	0.15	0.07
10-Jun-09	06-Dec-11	Chromium, water, filtered, micrograms per liter	µg/L	20	0.003	3	1.4
10-Jun-09	06-Dec-11	Copper, water, filtered, micrograms per liter	µg/L	20	0.0012	1.2	0.6
10-Jun-09	06-Dec-11	Iron, water, filtered, micrograms per liter	µg/L	20	0.03	178	24.63
10-Jun-09	06-Dec-11	Lead, water, filtered, micrograms per liter	µg/L	20	0.00045	0.45	0.21
10-Jun-09	06-Dec-11	Nickel, water, filtered, micrograms per liter	µg/L	20	0.0135	13.5	6.31
10-Jun-09	06-Dec-11	Zinc, water, filtered, micrograms per liter	µg/L	20	0.0105	65	17.68
10-Jun-09	06-Oct-09	Fecal coliform, M-FC MF (0.7 micron) method, water, colonies per 100 milliliters	cfu/100 mL	6	27	290000	48396
10-Jun-09	04-Oct-11	Fecal streptococci, m-enterococcus MF method, water, colonies per 100 milliliters	cfu/100mL	10	5	54000	5605.6
15-Sep-10	04-Oct-11	Escherichia coli, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	4	41	487	155.25
10-Jun-09	06-Dec-11	Chloride, water, unfiltered, milligrams per liter	mg/L	20	18	1460	213.94
15-Sep-10	04-Oct-11	Enterococci, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	4	30	350	155.75

Sample Summary and Statistics

Grand Glaize Creek near Valley Park, MO

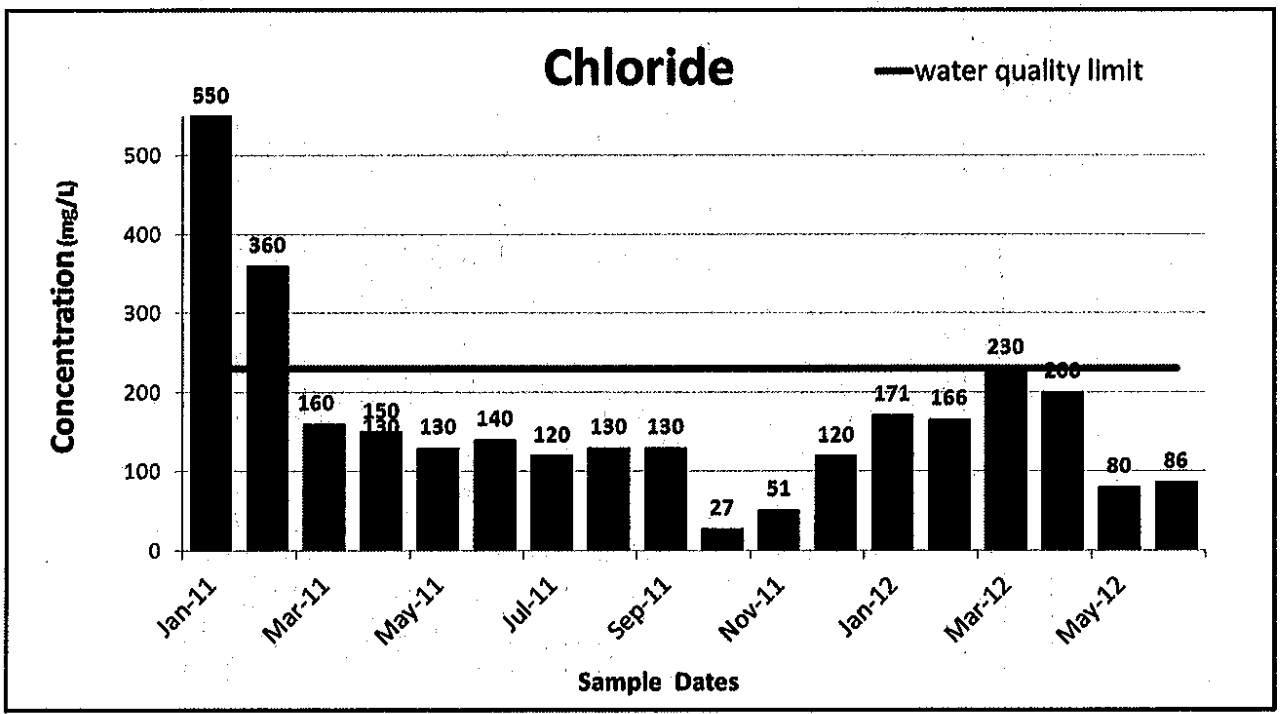
Begin Date	End Date	Parameter Description	Units	Count	Min	Max	Average
16-Jun-09	06-Jun-12	Temperature, water, degrees Celsius	°C	37	0.34	28.71	13.92
16-Jun-09	13-Dec-11	Discharge, instantaneous, cubic feet per second	cfs	31	0.74	247	24.64
16-Jun-09	13-Dec-11	Specific conductance, water, unfiltered, field, microsiemens per centimeter at 25 degrees Celsius	uS/cm at 25 °C	31	294	4912	1053.52
16-Jun-09	06-Jun-12	Dissolved oxygen, water, unfiltered, milligrams per liter	mg/L	37	3.43	15.09	8.71
16-Jun-09	06-Jun-12	Chemical oxygen demand, high level, water, unfiltered, milligrams per liter	mg/L	37	1.6	80	16.66
16-Jun-09	06-Jun-12	pH, water, unfiltered, field, standard units	SU	37	7.1	8.05	7.71
16-Jun-09	06-Jun-12	Residue, total nonfilterable, milligrams per liter	mg/L	37	0.5	440	32.24
18-Jan-11	13-Dec-11	Total nitrogen, water, unfiltered, milligrams per liter	mg/L	12	0.00115	1.4	0.57
16-Jun-09	06-Jun-12	Ammonia, water, filtered, milligrams per liter as nitrogen	mg/L as N	25	0.0022	0.202	0.04
18-Jan-11	13-Dec-11	Ammonia, water, unfiltered, milligrams per liter as nitrogen	mg/L	12	0.0022	0.074	0.03
16-Jun-09	14-Dec-10	Nitrite, water, filtered, milligrams per liter as nitrogen	mg/L as N	19	0.001	0.1	0.01
16-Jun-09	14-Dec-10	Nitrate, water, filtered, milligrams per liter as nitrogen	mg/L as N	19	0.01	0.7	0.43
16-Jun-09	13-Dec-11	Ammonia plus organic nitrogen, water, unfiltered, milligrams per liter as nitrogen	mg/L	31	0.36	1.8	0.7
18-Jan-11	13-Dec-11	Nitrate plus nitrite, water, unfiltered, milligrams per liter as nitrogen	mg/L as	12	0.12	0.79	0.42
16-Jun-09	14-Dec-10	Nitrate plus nitrite, water, filtered, milligrams per liter as nitrogen	mg/L as N	19	0.011	0.71	0.44
16-Jun-09	13-Dec-11	Phosphorus, water, unfiltered, milligrams per liter as phosphorus	mg/L	31	0.03	0.43	0.15
16-Jun-09	13-Dec-11	Orthophosphate, water, filtered, milligrams per liter as phosphorus	mg/L as P	31	0.01	0.26	0.09
16-Jun-09	13-Dec-11	Hardness, water, milligrams per liter as calcium carbonate	mg/L	31	99	460	249.35
16-Jun-09	14-Dec-10	Calcium, water, filtered, milligrams per liter	mg/L	19	30	140	67.58
16-Jun-09	14-Dec-10	Magnesium, water, filtered, milligrams per liter	mg/L	19	6.2	26	15.85
16-Jun-09	14-Dec-10	Chloride, water, filtered, milligrams per liter	mg/L	19	21	1500	180.95
16-Jun-09	14-Dec-10	Arsenic, water, filtered, micrograms per liter	µg/L	19	0.9	2.8	1.64
16-Jun-09	14-Dec-10	Arsenic, water, unfiltered, micrograms per liter	µg/L	19	1.1	6.1	2.03
16-Jun-09	14-Dec-10	Beryllium, water, filtered, micrograms per liter	µg/L	19	0.006	0.06	0.01
16-Jun-09	14-Dec-10	Beryllium, water, unfiltered, recoverable, micrograms per liter	µg/L	19	0.006	0.44	0.05
16-Jun-09	13-Dec-11	Cadmium, water, filtered, micrograms per liter	µg/L	31	0.00395	0.08	0.03
16-Jun-09	14-Dec-10	Cadmium, water, unfiltered, micrograms per liter	µg/L	19	0.01	0.28	0.06
16-Jun-09	13-Dec-11	Chromium, water, filtered, micrograms per liter	µg/L	31	1.3	33	6.05
16-Jun-09	14-Dec-10	Chromium, water, unfiltered, recoverable, micrograms per liter	µg/L	19	1.4	36	6.41
16-Jun-09	13-Dec-11	Copper, water, filtered, micrograms per liter	µg/L	31	1.7	17	3.54
16-Jun-09	14-Dec-10	Copper, water, unfiltered, recoverable, micrograms per liter	µg/L	19	2.6	20	5.13
16-Jun-09	14-Dec-10	Iron, water, unfiltered, recoverable, micrograms per liter	µg/L	19	170	13000	1290.53
16-Jun-09	13-Dec-11	Iron, water, filtered, micrograms per liter	µg/L	31	2.9	410	53.32
16-Jun-09	13-Dec-11	Lead, water, filtered, micrograms per liter	µg/L	31	0.0016	0.55	0.07
16-Jun-09	14-Dec-10	Lead, water, unfiltered, recoverable, micrograms per liter	µg/L	19	0.3	16	2.19
16-Jun-09	14-Dec-10	Manganese, water, unfiltered, recoverable, micrograms per liter	µg/L	19	92	580	197.42
16-Jun-09	14-Dec-10	Manganese, water, filtered, micrograms per liter	µg/L	19	40	320	138.84
16-Jun-09	13-Dec-11	Nickel, water, filtered, micrograms per liter	µg/L	31	1.9	8.1	5.26
16-Jun-09	14-Dec-10	Nickel, water, unfiltered, recoverable, micrograms per liter	µg/L	19	3.6	19	6.95
16-Jun-09	14-Dec-10	Silver, water, filtered, micrograms per liter	µg/L	19	0.00475	0.1	0.01
16-Jun-09	14-Dec-10	Silver, water, unfiltered, recoverable, micrograms per liter	µg/L	19	0.00475	1.1	0.09
16-Jun-09	13-Dec-11	Zinc, water, filtered, micrograms per liter	µg/L	31	0.0095	41	3.49
16-Jun-09	14-Dec-10	Zinc, water, unfiltered, recoverable, micrograms per liter	µg/L	19	3.3	57	12.14
16-Jun-09	14-Dec-10	Aluminum, water, unfiltered, recoverable, micrograms per liter	µg/L	19	92	12000	1160.63
16-Jun-09	14-Dec-10	Aluminum, water, filtered, micrograms per liter	µg/L	19	1.3	200	36.13
16-Jun-09	13-Dec-11	Selenium, water, filtered, micrograms per liter	µg/L	31	0.56	2.7	1.46
16-Jun-09	14-Dec-10	Selenium, water, unfiltered, micrograms per liter	µg/L	19	0.53	4.3	1.75
16-Jun-09	15-Dec-09	Fecal coliform, M-FC MF (0.45 micron) method, water, colonies per 100 milliliters	cfu/100mL	7	420	87300	20237.14
11-Apr-11	06-Jun-12	Fecal streptococci, m-enterococcus MF method, water, colonies per 100 milliliters	cfu/100mL	10	99	27000	3864.9
19-Jan-10	06-Jun-12	Escherichia coli, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	22	10	29100	2200.77
16-Jun-09	14-Dec-10	Mercury, water, unfiltered, recoverable, micrograms per liter	µg/L	19	0.0155	0.11	0.03
16-Jun-09	15-Dec-09	Escherichia coli, modified m-TEC MF method, water, colonies per 100 milliliters	cfu/100mL	7	230	38000	8773.29
18-Jan-11	06-Jun-12	Chloride, water, unfiltered, milligrams per liter	mg/L	18	27	550	165.61
19-Jan-10	18-Oct-11	Enterococci, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	19	20	41000	3352.74

Grand Glaize Creek, Marshall Road



Note – Limit shown for comparative purposes only. MDNR determines compliance based on 303(d) listing methodology

Grand Glaize Creek, Valley Park



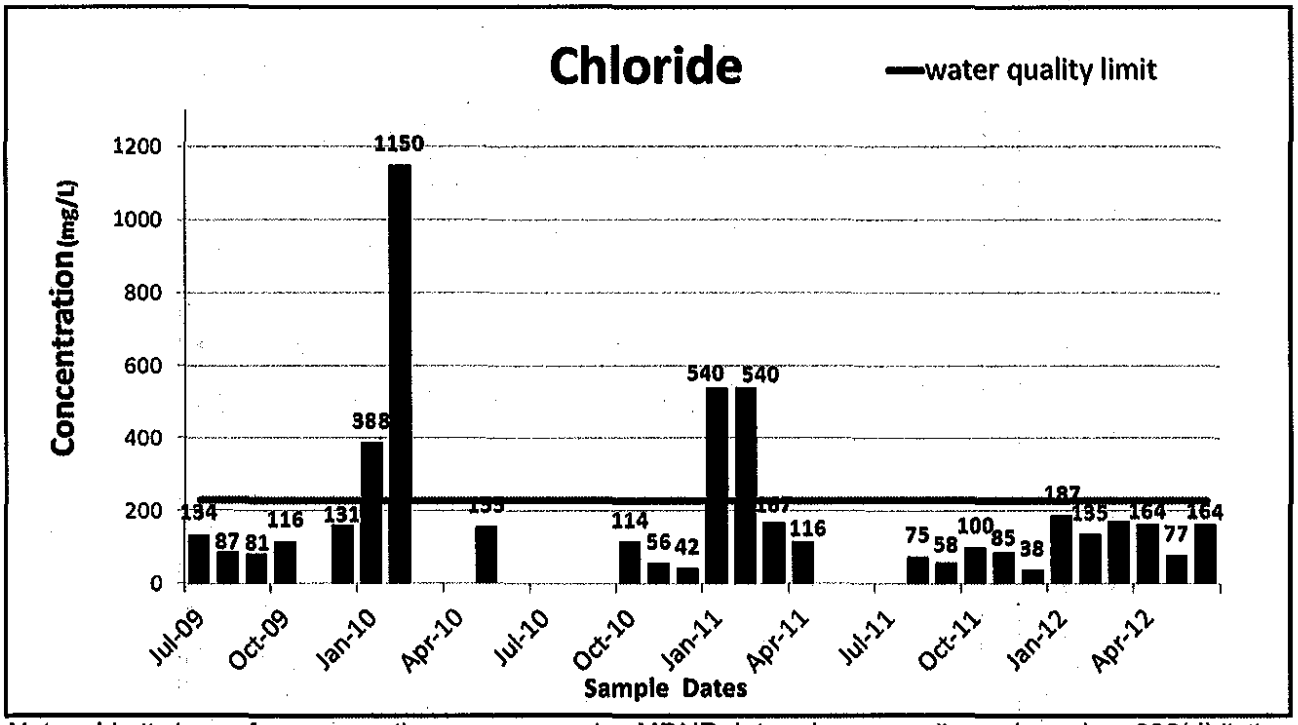
Note – Limit shown for comparative purposes only. MDNR determines compliance based on 303(d) listing methodology

Sample Summary and Statistics

Gravois Creek at Weber Rd

Begin Date	End Date	Parameter Description	Units	Count	Min	Max	Average
28-Jul-09	04-Jun-12	Temperature, water, degrees Celsius	°C	29	1	29	12.1
28-Jul-09	04-Jun-12	Dissolved oxygen, water, unfiltered, milligrams per liter	mg/L	29	5.5	13.56	8.98
28-Jul-09	04-Jun-12	Chemical oxygen demand, high level, water, unfiltered, milligrams per liter	mg/L	29	15	56	30.21
28-Jul-09	04-Jun-12	pH, water, unfiltered, field, standard units	SU	22	5.8	7.77	7.18
16-Feb-11	04-Jun-12	Residue, total nonfilterable, milligrams per liter	mg/L	14	0.5	313	33.96
01-Aug-11	04-Jun-12	Ammonia, water, filtered, milligrams per liter as nitrogen	mg/L as N	11	0.025	0.183	0.1
16-Feb-11	05-Dec-11	Ammonia plus organic nitrogen, water, unfiltered, milligrams per liter as nitrogen	mg/L	8	1.5	1.5	1.5
16-Feb-11	05-Dec-11	Nitrate plus nitrite, water, unfiltered, milligrams per liter as nitrogen	mg/L as	8	0.1	0.95	0.54
16-Feb-11	05-Dec-11	Phosphorus, water, unfiltered, milligrams per liter as phosphorus	mg/L	8	0.125	0.475	0.19
01-Mar-11	05-Dec-11	Orthophosphate, water, filtered, milligrams per liter as phosphorus	mg/L as P	7	0.05	0.185	0.11
28-Jul-09	05-Dec-11	Hardness, water, milligrams per liter as calcium carbonate	mg/L	23	116.4	778.8	275.05
28-Jul-09	05-Dec-11	Cadmium, water, filtered, micrograms per liter	µg/L	22	0.00015	0.15	0.07
28-Jul-09	05-Dec-11	Chromium, water, filtered, micrograms per liter	µg/L	23	0.003	3	1.44
28-Jul-09	05-Dec-11	Copper, water, filtered, micrograms per liter	µg/L	23	0.0012	10.1	1.05
28-Jul-09	05-Dec-11	Iron, water, filtered, micrograms per liter	µg/L	23	0.03	30	14.38
28-Jul-09	05-Dec-11	Lead, water, filtered, micrograms per liter	µg/L	23	0.00045	0.45	0.22
28-Jul-09	05-Dec-11	Nickel, water, filtered, micrograms per liter	µg/L	23	0.0135	13.5	6.46
28-Jul-09	05-Dec-11	Zinc, water, filtered, micrograms per liter	µg/L	23	0.0105	52	12.9
28-Jul-09	21-Oct-09	Fecal coliform, M-FC MF (0.7 micron) method, water, colonies per 100 milliliters	cfu/100 mL	5	18	580	259.6
28-Jul-09	04-Jun-12	Fecal streptococci, m-enterococcus MF method, water, colonies per 100 milliliters	cfu/100mL	14	82	34000	3015.29
11-May-10	04-Jun-12	Escherichia coli, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	9	74	16000	2412.56
28-Jul-09	04-Jun-12	Chloride, water, unfiltered, milligrams per liter	mg/L	29	38	1150	185.31
11-May-10	03-Oct-11	Enterococci, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	6	96	3450	837.17

Gravois Creek



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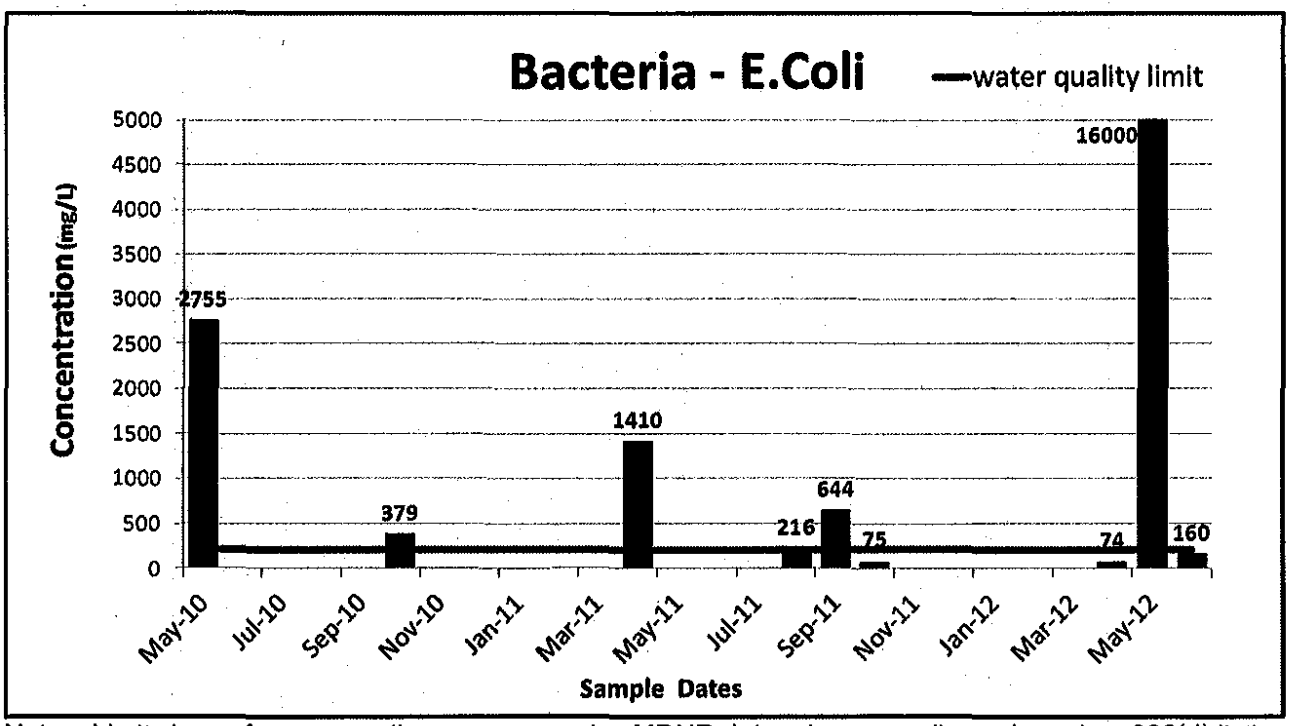


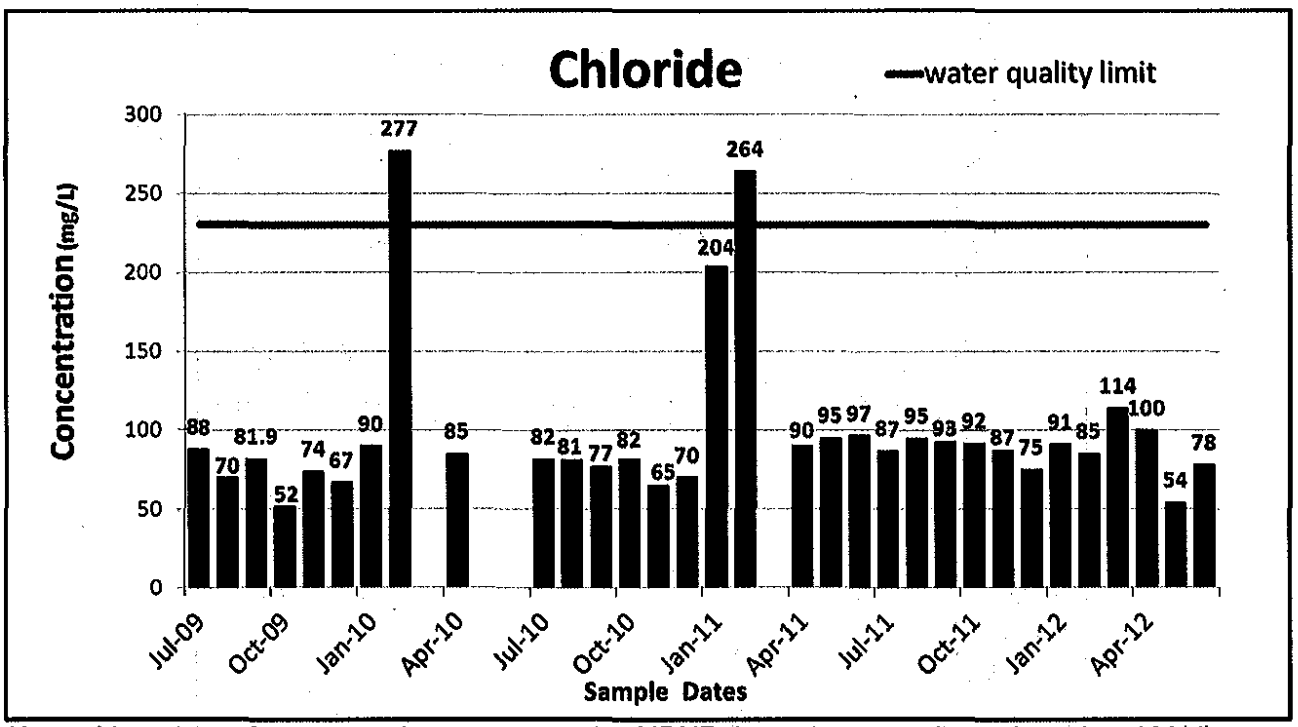
Note – Limit shown for comparative purposes only. MDNR determines compliance based on 303(d) listing methodology

Sample Summary and Statistics

Kieffer Creek at Kiefer Cr. Rd

Begin Date	End Date	Parameter Description	Units	Count	Min	Max	Average
29-Jul-09	06-Jun-12	Temperature, water, degrees Celsius	°C	36	4	24	14.18
29-Jul-09	06-Jun-12	Dissolved oxygen, water, unfiltered, milligrams per liter	mg/L	36	6.1	14	9.33
29-Jul-09	06-Jun-12	Chemical oxygen demand, high level, water, unfiltered, milligrams per liter	mg/L	36	2	36	14.81
29-Jul-09	06-Jun-12	pH, water, unfiltered, field, standard units	SU	26	6.4	8.5	7.44
22-Feb-11	06-Jun-12	Residue, total nonfilterable, milligrams per liter	mg/L	16	0.5	14	4.22
17-May-11	06-Jun-12	Ammonia, water, filtered, milligrams per liter as nitrogen	mg/L as N	14	0.025	0.118	0.04
22-Feb-11	06-Dec-11	Ammonia plus organic nitrogen, water, unfiltered, milligrams per liter as nitrogen	mg/L	10	1.5	1.5	1.5
22-Feb-11	06-Dec-11	Nitrate plus nitrite, water, unfiltered, milligrams per liter as nitrogen	mg/L as	10	1.065	3.65	1.67
22-Feb-11	06-Dec-11	Phosphorus, water, unfiltered, milligrams per liter as phosphorus	mg/L	10	0.125	0.125	0.12
05-Apr-11	06-Dec-11	Orthophosphate, water, filtered, milligrams per liter as phosphorus	mg/L as P	10	0.04	0.103	0.06
29-Jul-09	06-Dec-11	Hardness, water, milligrams per liter as calcium carbonate	mg/L	30	174	427	277.66
29-Jul-09	06-Dec-11	Cadmium, water, filtered, micrograms per liter	µg/L	29	0.00015	0.15	0.06
29-Jul-09	06-Dec-11	Chromium, water, filtered, micrograms per liter	µg/L	30	0.003	3	1.2
29-Jul-09	06-Dec-11	Copper, water, filtered, micrograms per liter	µg/L	30	0.0012	5.1	0.61
29-Jul-09	06-Dec-11	Iron, water, filtered, micrograms per liter	µg/L	30	0.03	30	12.03
29-Jul-09	06-Dec-11	Lead, water, filtered, micrograms per liter	µg/L	30	0.00045	0.45	0.18
29-Jul-09	06-Dec-11	Nickel, water, filtered, micrograms per liter	µg/L	30	0.0135	13.5	5.41
29-Jul-09	06-Dec-11	Zinc, water, filtered, micrograms per liter	µg/L	30	0.0105	52	8.68
29-Jul-09	05-Jan-11	Aluminum, water, filtered, micrograms per liter	µg/L	20	0.0645	64.5	38.73
29-Jul-09	06-Oct-09	Fecal coliform, M-FC MF (0.7 micron) method, water, colonies per 100 milliliters	cfu/100 mL	4	110	5400	1527.5
29-Jul-09	06-Jun-12	Fecal streptococci, m-enterococcus MF method, water, colonies per 100 milliliters	cfu/100mL	22	5	18000	1343.5
06-Apr-10	06-Jun-12	Escherichia coli, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	18	5	1500	207
29-Jul-09	06-Jun-12	Chloride, water, unfiltered, milligrams per liter	mg/L	36	52	277	95.69
06-Apr-10	04-Oct-11	Enterococci, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	15	10	933	240.8

Kiefer Creek



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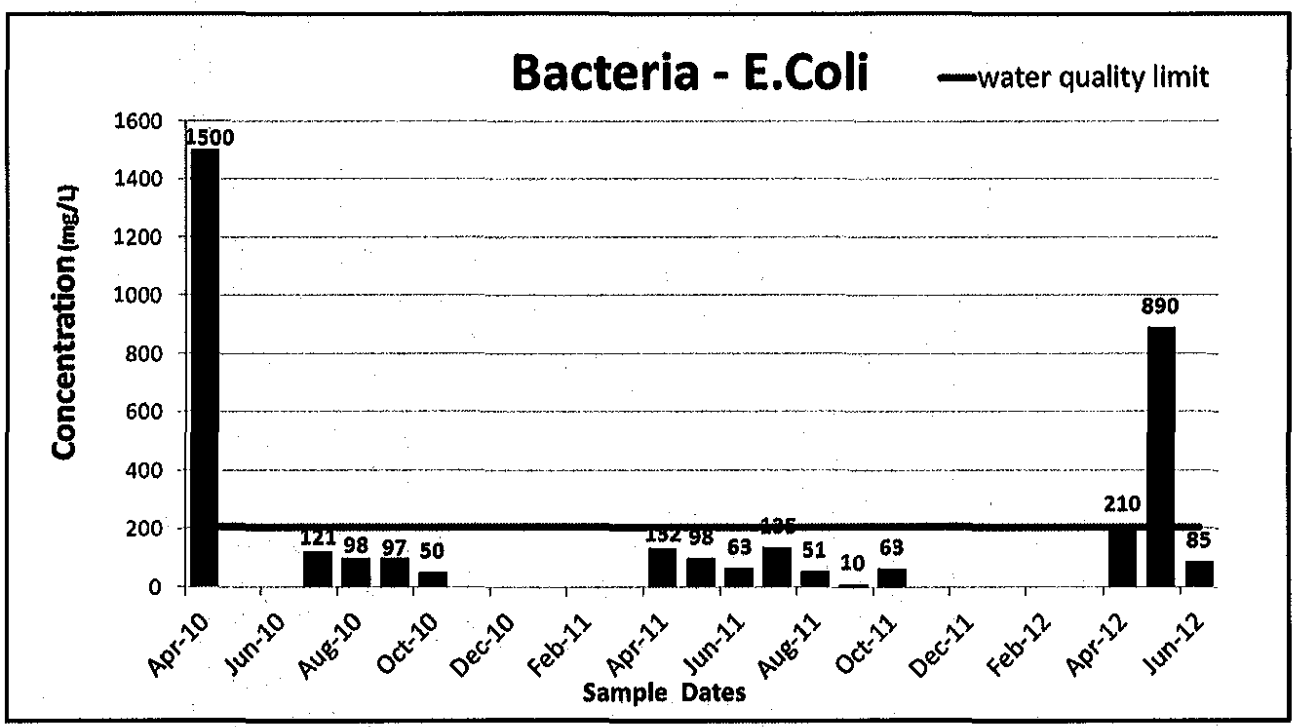


Note – Limit shown for comparative purposes only. MDNR determines compliance based on 303(d) listing methodology

Sample Summary and Statistics

Little Antire Creek at Beaumont-Antire Rd

Begin Date	End Date	Parameter Description	Units	Count	Min	Max	Average
29-Jul-09	06-Jun-12	Temperature, water, degrees Celsius	°C	36	1	24	12.58
29-Jul-09	06-Jun-12	Dissolved oxygen, water, unfiltered, milligrams per liter	mg/L	36	5.9	14.2	9.03
29-Jul-09	06-Jun-12	Chemical oxygen demand, high level, water, unfiltered, milligrams per liter	mg/L	36	2	26	11.19
29-Jul-09	06-Jun-12	pH, water, unfiltered, field, standard units	SU	26	6.12	8.5	7.33
22-Feb-11	06-Jun-12	Residue, total nonfilterable, milligrams per liter	mg/L	16	0.5	38	9.12
17-May-11	06-Jun-12	Ammonia, water, filtered, milligrams per liter as nitrogen	mg/L as N	14	0.025	0.0803	0.04
22-Feb-11	06-Dec-11	Ammonia plus organic nitrogen, water, unfiltered, milligrams per liter as nitrogen	mg/L	10	1.5	1.5	1.5
22-Feb-11	06-Dec-11	Nitrate plus nitrite, water, unfiltered, milligrams per liter as nitrogen	mg/L as	10	0.1	1.05	0.48
22-Feb-11	06-Dec-11	Phosphorus, water, unfiltered, milligrams per liter as phosphorus	mg/L	10	0.125	0.125	0.12
05-Apr-11	06-Dec-11	Orthophosphate, water, filtered, milligrams per liter as phosphorus	mg/L as P	9	0.11	0.246	0.17
29-Jul-09	06-Dec-11	Hardness, water, milligrams per liter as calcium carbonate	mg/L	30	154	301.2	227.49
29-Jul-09	06-Dec-11	Cadmium, water, filtered, micrograms per liter	µg/L	29	0.00015	0.15	0.06
29-Jul-09	06-Dec-11	Chromium, water, filtered, micrograms per liter	µg/L	30	0.003	3	1.2
29-Jul-09	06-Dec-11	Copper, water, filtered, micrograms per liter	µg/L	30	0.0012	11.8	0.83
29-Jul-09	06-Dec-11	Iron, water, filtered, micrograms per liter	µg/L	30	0.03	30	12.02
29-Jul-09	06-Dec-11	Lead, water, filtered, micrograms per liter	µg/L	30	0.00045	0.45	0.18
29-Jul-09	06-Dec-11	Nickel, water, filtered, micrograms per liter	µg/L	30	0.0135	13.5	5.41
29-Jul-09	06-Dec-11	Zinc, water, filtered, micrograms per liter	µg/L	30	0.0105	10.5	4.21
29-Jul-09	06-Oct-09	Fecal coliform, M-FC MF (0.7 micron) method, water, colonies per 100 milliliters	cfu/100 mL	4	120	20000	5122.5
29-Jul-09	06-Jun-12	Fecal streptococci, m-enterococcus MF method, water, colonies per 100 milliliters	cfu/100mL	22	36	22000	1838.86
06-Apr-10	06-Jun-12	Escherichia coli, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	18	20	730	198.89
29-Jul-09	06-Jun-12	Chloride, water, unfiltered, milligrams per liter	mg/L	36	10	32.9	16.55
06-Apr-10	04-Oct-11	Enterococci, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	15	20	2098	576.27

Sample Summary and Statistics

Louiselle Creek at Creve Coeur Mill Rd

Begin Date	End Date	Parameter Description	Units	Count	Min	Max	Average
03-Jun-09	13-Jun-12	Temperature, water, degrees Celsius	°C	29	1	27	13.24
03-Jun-09	13-Jun-12	Dissolved oxygen, water, unfiltered, milligrams per liter	mg/L	29	3.9	14.03	9.36
03-Jun-09	13-Jun-12	Chemical oxygen demand, high level, water, unfiltered, milligrams per liter	mg/L	29	16	120	35.03
03-Jun-09	13-Jun-12	pH, water, unfiltered, field, standard units	SU	24	6.8	8.4	7.64
08-Mar-11	13-Jun-12	Residue, total nonfilterable, milligrams per liter	mg/L	12	0.5	76	18.21
10-May-11	13-Jun-12	Ammonia, water, filtered, milligrams per liter as nitrogen	mg/L as N	11	0.025	0.159	0.07
08-Mar-11	14-Dec-11	Ammonia plus organic nitrogen, water, unfiltered, milligrams per liter as nitrogen	mg/L	7	1.5	4.48	2.19
08-Mar-11	14-Dec-11	Nitrate plus nitrite, water, unfiltered, milligrams per liter as nitrogen	mg/L as	7	0.1	0.52	0.32
08-Mar-11	14-Dec-11	Phosphorus, water, unfiltered, milligrams per liter as phosphorus	mg/L	7	0.125	1.06	0.33
08-Mar-11	14-Dec-11	Orthophosphate, water, filtered, milligrams per liter as phosphorus	mg/L as P	7	0.015	0.218	0.1
03-Jun-09	14-Dec-11	Hardness, water, milligrams per liter as calcium carbonate	mg/L	23	121.6	484	283.49
03-Jun-09	14-Dec-11	Cadmium, water, filtered, micrograms per liter	µg/L	23	0.00015	0.15	0.08
03-Jun-09	14-Dec-11	Chromium, water, filtered, micrograms per liter	µg/L	23	0.003	3	1.61
03-Jun-09	14-Dec-11	Copper, water, filtered, micrograms per liter	µg/L	23	0.0012	39.4	2.4
03-Jun-09	14-Dec-11	Iron, water, filtered, micrograms per liter	µg/L	23	0.03	189	28.42
03-Jun-09	14-Dec-11	Lead, water, filtered, micrograms per liter	µg/L	23	0.00045	0.45	0.24
03-Jun-09	14-Dec-11	Nickel, water, filtered, micrograms per liter	µg/L	23	0.0135	13.5	7.25
03-Jun-09	14-Dec-11	Zinc, water, filtered, micrograms per liter	µg/L	23	0.0105	46	10.66
03-Jun-09	12-Oct-09	Fecal coliform, M-FC MF (0.7 micron) method, water, colonies per 100 milliliters	cfu/100 mL	5	200	4500	2140
03-Jun-09	13-Jun-12	Fecal streptococci, m-enterococcus MF method, water, colonies per 100 milliliters	cfu/100mL	16	91	16000	4953.19
19-Apr-10	13-Jun-12	Escherichia coli, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	9	73	20000	4507.44
03-Jun-09	13-Jun-12	Chloride, water, unfiltered, milligrams per liter	mg/L	29	21	1260	163.31
19-Apr-10	13-Sep-11	Enterococci, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	8	110	24196	4846.75

Sample Summary and Statistics

Maline Creek at Bellefontaine Neighbors, MO

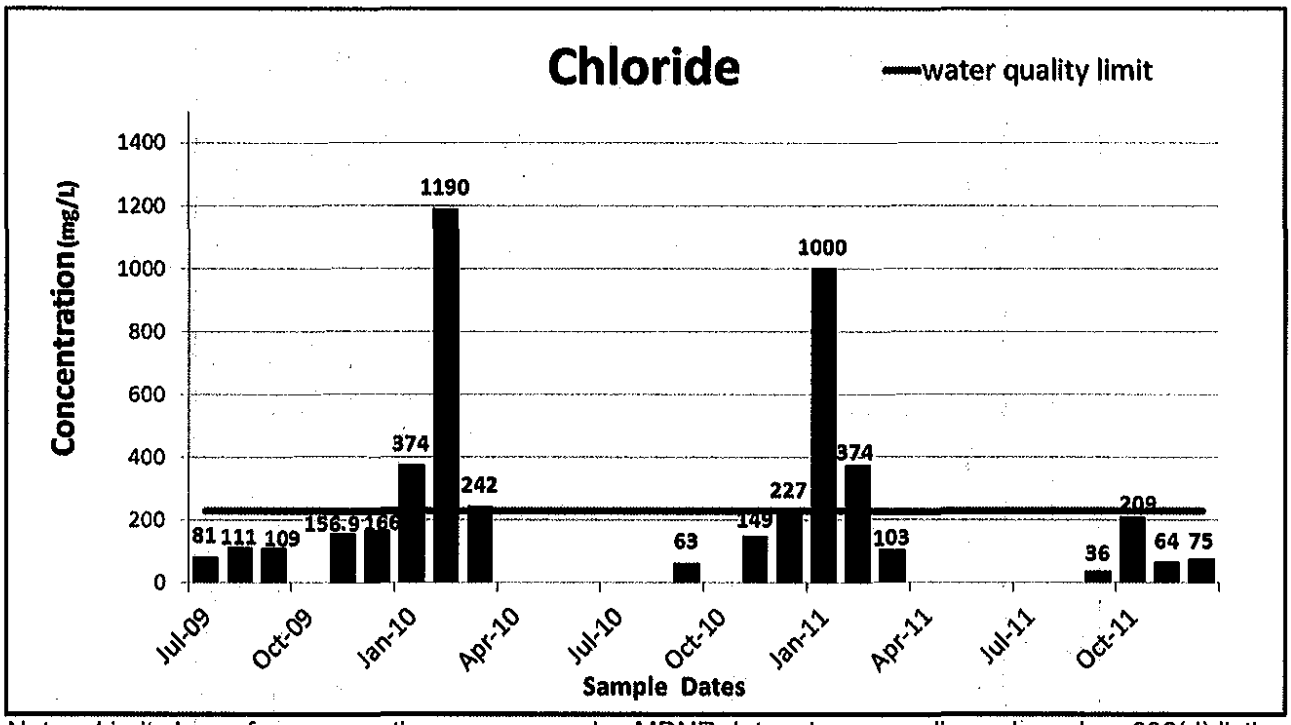
Begin Date	End Date	Parameter Description	Units	Count	Min.	Max.	Average
16-Jun-09	18-Jun-12	Temperature, water, degrees Celsius	°C	43	0.16	32.57	14.08
18-May-10	12-Jul-11	Discharge, cubic feet per second	cfs	13	3.3	28	11.78
16-Jun-09	13-Dec-11	Discharge, instantaneous, cubic feet per second	cfs	18	0.47	1480	123.09
16-Jun-09	13-Dec-11	Specific conductance, water, unfiltered, field, microsiemens per centimeter at 25 degrees Celsius	uS/cm at 25 °C	31	163	4398	957.77
16-Jun-09	18-Jun-12	Dissolved oxygen, water, unfiltered, milligrams per liter	mg/L	43	4.39	15.24	8.52
16-Jun-09	18-Jun-12	Chemical oxygen demand, high level, water, unfiltered, milligrams per liter	mg/L	43	1.6	120	26.11
16-Jun-09	18-Jun-12	pH, water, unfiltered, field, standard units	SU	43	6.7	8.16	7.6
16-Jun-09	18-Jun-12	Residue, total nonfilterable, milligrams per liter	mg/L	43	0.5	1100	52.15
18-Jan-11	13-Dec-11	Total nitrogen, water, unfiltered, milligrams per liter	mg/L	12	0.00115	1.5	0.72
16-Jun-09	18-Jun-12	Ammonia, water, filtered, milligrams per liter as nitrogen	mg/L as N	31	0.0022	0.161	0.06
18-Jan-11	13-Dec-11	Ammonia, water, unfiltered, milligrams per liter as nitrogen	mg/L	12	0.0075	0.23	0.05
16-Jun-09	14-Dec-10	Nitrite, water, filtered, milligrams per liter as nitrogen	mg/L as N	19	0.001	0.15	0.03
16-Jun-09	14-Dec-10	Nitrate, water, filtered, milligrams per liter as nitrogen	mg/L as N	19	0.06	0.88	0.45
16-Jun-09	13-Dec-11	Ammonia plus organic nitrogen, water, unfiltered, milligrams per liter as nitrogen	mg/L	31	0.1	2.6	0.82
18-Jan-11	13-Dec-11	Nitrate plus nitrite, water, unfiltered, milligrams per liter as nitrogen	mg/L as	12	0.069	1	0.35
16-Jun-09	14-Dec-10	Nitrate plus nitrite, water, filtered, milligrams per liter as nitrogen	mg/L as N	19	0.061	0.91	0.48
16-Jun-09	13-Dec-11	Phosphorus, water, unfiltered, milligrams per liter as phosphorus	mg/L	31	0.07	0.88	0.24
16-Jun-09	13-Dec-11	Orthophosphate, water, filtered, milligrams per liter as phosphorus	mg/L as P	31	0.0025	0.32	0.13
16-Jun-09	13-Dec-11	Hardness, water, milligrams per liter as calcium carbonate	mg/L	31	44	400	214.32
16-Jun-09	14-Dec-10	Calcium, water, filtered, milligrams per liter	mg/L	19	13	110	54.32
16-Jun-09	14-Dec-10	Magnesium, water, filtered, milligrams per liter	mg/L	19	2.6	29	14.49
16-Jun-09	14-Dec-10	Chloride, water, filtered, milligrams per liter	mg/L	19	12	1300	171.95
16-Jun-09	14-Dec-10	Arsenic, water, filtered, micrograms per liter	µg/L	19	1.1	3.8	2.31
16-Jun-09	14-Dec-10	Arsenic, water, unfiltered, micrograms per liter	µg/L	19	1.7	7.4	2.96
16-Jun-09	14-Dec-10	Beryllium, water, filtered, micrograms per liter	µg/L	19	0.006	0.06	0.01
16-Jun-09	14-Dec-10	Beryllium, water, unfiltered, recoverable, micrograms per liter	µg/L	19	0.006	0.66	0.08
16-Jun-09	13-Dec-11	Cadmium, water, filtered, micrograms per liter	µg/L	31	0.00395	0.14	0.03
16-Jun-09	14-Dec-10	Cadmium, water, unfiltered, micrograms per liter	µg/L	19	0.02	0.51	0.09
16-Jun-09	13-Dec-11	Chromium, water, filtered, micrograms per liter	µg/L	31	1.2	25	5.33
16-Jun-09	14-Dec-10	Chromium, water, unfiltered, recoverable, micrograms per liter	µg/L	19	1.7	29	6.46
16-Jun-09	13-Dec-11	Copper, water, filtered, micrograms per liter	µg/L	31	1.8	14	3.73
16-Jun-09	14-Dec-10	Copper, water, unfiltered, recoverable, micrograms per liter	µg/L	19	3.2	24	6.74
16-Jun-09	14-Dec-10	Iron, water, unfiltered, recoverable, micrograms per liter	µg/L	19	280	16000	2005.79
16-Jun-09	13-Dec-11	Iron, water, filtered, micrograms per liter	µg/L	31	6	340	64.47
16-Jun-09	13-Dec-11	Lead, water, filtered, micrograms per liter	µg/L	31	0.0016	0.55	0.11
16-Jun-09	14-Dec-10	Lead, water, unfiltered, recoverable, micrograms per liter	µg/L	19	0.38	39	4.7
16-Jun-09	14-Dec-10	Manganese, water, unfiltered, recoverable, micrograms per liter	µg/L	19	100	1000	311.05
16-Jun-09	14-Dec-10	Manganese, water, filtered, micrograms per liter	µg/L	19	24	940	194.68
16-Jun-09	13-Dec-11	Nickel, water, filtered, micrograms per liter	µg/L	31	1.8	9.3	5.05
16-Jun-09	14-Dec-10	Nickel, water, unfiltered, recoverable, micrograms per liter	µg/L	19	4.2	23	7.21
16-Jun-09	14-Dec-10	Silver, water, filtered, micrograms per liter	µg/L	19	0.00475	0.1	0.01
16-Jun-09	14-Dec-10	Silver, water, unfiltered, recoverable, micrograms per liter	µg/L	19	0.00475	0.08	0.02
16-Jun-09	13-Dec-11	Zinc, water, filtered, micrograms per liter	µg/L	31	0.0095	17	3.76
16-Jun-09	14-Dec-10	Zinc, water, unfiltered, recoverable, micrograms per liter	µg/L	19	5.1	97	19.93
16-Jun-09	14-Dec-10	Aluminum, water, unfiltered, recoverable, micrograms per liter	µg/L	19	110	13000	1467.37
16-Jun-09	14-Dec-10	Aluminum, water, filtered, micrograms per liter	µg/L	19	2.4	190	46.2
16-Jun-09	13-Dec-11	Selenium, water, filtered, micrograms per liter	µg/L	31	0.38	3.8	1.54
16-Jun-09	14-Dec-10	Selenium, water, unfiltered, micrograms per liter	µg/L	19	0.35	8.8	2.02
16-Jun-09	15-Dec-09	Fecal coliform, M-FC MF (0.45 micron) method, water, colonies per 100 milliliters	cfu/100mL	7	340	210000	63390
12-Apr-11	18-Jun-12	Fecal streptococci, m-enterococcus MF method, water, colonies per 100 milliliters	cfu/100mL	13	63	40000	6297
19-Jan-10	18-Jun-12	Escherichia coli, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	24	41	20000	2078.79
16-Jun-09	14-Dec-10	Mercury, water, unfiltered, recoverable, micrograms per liter	µg/L	19	0.0155	0.11	0.03
16-Jun-09	15-Dec-09	Escherichia coli, modified m-TEC MF method, water, colonies per 100 milliliters	cfu/100mL	7	320	94000	22031.43
18-Jan-11	18-Jun-12	Chloride, water, unfiltered, milligrams per liter	mg/L	24	2.5	670	167.65
19-Jan-10	18-Oct-11	Enterococci, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	19	20	24200	2543.21

Sample Summary and Statistics

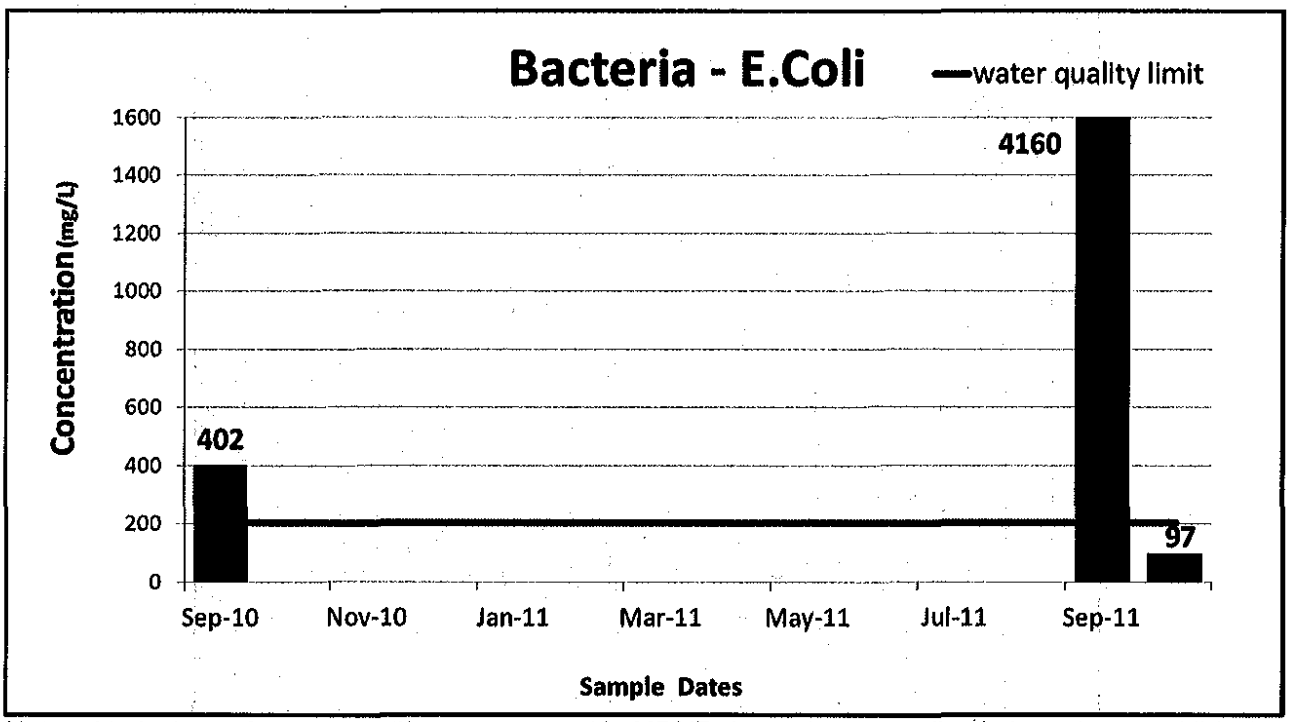
Maline Creek at Riverview Drive

Begin Date	End Date	Parameter Description	Units	Count	Min	Max	Average
22-Jul-09	19-Dec-11	Temperature, water, degrees Celsius	°C	20	1	26	11.31
22-Jul-09	19-Dec-11	Dissolved oxygen, water, unfiltered, milligrams per liter	mg/L	21	1	14.5	9.47
22-Jul-09	19-Dec-11	Chemical oxygen demand, high level, water, unfiltered, milligrams per liter	mg/L	20	12	110	40.4
22-Jul-09	19-Dec-11	pH, water, unfiltered, field, standard units	SU	14	6.5	8.2	7.4
15-Feb-11	19-Dec-11	Residue, total nonfilterable, milligrams per liter	mg/L	6	9	80	39.17
19-Sep-11	19-Dec-11	Ammonia, water, filtered, milligrams per liter as nitrogen	mg/L as N	4	0.053	0.107	0.08
15-Feb-11	19-Dec-11	Ammonia plus organic nitrogen, water, unfiltered, milligrams per liter as nitrogen	mg/L	6	1.5	1.5	1.5
15-Feb-11	19-Dec-11	Nitrate plus nitrite, water, unfiltered, milligrams per liter as nitrogen	mg/L as	6	0.1	0.7	0.41
15-Feb-11	19-Dec-11	Phosphorus, water, unfiltered, milligrams per liter as phosphorus	mg/L	6	0.125	0.271	0.15
09-Mar-11	19-Dec-11	Orthophosphate, water, filtered, milligrams per liter as phosphorus	mg/L as P	5	0.084	0.17	0.12
22-Jul-09	19-Dec-11	Hardness, water, milligrams per liter as calcium carbonate	mg/L	20	104.4	545.6	311.51
22-Jul-09	19-Dec-11	Cadmium, water, filtered, micrograms per liter	µg/L	20	0.00015	0.15	0.07
22-Jul-09	19-Dec-11	Chromium, water, filtered, micrograms per liter	µg/L	20	0.003	3	1.5
22-Jul-09	19-Dec-11	Copper, water, filtered, micrograms per liter	µg/L	20	0.0012	1.2	0.6
22-Jul-09	19-Dec-11	Iron, water, filtered, micrograms per liter	µg/L	20	0.03	30	15.06
22-Jul-09	19-Dec-11	Lead, water, filtered, micrograms per liter	µg/L	20	0.00045	0.45	0.23
22-Jul-09	19-Dec-11	Nickel, water, filtered, micrograms per liter	µg/L	20	0.0135	13.5	6.76
22-Jul-09	19-Dec-11	Zinc, water, filtered, micrograms per liter	µg/L	20	0.0105	231	26.37
22-Jul-09	23-Sep-09	Fecal coliform, M-FC MF (0.7 micron) method, water, colonies per 100 milliliters	cfu/100 mL	4	110	1300	862.5
22-Jul-09	17-Oct-11	Fecal streptococci, m-enterococcus MF method, water, colonies per 100 milliliters	cfu/100mL	7	18	190000	27478
08-Sep-10	17-Oct-11	Escherichia coli, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	3	97	4160	1553
22-Jul-09	19-Dec-11	Chloride, water, unfiltered, milligrams per liter	mg/L	20	36	1190	254.54
08-Sep-10	17-Oct-11	Enterococci, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	3	52	13000	4399.33

Maline Creek, near Riverview



Note – Limit shown for comparative purposes only. MDNR determines compliance based on 303(d) listing methodology



Note – Limit shown for comparative purposes only. MDNR determines compliance based on 303(d) listing methodology

Sample Summary and Statistics

Martigney Creek at Koch Rd

Begin Date	End Date	Parameter Description	Units	Count	Min	Max	Average
28-Jul-09	03-Nov-10	Temperature, water, degrees Celsius	°C	13	1	22	11.92
28-Jul-09	03-Nov-10	Dissolved oxygen, water, unfiltered, milligrams per liter	mg/L	13	6.2	13	9.04
28-Jul-09	03-Nov-10	Chemical oxygen demand, high level, water, unfiltered, milligrams per liter	mg/L	13	9	101	27.69
28-Jul-09	11-May-10	pH, water, unfiltered, field, standard units	SU	11	6.1	7.8	7
28-Jul-09	03-Nov-10	Hardness, water, milligrams per liter as calcium carbonate	mg/L	13	219.6	604.8	422.36
28-Jul-09	03-Nov-10	Cadmium, water, filtered, micrograms per liter	µg/L	13	0.00015	0.15	0.12
28-Jul-09	03-Nov-10	Chromium, water, filtered, micrograms per liter	µg/L	13	0.003	3	2.54
28-Jul-09	03-Nov-10	Copper, water, filtered, micrograms per liter	µg/L	13	0.0012	8.4	1.68
28-Jul-09	03-Nov-10	Iron, water, filtered, micrograms per liter	µg/L	13	0.03	30	25.39
28-Jul-09	03-Nov-10	Lead, water, filtered, micrograms per liter	µg/L	13	0.00045	0.45	0.38
28-Jul-09	03-Nov-10	Nickel, water, filtered, micrograms per liter	µg/L	13	0.0135	13.5	11.43
28-Jul-09	03-Nov-10	Zinc, water, filtered, micrograms per liter	µg/L	13	0.0105	31	12.93
28-Jul-09	21-Oct-09	Fecal coliform, M-FC MF (0.7 micron) method, water, colonies per 100 milliliters	cfu/100 mL	5	27	1200	643.4
28-Jul-09	11-Oct-10	Fecal streptococci, m-enterococcus MF method, water, colonies per 100 milliliters	cfu/100mL	7	380	73000	11338.57
11-May-10	11-Oct-10	Escherichia coli, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	2	836	4884	2860
28-Jul-09	03-Nov-10	Chloride, water, unfiltered, milligrams per liter	mg/L	13	69	1820	277.22
11-May-10	11-Oct-10	Enterococci, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	2	1660	6490	4075

Sample Summary and Statistics

Martigney Creek at Sunset Heights

Begin Date	End Date	Parameter Description	Units	Count	Min	Max	Average
01-Dec-10	04-Jun-12	Temperature, water, degrees Celsius	°C	19	4	28	13.25
01-Dec-10	04-Jun-12	Dissolved oxygen, water, unfiltered, milligrams per liter	mg/L	19	4.19	9.68	7
01-Dec-10	04-Jun-12	Chemical oxygen demand, high level, water, unfiltered, milligrams per liter	mg/L	19	5	73	27.05
02-May-11	04-Jun-12	pH, water, unfiltered, field, standard units	SU	14	5.95	8.1	7.38
16-Feb-11	04-Jun-12	Residue, total nonfilterable, milligrams per liter	mg/L	17	0.5	78	19.26
02-May-11	04-Jun-12	Ammonia, water, filtered, milligrams per liter as nitrogen	mg/L as N	14	0.025	0.251	0.1
16-Feb-11	05-Dec-11	Ammonia plus organic nitrogen, water, unfiltered, milligrams per liter as nitrogen	mg/L	11	1.5	3	1.64
16-Feb-11	05-Dec-11	Nitrate plus nitrite, water, unfiltered, milligrams per liter as nitrogen	mg/L as	11	0.1	2.32	1.34
16-Feb-11	05-Dec-11	Phosphorus, water, unfiltered, milligrams per liter as phosphorus	mg/L	11	0.125	0.643	0.17
01-Mar-11	05-Dec-11	Orthophosphate, water, filtered, milligrams per liter as phosphorus	mg/L as P	10	0.1	0.33	0.16
01-Dec-10	05-Dec-11	Hardness, water, milligrams per liter as calcium carbonate	mg/L	13	175.6	452.8	322.98
01-Dec-10	05-Dec-11	Cadmium, water, filtered, micrograms per liter	µg/L	13	0.00015	0.0003	0
01-Dec-10	05-Dec-11	Chromium, water, filtered, micrograms per liter	µg/L	13	0.003	0.005	0
01-Dec-10	05-Dec-11	Copper, water, filtered, micrograms per liter	µg/L	13	0.0012	0.0031	0
01-Dec-10	05-Dec-11	Iron, water, filtered, micrograms per liter	µg/L	13	0.03	0.154	0.06
01-Dec-10	05-Dec-11	Lead, water, filtered, micrograms per liter	µg/L	13	0.00045	0.00419	0
01-Dec-10	05-Dec-11	Nickel, water, filtered, micrograms per liter	µg/L	13	0.0135	0.028	0.02
01-Dec-10	05-Dec-11	Zinc, water, filtered, micrograms per liter	µg/L	13	0.0105	0.2738	0.05
06-Apr-11	04-Jun-12	Fecal streptococci, m-enterococcus MF method, water, colonies per 100 milliliters	cfu/100mL	9	580	73000	11955.56
06-Apr-11	04-Jun-12	Escherichia coli, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	10	570	24000	5575.2
01-Dec-10	04-Jun-12	Chloride, water, unfiltered, milligrams per liter	mg/L	19	47	454	158.63
06-Apr-11	03-Oct-11	Enterococci, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	7	315	36294	8220.14

Sample Summary and Statistics

Mattese Creek at Fred Weber

Begin Date	End Date	Parameter Description	Units	Count	Min	Max	Average
11-May-10	04-Jun-12	Temperature, water, degrees Celsius	°C	15	2	22.1	11.34
11-May-10	04-Jun-12	Dissolved oxygen, water, unfiltered, milligrams per liter	mg/L	15	6.35	13.2	9.31
11-May-10	04-Jun-12	Chemical oxygen demand, high level, water, unfiltered, milligrams per liter	mg/L	15	10	44	23.67
11-May-10	04-Jun-12	pH, water, unfiltered, field, standard units	SU	11	6.54	8.14	7.69
16-Feb-11	04-Jun-12	Residue, total nonfilterable, milligrams per liter	mg/L	11	2	57	13.36
06-Sep-11	04-Jun-12	Ammonia, water, filtered, milligrams per liter as nitrogen	mg/L as N	10	0.025	0.126	0.08
16-Feb-11	05-Dec-11	Ammonia plus organic nitrogen, water, unfiltered, milligrams per liter as nitrogen	mg/L	5	1.5	1.5	1.5
16-Feb-11	05-Dec-11	Nitrate plus nitrite, water, unfiltered, milligrams per liter as nitrogen	mg/L as	5	0.1	1.87	0.64
16-Feb-11	05-Dec-11	Phosphorus, water, unfiltered, milligrams per liter as phosphorus	mg/L	5	0.125	0.125	0.12
06-Sep-11	05-Dec-11	Orthophosphate, water, filtered, milligrams per liter as phosphorus	mg/L as P	4	0.036	0.14	0.08
11-May-10	05-Dec-11	Hardness, water, milligrams per liter as calcium carbonate	mg/L	9	157.2	336	273.76
11-May-10	05-Dec-11	Cadmium, water, filtered, micrograms per liter	µg/L	9	0.00015	0.1	0.01
11-May-10	05-Dec-11	Chromium, water, filtered, micrograms per liter	µg/L	9	0.003	3	0.34
11-May-10	05-Dec-11	Copper, water, filtered, micrograms per liter	µg/L	9	0.0012	38.3	4.26
11-May-10	05-Dec-11	Iron, water, filtered, micrograms per liter	µg/L	9	0.03	30	3.4
11-May-10	05-Dec-11	Lead, water, filtered, micrograms per liter	µg/L	9	0.00045	1.2	0.13
11-May-10	05-Dec-11	Nickel, water, filtered, micrograms per liter	µg/L	9	0.0135	13.5	1.51
11-May-10	05-Dec-11	Zinc, water, filtered, micrograms per liter	µg/L	9	0.0105	49	5.46
11-May-10	04-Jun-12	Fecal streptococci, m-enterococcus MF method, water, colonies per 100 milliliters	cfu/100mL	6	5	3400000	566759.33
11-May-10	04-Jun-12	Escherichia coli, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	6	52	24000	4108.83
11-May-10	04-Jun-12	Chloride, water, unfiltered, milligrams per liter	mg/L	15	22	475	160.73
11-May-10	03-Oct-11	Enterococci, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	3	10	537	223

Sample Summary and Statistics

Mill Creek at Sioux Passage Park

Begin Date	End Date	Parameter Description	Units	Count	Min	Max	Average
03-Jun-09	18-Jun-12	Temperature, water, degrees Celsius	°C	30	1	22	12
03-Jun-09	18-Jun-12	Dissolved oxygen, water, unfiltered, milligrams per liter	mg/L	31	1	14	9.09
03-Jun-09	18-Jun-12	Chemical oxygen demand, high level, water, unfiltered, milligrams per liter	mg/L	30	5	51	25.17
03-Jun-09	18-Jun-12	pH, water, unfiltered, field, standard units	SU	22	6.2	8	7.44
15-Feb-11	18-Jun-12	Residue, total nonfilterable, milligrams per liter	mg/L	13	7	301	70.46
19-Sep-11	18-Jun-12	Ammonia, water, filtered, milligrams per liter as nitrogen	mg/L as N	10	0.025	0.118	0.07
15-Feb-11	19-Dec-11	Ammonia plus organic nitrogen, water, unfiltered, milligrams per liter as nitrogen	mg/L	7	1.5	1.5	1.5
15-Feb-11	19-Dec-11	Nitrate plus nitrite, water, unfiltered, milligrams per liter as nitrogen	mg/L as	7	1.01	2.33	1.53
15-Feb-11	19-Dec-11	Phosphorus, water, unfiltered, milligrams per liter as phosphorus	mg/L	6	0.125	0.426	0.21
09-Mar-11	19-Dec-11	Orthophosphate, water, filtered, milligrams per liter as phosphorus	mg/L as P	6	0.04	0.351	0.13
03-Jun-09	19-Dec-11	Hardness, water, milligrams per liter as calcium carbonate	mg/L	24	263.6	636	463.81
03-Jun-09	19-Dec-11	Cadmium, water, filtered, micrograms per liter	µg/L	24	0.00015	0.15	0.06
03-Jun-09	19-Dec-11	Chromium, water, filtered, micrograms per liter	µg/L	24	0.003	3	1.42
03-Jun-09	19-Dec-11	Copper, water, filtered, micrograms per liter	µg/L	24	0.0012	13.3	1.87
03-Jun-09	19-Dec-11	Iron, water, filtered, micrograms per liter	µg/L	24	0.03	144	24.85
03-Jun-09	19-Dec-11	Lead, water, filtered, micrograms per liter	µg/L	24	0.00045	0.45	0.21
03-Jun-09	19-Dec-11	Nickel, water, filtered, micrograms per liter	µg/L	24	0.0135	13.5	6.38
03-Jun-09	19-Dec-11	Zinc, water, filtered, micrograms per liter	µg/L	24	0.0105	34	6.24
03-Jun-09	23-Sep-09	Fecal coliform, M-FC MF (0.7 micron) method, water, colonies per 100 milliliters	cfu/100 mL	5	180	4600	1876
03-Jun-09	18-Jun-12	Fecal streptococci, m-enterococcus MF method, water, colonies per 100 milliliters	cfu/100mL	15	110	33000	7578
04-May-10	18-Jun-12	Escherichia coli, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	9	122	24200	6507.67
03-Jun-09	18-Jun-12	Chloride, water, unfiltered, milligrams per liter	mg/L	29	27	98	66.28
04-May-10	17-Oct-11	Enterococci, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	7	95	9210	4059.71

Sample Summary and Statistics

Mississippi River above Lemay, MO

BeginDate	EndDate	ParameterDescription	Units	Count	Min	Max	Average
09-Jun-09	06-Aug-12	Temperature, water, degrees Celsius	°C	34	8.11	30.53	22.61
09-Jun-09	06-Aug-12	Discharge, instantaneous, cubic feet per second	cfs	34	78700	455000	282226.47
09-Jun-09	06-Aug-12	Specific conductance, water, unfiltered, field, microsiemens per centimeter at 25 degrees Celsius	uS/cm at 25 °C	34	380	743	583.12
09-Jun-09	06-Aug-12	Dissolved oxygen, water, unfiltered, milligrams per liter	mg/L	34	5.22	10.73	7.41
09-Jun-09	20-Jun-12	Chemical oxygen demand, high level, water, unfiltered, milligrams per liter	mg/L	32	1.6	33	16.49
09-Jun-09	06-Aug-12	pH, water, unfiltered, field, standard units	SU	34	7.09	8.53	8
09-Jun-09	20-Jun-12	Residue, total nonfilterable, milligrams per liter	mg/L	32	51	820	271.38
05-Apr-11	20-Jun-12	Total nitrogen, water, unfiltered, milligrams per liter	mg/L	15	0.72	3.6	1.94
09-Jun-09	26-Oct-10	Ammonia, water, filtered, milligrams per liter as nitrogen	mg/L as N	17	0.0022	0.02	0.01
05-Apr-11	20-Jun-12	Ammonia, water, unfiltered, milligrams per liter as nitrogen	mg/L	15	0.0075	0.058	0.02
09-Jun-09	26-Oct-10	Nitrite, water, filtered, milligrams per liter as nitrogen	mg/L as N	17	0.001	0.05	0.02
09-Jun-09	26-Oct-10	Nitrate, water, filtered, milligrams per liter as nitrogen	mg/L as N	17	1	6.9	2.54
09-Jun-09	20-Jun-12	Ammonia plus organic nitrogen, water, unfiltered, milligrams per liter as nitrogen	mg/L	32	0.63	5.2	1.37
05-Apr-11	20-Jun-12	Nitrate plus nitrite, water, unfiltered, milligrams per liter as nitrogen	mg/L as	15	0.31	3.4	1.54
09-Jun-09	26-Oct-10	Nitrate plus nitrite, water, filtered, milligrams per liter as nitrogen	mg/L as N	17	1.01	6.91	2.56
09-Jun-09	20-Jun-12	Phosphorus, water, unfiltered, milligrams per liter as phosphorus	mg/L	32	0.16	0.8	0.35
09-Jun-09	20-Jun-12	Orthophosphate, water, filtered, milligrams per liter as phosphorus	mg/L as P	32	0.07	0.24	0.12
09-Jun-09	26-Oct-10	Chloride, water, filtered, milligrams per liter	mg/L	17	13	25	18.18
09-Jun-09	13-Oct-09	Fecal coliform, M-FC MF (0.45 micron) method, water, colonies per 100 milliliters	cfu/100mL	7	108	2100	910.29
05-Apr-11	20-Jun-12	Fecal streptococci, m-enterococcus MF method, water, colonies per 100 milliliters	cfu/100mL	15	18	750	187.2
14-Apr-10	20-Jun-12	Escherichia coli, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	25	20	1439	236.64
09-Jun-09	13-Oct-09	Escherichia coli, modified m-TEC MF method, water, colonies per 100 milliliters	cfu/100mL	7	110	1300	582.86
05-Apr-11	20-Jun-12	Chloride, water, unfiltered, milligrams per liter	mg/L	15	15	24	19.2
14-Apr-10	20-Jun-12	Enterococci, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	25	10	3873	267.4

Sample Summary and Statistics

Mississippi River above St. Louis at mm 184.5

Begin Date	End Date	Parameter Description	Units	Count	Min	Max	Average
09-Jun-09	06-Aug-12	Temperature, water, degrees Celsius	°C	34	8.04	30.65	22.57
09-Jun-09	06-Aug-12	Discharge, instantaneous, cubic feet per second	cfs	34	78700	456000	282550
09-Jun-09	06-Aug-12	Specific conductance, water, unfiltered, field, microsiemens per centimeter at 25 degrees Celsius	uS/cm at 25 °C	34	382	798	577.5
09-Jun-09	06-Aug-12	Dissolved oxygen, water, unfiltered, milligrams per liter	mg/L	34	5.15	11.03	7.45
09-Jun-09	20-Jun-12	Chemical oxygen demand, high level, water, unfiltered, milligrams per liter	mg/L	32	1.6	31	14.48
09-Jun-09	06-Aug-12	pH, water, unfiltered, field, standard units	SU	34	6.93	8.6	7.96
09-Jun-09	20-Jun-12	Residue, total nonfilterable, milligrams per liter	mg/L	32	53	840	268.28
05-Apr-11	20-Jun-12	Total nitrogen, water, unfiltered, milligrams per liter	mg/L	15	0.75	3.5	1.91
09-Jun-09	26-Oct-10	Ammonia, water, filtered, milligrams per liter as nitrogen	mg/L as N	17	0.0022	0.04	0.01
05-Apr-11	20-Jun-12	Ammonia, water, unfiltered, milligrams per liter as nitrogen	mg/L	15	0.0075	0.12	0.03
09-Jun-09	26-Oct-10	Nitrite, water, filtered, milligrams per liter as nitrogen	mg/L as N	17	0.001	0.03	0.01
09-Jun-09	26-Oct-10	Nitrate, water, filtered, milligrams per liter as nitrogen	mg/L as N	17	0.79	3.37	1.93
09-Jun-09	20-Jun-12	Ammonia plus organic nitrogen, water, unfiltered, milligrams per liter as nitrogen	mg/L	32	0.81	5.8	1.52
05-Apr-11	20-Jun-12	Nitrate plus nitrite, water, unfiltered, milligrams per liter as nitrogen	mg/L as	15	0.29	3.2	1.47
09-Jun-09	26-Oct-10	Nitrate plus nitrite, water, filtered, milligrams per liter as nitrogen	mg/L as N	17	0.8	3.39	1.94
09-Jun-09	20-Jun-12	Phosphorus, water, unfiltered, milligrams per liter as phosphorus	mg/L	32	0.18	0.82	0.35
09-Jun-09	20-Jun-12	Orthophosphate, water, filtered, milligrams per liter as phosphorus	mg/L as P	32	0.07	0.25	0.12
09-Jun-09	26-Oct-10	Chloride, water, filtered, milligrams per liter	mg/L	17	9	30	17.12
09-Jun-09	13-Oct-09	Fecal coliform, M-FC MF (0.45 micron) method, water, colonies per 100 milliliters	cfu/100mL	7	18	1320	722
05-Apr-11	20-Jun-12	Fecal streptococci, m-enterococcus MF method, water, colonies per 100 milliliters	cfu/100mL	15	5	1000	211.47
14-Apr-10	20-Jun-12	Escherichia coli, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	25	20	1842	172.44
09-Jun-09	13-Oct-09	Escherichia coli, modified m-TEC MF method, water, colonies per 100 milliliters	cfu/100mL	7	5	840	390.71
05-Apr-11	20-Jun-12	Chloride, water, unfiltered, milligrams per liter	mg/L	15	14	35	18.87
14-Apr-10	20-Jun-12	Enterococci, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	25	1	1989	158.52

Sample Summary and Statistics

Mississippi River at Kimmswick, MO

Begin Date	End Date	Parameter Description	Units	Count	Min	Max	Average
09-Jun-09	06-Aug-12	Temperature, water, degrees Celsius	°C	34	8.31	30.74	22.6
09-Jun-09	06-Aug-12	Discharge, instantaneous, cubic feet per second	cfs	34	78000	454000	282216.47
09-Jun-09	06-Aug-12	Specific conductance, water, unfiltered, field, microsiemens per centimeter at 25 degrees Celsius	uS/cm at 25 °C	34	379	719	568.06
09-Jun-09	06-Aug-12	Dissolved oxygen, water, unfiltered, milligrams per liter	mg/L	34	5.55	10.83	7.36
09-Jun-09	20-Jun-12	Chemical oxygen demand, high level, water, unfiltered, milligrams per liter	mg/L	32	1.6	62	17.38
09-Jun-09	06-Aug-12	pH, water, unfiltered, field, standard units	SU	34	7.36	8.52	8.03
09-Jun-09	20-Jun-12	Residue, total nonfilterable, milligrams per liter	mg/L	32	57	730	251.97
05-Apr-11	20-Jun-12	Total nitrogen, water, unfiltered, milligrams per liter	mg/L	15	0.73	3.5	1.99
09-Jun-09	26-Oct-10	Ammonia, water, filtered, milligrams per liter as nitrogen	mg/L as N	17	0.0022	0.03	0.01
05-Apr-11	20-Jun-12	Ammonia, water, unfiltered, milligrams per liter as nitrogen	mg/L	15	0.0075	0.052	0.02
09-Jun-09	26-Oct-10	Nitrite, water, filtered, milligrams per liter as nitrogen	mg/L as N	17	0.001	0.04	0.02
09-Jun-09	26-Oct-10	Nitrate, water, filtered, milligrams per liter as nitrogen	mg/L as N	17	0.86	3.1	2.07
09-Jun-09	20-Jun-12	Ammonia plus organic nitrogen, water, unfiltered, milligrams per liter as nitrogen	mg/L	32	0.76	5	1.33
05-Apr-11	20-Jun-12	Nitrate plus nitrite, water, unfiltered, milligrams per liter as nitrogen	mg/L as	15	0.36	2.9	1.52
09-Jun-09	26-Oct-10	Nitrate plus nitrite, water, filtered, milligrams per liter as nitrogen	mg/L as N	17	0.87	3.14	2.08
09-Jun-09	20-Jun-12	Phosphorus, water, unfiltered, milligrams per liter as phosphorus	mg/L	32	0.18	0.63	0.33
09-Jun-09	20-Jun-12	Orthophosphate, water, filtered, milligrams per liter as phosphorus	mg/L as P	32	0.08	0.26	0.13
09-Jun-09	26-Oct-10	Chloride, water, filtered, milligrams per liter	mg/L	17	12	26	19.35
09-Jun-09	13-Oct-09	Fecal coliform, M-FC MF (0.45 micron) method, water, colonies per 100 milliliters	cfu/100mL	7	380	7840	1769.29
05-Apr-11	20-Jun-12	Fecal streptococci, m-enterococcus MF method, water, colonies per 100 milliliters	cfu/100mL	15	63	680	254.4
14-Apr-10	20-Jun-12	Escherichia coli, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	25	62	1198	285.68
09-Jun-09	13-Oct-09	Escherichia coli, modified m-TEC MF method, water, colonies per 100 milliliters	cfu/100mL	7	130	3700	812.86
05-Apr-11	20-Jun-12	Chloride, water, unfiltered, milligrams per liter	mg/L	15	15	28	20.13
14-Apr-10	20-Jun-12	Enterococci, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	25	20	1920	166.76

Sample Summary and Statistics

Mississippi River at Oakville at mm 164.5

Begin Date	End Date	Parameter Description	Units	Count	Min	Max	Average
09-Jun-09	06-Aug-12	Temperature, water, degrees Celsius	°C	34	8.22	30.62	22.55
09-Jun-09	06-Aug-12	Discharge, instantaneous, cubic feet per second	cfs	34	78000	455000	282113.24
09-Jun-09	06-Aug-12	Specific conductance, water, unfiltered, field, microsiemens per centimeter at 25 degrees Celsius	uS/cm at 25 °C	34	380	727	566.24
09-Jun-09	06-Aug-12	Dissolved oxygen, water, unfiltered, milligrams per liter	mg/L	34	5.61	10.95	7.38
09-Jun-09	20-Jun-12	Chemical oxygen demand, high level, water, unfiltered, milligrams per liter	mg/L	32	1.6	36	15.12
09-Jun-09	06-Aug-12	pH, water, unfiltered, field, standard units	SU	34	7.29	8.54	8.02
09-Jun-09	20-Jun-12	Residue, total nonfilterable, milligrams per liter	mg/L	32	53	630	239.94
05-Apr-11	20-Jun-12	Total nitrogen, water, unfiltered, milligrams per liter	mg/L	15	0.75	3.9	2.23
09-Jun-09	26-Oct-10	Ammonia, water, filtered, milligrams per liter as nitrogen	mg/L as N	17	0.0022	0.03	0.01
05-Apr-11	20-Jun-12	Ammonia, water, unfiltered, milligrams per liter as nitrogen	mg/L	15	0.0075	0.059	0.02
09-Jun-09	26-Oct-10	Nitrite, water, filtered, milligrams per liter as nitrogen	mg/L as N	17	0.001	0.05	0.02
09-Jun-09	26-Oct-10	Nitrate, water, filtered, milligrams per liter as nitrogen	mg/L as N	17	0.9	4	2.41
09-Jun-09	20-Jun-12	Ammonia plus organic nitrogen, water, unfiltered, milligrams per liter as nitrogen	mg/L	32	0.8	4.9	1.33
05-Apr-11	20-Jun-12	Nitrate plus nitrite, water, unfiltered, milligrams per liter as nitrogen	mg/L as	15	0.37	4	1.89
09-Jun-09	26-Oct-10	Nitrate plus nitrite, water, filtered, milligrams per liter as nitrogen	mg/L as N	17	0.91	4.04	2.43
09-Jun-09	20-Jun-12	Phosphorus, water, unfiltered, milligrams per liter as phosphorus	mg/L	32	0.18	0.64	0.33
09-Jun-09	20-Jun-12	Orthophosphate, water, filtered, milligrams per liter as phosphorus	mg/L as P	32	0.07	0.26	0.12
09-Jun-09	26-Oct-10	Chloride, water, filtered, milligrams per liter	mg/L	17	10	29	19.59
09-Jun-09	13-Oct-09	Fecal coliform, M-FC MF (0.45 micron) method, water, colonies per 100 milliliters	cfu/100mL	7	330	9910	1996
05-Apr-11	20-Jun-12	Fecal streptococci, m-enterococcus MF method, water, colonies per 100 milliliters	cfu/100mL	15	27	510	173.47
14-Apr-10	20-Jun-12	Escherichia coli, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	25	41	2187	282
09-Jun-09	13-Oct-09	Escherichia coli, modified m-TEC MF method, water, colonies per 100 milliliters	cfu/100mL	7	60	3600	871.43
05-Apr-11	20-Jun-12	Chloride, water, unfiltered, milligrams per liter	mg/L	15	15	28	21.2
14-Apr-10	20-Jun-12	Enterococci, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	25	20	2909	207.76

Sample Summary and Statistics

Mississippi River at St. Louis, MO

Begin Date	End Date	Parameter Description	Units	Count	Min	Max	Average
09-Jun-09	06-Aug-12	Temperature, water, degrees Celsius	°C	34	7.97	30.52	22.5
09-Jun-09	06-Aug-12	Discharge, instantaneous, cubic feet per second	cfs	34	78700	456000	282285.29
09-Jun-09	06-Aug-12	Specific conductance, water, unfiltered, field, microsiemens per centimeter at 25 degrees Celsius	uS/cm at 25 °C	34	380	759	571.94
09-Jun-09	06-Aug-12	Dissolved oxygen, water, unfiltered, milligrams per liter	mg/L	34	5.64	10.81	7.48
09-Jun-09	20-Jun-12	Chemical oxygen demand, high level, water, unfiltered, milligrams per liter	mg/L	32	1.6	79	18.2
09-Jun-09	06-Aug-12	pH, water, unfiltered, field, standard units	SU	34	7.07	8.56	7.99
09-Jun-09	20-Jun-12	Residue, total nonfilterable, milligrams per liter	mg/L	32	50	690	246.62
05-Apr-11	20-Jun-12	Total nitrogen, water, unfiltered, milligrams per liter	mg/L	15	0.7	3.8	2.08
09-Jun-09	26-Oct-10	Ammonia, water, filtered, milligrams per liter as nitrogen	mg/L as N	17	0.0022	0.03	0.01
05-Apr-11	20-Jun-12	Ammonia, water, unfiltered, milligrams per liter as nitrogen	mg/L	15	0.0075	0.054	0.02
09-Jun-09	26-Oct-10	Nitrite, water, filtered, milligrams per liter as nitrogen	mg/L as N	17	0.001	0.04	0.02
09-Jun-09	26-Oct-10	Nitrate, water, filtered, milligrams per liter as nitrogen	mg/L as N	17	0.8	6.5	2.56
09-Jun-09	20-Jun-12	Ammonia plus organic nitrogen, water, unfiltered, milligrams per liter as nitrogen	mg/L	32	0.84	8.6	1.57
05-Apr-11	20-Jun-12	Nitrate plus nitrite, water, unfiltered, milligrams per liter as nitrogen	mg/L as	15	0.35	4.6	1.6
09-Jun-09	26-Oct-10	Nitrate plus nitrite, water, filtered, milligrams per liter as nitrogen	mg/L as N	17	0.81	6.51	2.58
09-Jun-09	20-Jun-12	Phosphorus, water, unfiltered, milligrams per liter as phosphorus	mg/L	32	0.15	0.68	0.34
09-Jun-09	20-Jun-12	Orthophosphate, water, filtered, milligrams per liter as phosphorus	mg/L as P	32	0.08	0.25	0.12
09-Jun-09	26-Oct-10	Chloride, water, filtered, milligrams per liter	mg/L	17	12	27	18.53
09-Jun-09	13-Oct-09	Fecal coliform, M-FC MF (0.45 micron) method, water, colonies per 100 milliliters	cfu/100mL	7	27	2200	968.57
05-Apr-11	20-Jun-12	Fecal streptococci, m-enterococcus MF method, water, colonies per 100 milliliters	cfu/100mL	15	5	860	169.93
14-Apr-10	20-Jun-12	Escherichia coli, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	25	5	1607	193.36
09-Jun-09	13-Oct-09	Escherichia coli, modified m-TEC MF method, water, colonies per 100 milliliters	cfu/100mL	7	50	790	438.57
05-Apr-11	20-Jun-12	Chloride, water, unfiltered, milligrams per liter	mg/L	15	15	25	20.33
14-Apr-10	20-Jun-12	Enterococci, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	25	10	3255	206.16

Sample Summary and Statistics

Mississippi River below Mo River confluence

Begin Date	End Date	Parameter Description	Units	Count	Min	Max	Average
09-Jun-09	06-Aug-12	Temperature, water, degrees Celsius	°C	34	8.09	30.8	22.56
09-Jun-09	06-Aug-12	Discharge, instantaneous, cubic feet per second	cfs	34	78100	455000	282637.06
09-Jun-09	06-Aug-12	Specific conductance, water, unfiltered, field, microsiemens per centimeter at 25 degrees Celsius	uS/cm at 25 °C	34	387	820	556.15
09-Jun-09	06-Aug-12	Dissolved oxygen, water, unfiltered, milligrams per liter	mg/L	34	5.35	11.32	7.57
09-Jun-09	20-Jun-12	Chemical oxygen demand, high level, water, unfiltered, milligrams per liter	mg/L	32	1.6	29	16.13
09-Jun-09	06-Aug-12	pH, water, unfiltered, field, standard units	SU	34	7.45	8.63	8.08
09-Jun-09	20-Jun-12	Residue, total nonfilterable, milligrams per liter	mg/L	32	44	570	215.78
05-Apr-11	20-Jun-12	Total nitrogen, water, unfiltered, milligrams per liter	mg/L	15	0.74	3.9	2.15
09-Jun-09	26-Oct-10	Ammonia, water, filtered, milligrams per liter as nitrogen	mg/L as N	17	0.0022	0.04	0.01
05-Apr-11	20-Jun-12	Ammonia, water, unfiltered, milligrams per liter as nitrogen	mg/L	15	0.0075	0.058	0.02
09-Jun-09	26-Oct-10	Nitrite, water, filtered, milligrams per liter as nitrogen	mg/L as N	17	0.001	0.05	0.02
09-Jun-09	26-Oct-10	Nitrate, water, filtered, milligrams per liter as nitrogen	mg/L as N	17	1.2	4.1	2.35
09-Jun-09	20-Jun-12	Ammonia plus organic nitrogen, water, unfiltered, milligrams per liter as nitrogen	mg/L	32	0.82	8.6	1.55
05-Apr-11	20-Jun-12	Nitrate plus nitrite, water, unfiltered, milligrams per liter as nitrogen	mg/L as	15	0.41	3.8	1.72
09-Jun-09	26-Oct-10	Nitrate plus nitrite, water, filtered, milligrams per liter as nitrogen	mg/L as N	17	1.22	4.13	2.37
09-Jun-09	20-Jun-12	Phosphorus, water, unfiltered, milligrams per liter as phosphorus	mg/L	32	0.16	0.59	0.31
09-Jun-09	20-Jun-12	Orthophosphate, water, filtered, milligrams per liter as phosphorus	mg/L as P	32	0.074	0.25	0.12
09-Jun-09	26-Oct-10	Chloride, water, filtered, milligrams per liter	mg/L	17	14	27	21.94
09-Jun-09	13-Oct-09	Fecal coliform, M-FC MF (0.45 micron) method, water, colonies per 100 milliliters	cfu/100mL	7	81	790	414.43
05-Apr-11	20-Jun-12	Fecal streptococci, m-enterococcus MF method, water, colonies per 100 milliliters	cfu/100mL	15	5	530	138.73
15-Apr-10	20-Jun-12	Escherichia coli, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	25	5	708	108.4
09-Jun-09	13-Oct-09	Escherichia coli, modified m-TEC MF method, water, colonies per 100 milliliters	cfu/100mL	7	40	855	242.14
05-Apr-11	20-Jun-12	Chloride, water, unfiltered, milligrams per liter	mg/L	15	4.2	30	20.21
15-Apr-10	20-Jun-12	Enterococci, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	25	5	2489	150.64

Sample Summary and Statistics

Missouri River at Columbia Bottom Consv. Area at mm 4

Begin Date	End Date	Parameter Description	Units	Count	Min	Max	Average
09-Jun-09	06-Aug-12	Temperature, water, degrees Celsius	°C	34	8.99	31.3	23.12
09-Jun-09	06-Aug-12	Discharge, instantaneous, cubic feet per second	cfs	34	46300	237000	127618.53
09-Jun-09	06-Aug-12	Specific conductance, water, unfiltered, field, microsiemens per centimeter at 25 degrees Celsius	uS/cm at 25 °C	34	389	833	650.82
09-Jun-09	06-Aug-12	Dissolved oxygen, water, unfiltered, milligrams per liter	mg/L	34	4.81	10.46	7.3
09-Jun-09	20-Jun-12	Chemical oxygen demand, high level, water, unfiltered, milligrams per liter	mg/L	32	1.6	32	15.56
09-Jun-09	06-Aug-12	pH, water, unfiltered, field, standard units	SU	34	7.53	8.49	8.05
09-Jun-09	20-Jun-12	Residue, total nonfilterable, milligrams per liter	mg/L	32	58	1000	334.97
05-Apr-11	20-Jun-12	Total nitrogen, water, unfiltered, milligrams per liter	mg/L	15	0.6	3.5	1.51
09-Jun-09	26-Oct-10	Ammonia, water, filtered, milligrams per liter as nitrogen	mg/L as N	16	0.0022	0.03	0.01
05-Apr-11	20-Jun-12	Ammonia, water, unfiltered, milligrams per liter as nitrogen	mg/L	15	0.0075	0.05	0.02
09-Jun-09	26-Oct-10	Nitrite, water, filtered, milligrams per liter as nitrogen	mg/L as N	17	0.001	0.03	0.01
09-Jun-09	26-Oct-10	Nitrate, water, filtered, milligrams per liter as nitrogen	mg/L as N	17	0.57	3	1.63
09-Jun-09	20-Jun-12	Ammonia plus organic nitrogen, water, unfiltered, milligrams per liter as nitrogen	mg/L	32	0.75	8.6	1.59
05-Apr-11	20-Jun-12	Nitrate plus nitrite, water, unfiltered, milligrams per liter as nitrogen	mg/L as	15	0.19	2.7	1.17
09-Jun-09	26-Oct-10	Nitrate plus nitrite, water, filtered, milligrams per liter as nitrogen	mg/L as N	17	0.571	3.001	1.64
09-Jun-09	20-Jun-12	Phosphorus, water, unfiltered, milligrams per liter as phosphorus	mg/L	32	0.19	0.92	0.4
09-Jun-09	20-Jun-12	Orthophosphate, water, filtered, milligrams per liter as phosphorus	mg/L as P	32	0.076	0.23	0.12
09-Jun-09	26-Oct-10	Chloride, water, filtered, milligrams per liter	mg/L	17	8.2	24	15.95
09-Jun-09	13-Oct-09	Fecal coliform, M-FC MF (0.45 micron) method, water, colonies per 100 milliliters	cfu/100mL	7	117	1470	705.71
05-Apr-11	20-Jun-12	Fecal streptococci, m-enterococcus MF method, water, colonies per 100 milliliters	cfu/100mL	15	5	880	203.33
15-Apr-10	20-Jun-12	Escherichia coli, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	25	10	910	156.24
09-Jun-09	13-Oct-09	Escherichia coli, modified m-TEC MF method, water, colonies per 100 milliliters	cfu/100mL	7	100	1150	452.86
05-Apr-11	20-Jun-12	Chloride, water, unfiltered, milligrams per liter	mg/L	15	6.4	24	15.63
15-Apr-10	20-Jun-12	Enterococci, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	25	5	3873	241.76

Sample Summary and Statistics

Missouri River below St. Charles at mm 24.5

Begin Date	End Date	Parameter Description	Units	Count	Min	Max	Average
09-Jun-09	06-Aug-12	Temperature, water, degrees Celsius	°C	34	9.31	31.15	23.13
09-Jun-09	06-Aug-12	Discharge, instantaneous, cubic feet per second	cfs	34	46400	237000	128023.53
09-Jun-09	06-Aug-12	Specific conductance, water, unfiltered, field, microsiemens per centimeter at 25 degrees Celsius	uS/cm at 25 °C	34	385	865	653.88
09-Jun-09	06-Aug-12	Dissolved oxygen, water, unfiltered, milligrams per liter	mg/L	34	4.87	10.22	7.21
09-Jun-09	20-Jun-12	Chemical oxygen demand, high level, water, unfiltered, milligrams per liter	mg/L	32	1.6	32	15.75
09-Jun-09	06-Aug-12	pH, water, unfiltered, field, standard units	SU	34	7.48	8.55	8.04
09-Jun-09	20-Jun-12	Residue, total nonfilterable, milligrams per liter	mg/L	32	64	920	330.06
05-Apr-11	20-Jun-12	Total nitrogen, water, unfiltered, milligrams per liter	mg/L	15	0.6	3.5	1.47
09-Jun-09	26-Oct-10	Ammonia, water, filtered, milligrams per liter as nitrogen	mg/L as N	16	0.0022	0.01	0.01
05-Apr-11	20-Jun-12	Ammonia, water, unfiltered, milligrams per liter as nitrogen	mg/L	15	0.0075	0.062	0.02
09-Jun-09	26-Oct-10	Nitrite, water, filtered, milligrams per liter as nitrogen	mg/L as N	17	0.001	0.03	0.01
09-Jun-09	26-Oct-10	Nitrate, water, filtered, milligrams per liter as nitrogen	mg/L as N	17	0.84	3.1	1.73
09-Jun-09	20-Jun-12	Ammonia plus organic nitrogen, water, unfiltered, milligrams per liter as nitrogen	mg/L	32	0.71	4.7	1.38
05-Apr-11	20-Jun-12	Nitrate plus nitrite, water, unfiltered, milligrams per liter as nitrogen	mg/L as	15	0.23	2.7	1.15
09-Jun-09	26-Oct-10	Nitrate plus nitrite, water, filtered, milligrams per liter as nitrogen	mg/L as N	17	0.841	3.101	1.73
09-Jun-09	20-Jun-12	Phosphorus, water, unfiltered, milligrams per liter as phosphorus	mg/L	32	0.19	0.85	0.4
09-Jun-09	20-Jun-12	Orthophosphate, water, filtered, milligrams per liter as phosphorus	mg/L as P	32	0.061	0.24	0.12
09-Jun-09	26-Oct-10	Chloride, water, filtered, milligrams per liter	mg/L	17	11	25	16.06
09-Jun-09	13-Oct-09	Fecal coliform, M-FC MF (0.45 micron) method, water, colonies per 100 milliliters	cfu/100mL	7	63	2100	762.57
05-Apr-11	20-Jun-12	Fecal streptococci, m-enterococcus MF method, water, colonies per 100 milliliters	cfu/100mL	15	18	700	159.07
15-Apr-10	20-Jun-12	Escherichia coli, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	25	5	987	137.04
09-Jun-09	13-Oct-09	Escherichia coli, modified m-TEC MF method, water, colonies per 100 milliliters	cfu/100mL	7	30	1340	417.14
05-Apr-11	20-Jun-12	Chloride, water, unfiltered, milligrams per liter	mg/L	15	6.4	22	15.69
15-Apr-10	20-Jun-12	Enterococci, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	25	10	2014	148.04

Sample Summary and Statistics

Missouri River near Chesterfield at mm 48

Begin Date	End Date	Parameter Description	Units	Count	Min	Max	Average
09-Jun-09	06-Aug-12	Temperature, water, degrees Celsius	°C	34	9.66	31.18	23.16
09-Jun-09	06-Aug-12	Discharge, instantaneous, cubic feet per second	cfs	34	46400	237000	127969.38
09-Jun-09	06-Aug-12	Specific conductance, water, unfiltered, field, microsiemens per centimeter at 25 degrees Celsius	uS/cm at 25 °C	34	382	890	646.76
09-Jun-09	06-Aug-12	Dissolved oxygen, water, unfiltered, milligrams per liter	mg/L	34	4.67	10.42	7.25
09-Jun-09	20-Jun-12	Chemical oxygen demand, high level, water, unfiltered, milligrams per liter	mg/L	32	1.6	32	13.65
09-Jun-09	06-Aug-12	pH, water, unfiltered, field, standard units	SU	34	7.43	8.61	8
09-Jun-09	20-Jun-12	Residue, total nonfilterable, milligrams per liter	mg/L	32	73	840	322.28
05-Apr-11	20-Jun-12	Total nitrogen, water, unfiltered, milligrams per liter	mg/L	15	0.58	3.3	1.42
09-Jun-09	26-Oct-10	Ammonia, water, filtered, milligrams per liter as nitrogen	mg/L as N	17	0.0022	0.043	0.01
05-Apr-11	20-Jun-12	Ammonia, water, unfiltered, milligrams per liter as nitrogen	mg/L	15	0.0075	0.06	0.01
09-Jun-09	26-Oct-10	Nitrite, water, filtered, milligrams per liter as nitrogen	mg/L as N	17	0.001	0.02	0
09-Jun-09	26-Oct-10	Nitrate, water, filtered, milligrams per liter as nitrogen	mg/L as N	17	0.49	2.9	1.51
09-Jun-09	20-Jun-12	Ammonia plus organic nitrogen, water, unfiltered, milligrams per liter as nitrogen	mg/L	32	0.73	4.2	1.33
05-Apr-11	20-Jun-12	Nitrate plus nitrite, water, unfiltered, milligrams per liter as nitrogen	mg/L as	15	0.00115	2.7	1.07
09-Jun-09	26-Oct-10	Nitrate plus nitrite, water, filtered, milligrams per liter as nitrogen	mg/L as N	17	0.491	2.901	1.52
09-Jun-09	20-Jun-12	Phosphorus, water, unfiltered, milligrams per liter as phosphorus	mg/L	32	0.18	0.8	0.39
09-Jun-09	20-Jun-12	Orthophosphate, water, filtered, milligrams per liter as phosphorus	mg/L as P	32	0.029	0.25	0.12
09-Jun-09	26-Oct-10	Chloride, water, filtered, milligrams per liter	mg/L	17	12	25	16.47
09-Jun-09	13-Oct-09	Fecal coliform, M-FC MF (0.45 micron) method, water, colonies per 100 milliliters	cfu/100mL	7	18	1320	583.86
05-Apr-11	20-Jun-12	Fecal streptococci, m-enterococcus MF method, water, colonies per 100 milliliters	cfu/100mL	15	5	670	167.8
15-Apr-10	20-Jun-12	Escherichia coli, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	25	5	594	120.16
09-Jun-09	13-Oct-09	Escherichia coli, modified m-TEC MF method, water, colonies per 100 milliliters	cfu/100mL	7	5	1200	380.71
05-Apr-11	20-Jun-12	Chloride, water, unfiltered, milligrams per liter	mg/L	15	13	24	16.53
15-Apr-10	20-Jun-12	Enterococci, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	25	5	1178	128

Sample Summary and Statistics

River des Peres at S. Broadway

Begin Date	End Date	Parameter Description	Units	Count	Min	Max	Average
28-Jul-09	05-Dec-11	Temperature, water, degrees Celsius	°C	16	1	23	11.16
28-Jul-09	05-Dec-11	Dissolved oxygen, water, unfiltered, milligrams per liter	mg/L	16	5.7	13	8.91
28-Jul-09	05-Dec-11	Chemical oxygen demand, high level, water, unfiltered, milligrams per liter	mg/L	16	15	74	32.06
28-Jul-09	05-Dec-11	pH, water, unfiltered, field, standard units	SU	11	5.5	7.83	6.89
16-Feb-11	05-Dec-11	Residue, total nonfilterable, milligrams per liter	mg/L	6	6	30	16.33
06-Sep-11	05-Dec-11	Ammonia, water, filtered, milligrams per liter as nitrogen	mg/L as N	4	0.057	0.359	0.16
16-Feb-11	05-Dec-11	Ammonia plus organic nitrogen, water, unfiltered, milligrams per liter as nitrogen	mg/L	6	1.5	1.5	1.5
16-Feb-11	05-Dec-11	Nitrate plus nitrite, water, unfiltered, milligrams per liter as nitrogen	mg/L as	6	0.1	1.05	0.4
16-Feb-11	05-Dec-11	Phosphorus, water, unfiltered, milligrams per liter as phosphorus	mg/L	6	0.125	0.284	0.15
01-Mar-11	05-Dec-11	Orthophosphate, water, filtered, milligrams per liter as phosphorus	mg/L as P	5	0.04	0.13	0.09
28-Jul-09	05-Dec-11	Hardness, water, milligrams per liter as calcium carbonate	mg/L	16	134.8	456.8	246.15
28-Jul-09	05-Dec-11	Cadmium, water, filtered, micrograms per liter	µg/L	16	0.00015	0.15	0.06
28-Jul-09	05-Dec-11	Chromium, water, filtered, micrograms per liter	µg/L	16	0.003	3	1.31
28-Jul-09	05-Dec-11	Copper, water, filtered, micrograms per liter	µg/L	16	0.0012	3.1	0.65
28-Jul-09	05-Dec-11	Iron, water, filtered, micrograms per liter	µg/L	16	0.03	160	28.67
28-Jul-09	05-Dec-11	Lead, water, filtered, micrograms per liter	µg/L	16	0.00045	0.45	0.2
28-Jul-09	05-Dec-11	Nickel, water, filtered, micrograms per liter	µg/L	16	0.0135	13.5	5.92
28-Jul-09	05-Dec-11	Zinc, water, filtered, micrograms per liter	µg/L	16	0.0105	36	6.2
28-Jul-09	21-Oct-09	Fecal coliform, M-FC MF (0.7 micron) method, water, colonies per 100 milliliters	cfu/100 mL	5	73	740	356.6
28-Jul-09	03-Oct-11	Fecal streptococci, m-enterococcus MF method, water, colonies per 100 milliliters	cfu/100mL	7	91	7000	1155.86
06-Sep-11	03-Oct-11	Escherichia coli, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	2	189	15500	7844.5
28-Jul-09	05-Dec-11	Chloride, water, unfiltered, milligrams per liter	mg/L	16	38	1160	201.81
06-Sep-11	03-Oct-11	Enterococci, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	2	173	5170	2671.5

Sample Summary and Statistics

River des Peres at St. Louis, MO

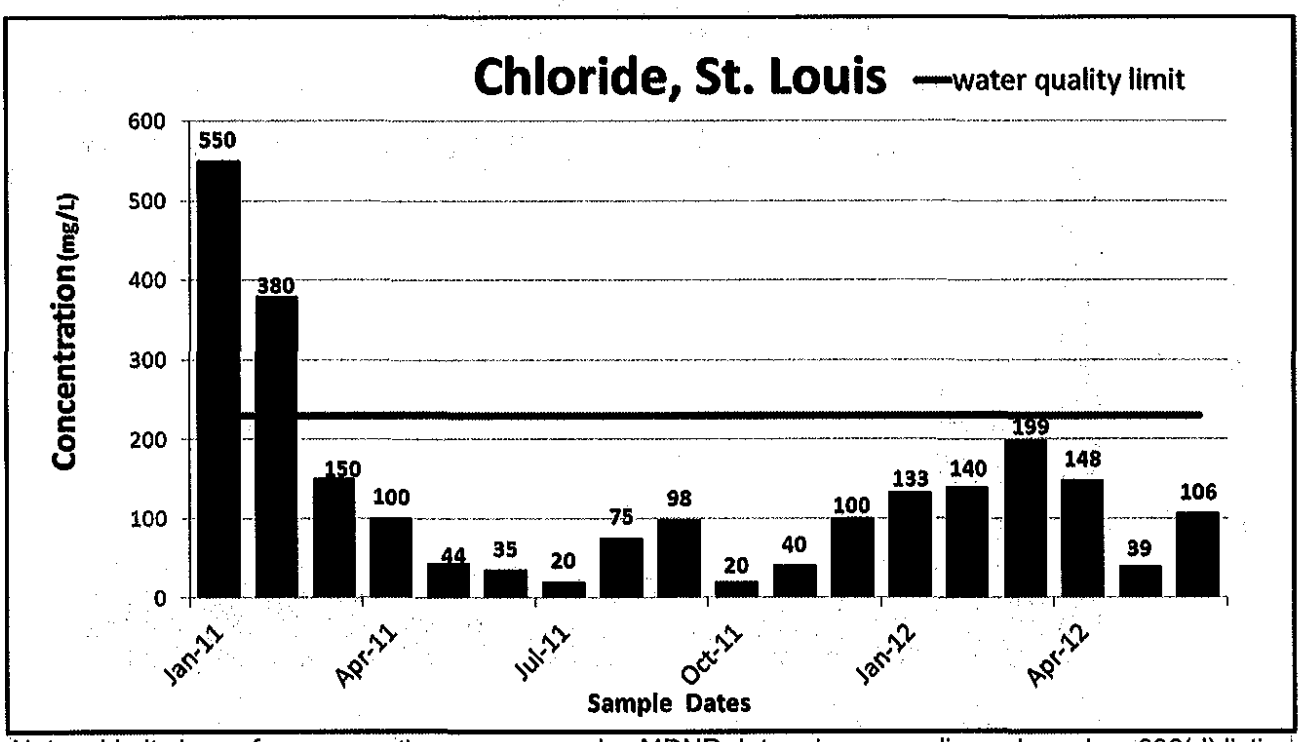
Begin Date	End Date	Parameter Description	Units	Count	Min	Max	Average
16-Jun-09	04-Jun-12	Temperature, water, degrees Celsius	°C	37	-0.17	30.73	15.18
16-Jun-09	17-Aug-11	Discharge, cubic feet per second	cfs	22	2	1150	138.87
14-Jul-09	13-Dec-11	Discharge, instantaneous, cubic feet per second	cfs	9	2.2	1010	151.97
16-Jun-09	13-Dec-11	Specific conductance, water, unfiltered, field, microsiemens per centimeter at 25 degrees Celsius	uS/cm at 25 °C	31	239	7367	975.45
16-Jun-09	04-Jun-12	Dissolved oxygen, water, unfiltered, milligrams per liter	mg/L	37	0.52	14.17	8.6
16-Jun-09	04-Jun-12	Chemical oxygen demand, high level, water, unfiltered, milligrams per liter	mg/L	37	1.6	78	24.04
16-Jun-09	04-Jun-12	pH, water, unfiltered, field, standard units	SU	37	6.22	9.54	7.73
16-Jun-09	04-Jun-12	Residue, total nonfilterable, milligrams per liter	mg/L	37	3	160	26.61
18-Jan-11	13-Dec-11	Total nitrogen, water, unfiltered, milligrams per liter	mg/L	12	0.58	2.3	1.38
16-Jun-09	04-Jun-12	Ammonia, water, filtered, milligrams per liter as nitrogen	mg/L as N	25	0.0075	1.27	0.16
18-Jan-11	13-Dec-11	Ammonia, water, unfiltered, milligrams per liter as nitrogen	mg/L	12	0.041	0.45	0.2
16-Jun-09	14-Dec-10	Nitrite, water, filtered, milligrams per liter as nitrogen	mg/L as N	19	0.001	0.14	0.04
16-Jun-09	14-Dec-10	Nitrate, water, filtered, milligrams per liter as nitrogen	mg/L as N	19	0.08	1.3	0.7
16-Jun-09	13-Dec-11	Ammonia plus organic nitrogen, water, unfiltered, milligrams per liter as nitrogen	mg/L	31	0.65	2.3	1.13
18-Jan-11	13-Dec-11	Nitrate plus nitrite, water, unfiltered, milligrams per liter as nitrogen	mg/L as	12	0.00115	1.2	0.57
16-Jun-09	14-Dec-10	Nitrate plus nitrite, water, filtered, milligrams per liter as nitrogen	mg/L as N	19	0.09	1.35	0.74
16-Jun-09	13-Dec-11	Phosphorus, water, unfiltered, milligrams per liter as phosphorus	mg/L	31	0.06	0.54	0.21
16-Jun-09	13-Dec-11	Orthophosphate, water, filtered, milligrams per liter as phosphorus	mg/L as P	31	0.02	0.26	0.1
16-Jun-09	13-Dec-11	Hardness, water, milligrams per liter as calcium carbonate	mg/L	31	79	351	194.19
16-Jun-09	14-Dec-10	Calcium, water, filtered, milligrams per liter	mg/L	19	24	110	51.79
16-Jun-09	14-Dec-10	Magnesium, water, filtered, milligrams per liter	mg/L	19	4.2	21	10.97
16-Jun-09	14-Dec-10	Chloride, water, filtered, milligrams per liter	mg/L	19	20	1400	144.74
16-Jun-09	14-Dec-10	Arsenic, water, filtered, micrograms per liter	µg/L	19	1	3.3	2.13
16-Jun-09	14-Dec-10	Arsenic, water, unfiltered, micrograms per liter	µg/L	19	1.5	4.9	2.35
16-Jun-09	14-Dec-10	Beryllium, water, filtered, micrograms per liter	µg/L	19	0.006	0.2	0.03
16-Jun-09	14-Dec-10	Beryllium, water, unfiltered, recoverable, micrograms per liter	µg/L	19	0.006	0.25	0.04
16-Jun-09	13-Dec-11	Cadmium, water, filtered, micrograms per liter	µg/L	31	0.00395	0.22	0.04
16-Jun-09	14-Dec-10	Cadmium, water, unfiltered, micrograms per liter	µg/L	19	0.00395	0.22	0.06
16-Jun-09	13-Dec-11	Chromium, water, filtered, micrograms per liter	µg/L	31	1.2	28	5.13
16-Jun-09	14-Dec-10	Chromium, water, unfiltered, recoverable, micrograms per liter	µg/L	19	1.7	32	5.63
16-Jun-09	13-Dec-11	Copper, water, filtered, micrograms per liter	µg/L	31	1.4	16	4.01
16-Jun-09	14-Dec-10	Copper, water, unfiltered, recoverable, micrograms per liter	µg/L	19	3.1	19	6.21
16-Jun-09	14-Dec-10	Iron, water, unfiltered, recoverable, micrograms per liter	µg/L	19	120	6300	842.11
16-Jun-09	13-Dec-11	Iron, water, filtered, micrograms per liter	µg/L	31	5.6	260	53.14
16-Jun-09	13-Dec-11	Lead, water, filtered, micrograms per liter	µg/L	31	0.0016	1.1	0.2
16-Jun-09	14-Dec-10	Lead, water, unfiltered, recoverable, micrograms per liter	µg/L	19	0.51	15	2.87
16-Jun-09	14-Dec-10	Manganese, water, unfiltered, recoverable, micrograms per liter	µg/L	19	43	280	107.63
16-Jun-09	14-Dec-10	Manganese, water, filtered, micrograms per liter	µg/L	19	2.3	200	60.84
16-Jun-09	13-Dec-11	Nickel, water, filtered, micrograms per liter	µg/L	31	1.9	8.1	4.69
16-Jun-09	14-Dec-10	Nickel, water, unfiltered, recoverable, micrograms per liter	µg/L	19	3.3	13	5.77
16-Jun-09	14-Dec-10	Silver, water, filtered, micrograms per liter	µg/L	19	0.00475	0.13	0.03
16-Jun-09	14-Dec-10	Silver, water, unfiltered, recoverable, micrograms per liter	µg/L	19	0.00475	0.13	0.03
16-Jun-09	13-Dec-11	Zinc, water, filtered, micrograms per liter	µg/L	31	0.0095	15	4.83
16-Jun-09	14-Dec-10	Zinc, water, unfiltered, recoverable, micrograms per liter	µg/L	19	3.6	45	14.94
16-Jun-09	14-Dec-10	Aluminum, water, unfiltered, recoverable, micrograms per liter	µg/L	19	72	6400	795.11
16-Jun-09	14-Dec-10	Aluminum, water, filtered, micrograms per liter	µg/L	19	2.3	200	47.67
16-Jun-09	13-Dec-11	Selenium, water, filtered, micrograms per liter	µg/L	31	0.71	4.1	1.95
16-Jun-09	14-Dec-10	Selenium, water, unfiltered, micrograms per liter	µg/L	19	0.7	5.3	2.05
16-Jun-09	15-Dec-09	Fecal coliform, M-FC MF (0.45 micron) method, water, colonies per 100 milliliters	cfu/100mL	7	440	140000	49102.86
12-Apr-11	04-Jun-12	Fecal streptococci, m-enterococcus MF method, water, colonies per 100 milliliters	cfu/100mL	10	45	28000	6370.2
19-Jan-10	04-Jun-12	Escherichia coli, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	22	1	32600	4578.36
16-Jun-09	14-Dec-10	Mercury, water, unfiltered, recoverable, micrograms per liter	µg/L	19	0.0155	0.11	0.03
16-Jun-09	15-Dec-09	Escherichia coli, modified m-TEC MF method, water, colonies per 100 milliliters	cfu/100mL	7	10	51000	16544.29
18-Jan-11	04-Jun-12	Chloride, water, unfiltered, milligrams per liter	mg/L	18	20	550	132
19-Jan-10	18-Oct-11	Enterococci, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	19	1	24800	2433.95

Sample Summary and Statistics

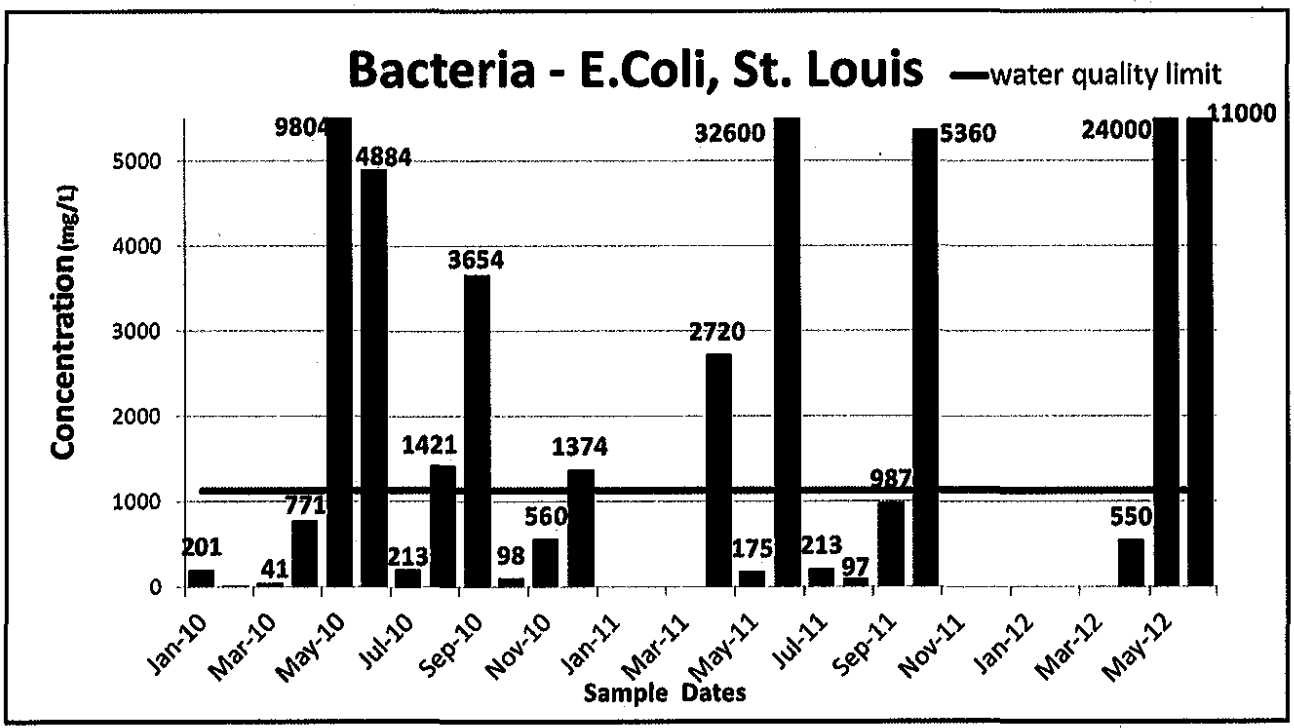
River des Peres near University City, MO

Begin Date	End Date	Parameter Description	Units	Count	Min	Max	Average
16-Jun-09	04-Jun-12	Temperature, water, degrees Celsius	°C	37	-0.22	29.14	14.97
16-Jun-09	13-Dec-11	Discharge, instantaneous, cubic feet per second	cfs	31	0.1	434	16.24
16-Jun-09	13-Dec-11	Specific conductance, water, unfiltered, field, microsiemens per centimeter at 25 degrees Celsius	uS/cm at 25 °C	31	338	11012	1484.19
16-Jun-09	04-Jun-12	Dissolved oxygen, water, unfiltered, milligrams per liter	mg/L	37	4.65	24	11.65
16-Jun-09	04-Jun-12	Chemical oxygen demand, high level, water, unfiltered, milligrams per liter	mg/L	37	1.6	120	23.05
16-Jun-09	04-Jun-12	pH, water, unfiltered, field, standard units	SU	37	6.87	9	8.09
16-Jun-09	04-Jun-12	Residue, total nonfilterable, milligrams per liter	mg/L	37	0.5	180	10.85
18-Jan-11	13-Dec-11	Total nitrogen, water, unfiltered, milligrams per liter	mg/L	12	0.00115	5	1.24
16-Jun-09	04-Jun-12	Ammonia, water, filtered, milligrams per liter as nitrogen	mg/L as N	25	0.0073	1.48	0.15
18-Jan-11	13-Dec-11	Ammonia, water, unfiltered, milligrams per liter as nitrogen	mg/L	12	0.0075	3.1	0.39
16-Jun-09	14-Dec-10	Nitrite, water, filtered, milligrams per liter as nitrogen	mg/L as N	19	0.001	0.1	0.01
16-Jun-09	14-Dec-10	Nitrate, water, filtered, milligrams per liter as nitrogen	mg/L as N	19	0.01	1	0.41
16-Jun-09	13-Dec-11	Ammonia plus organic nitrogen, water, unfiltered, milligrams per liter as nitrogen	mg/L	31	0.4	4.5	0.92
18-Jan-11	13-Dec-11	Nitrate plus nitrite, water, unfiltered, milligrams per liter as nitrogen	mg/L as	12	0.028	0.91	0.44
16-Jun-09	14-Dec-10	Nitrate plus nitrite, water, filtered, milligrams per liter as nitrogen	mg/L as N	19	0.011	1	0.42
16-Jun-09	13-Dec-11	Phosphorus, water, unfiltered, milligrams per liter as phosphorus	mg/L	31	0.0075	0.41	0.16
16-Jun-09	13-Dec-11	Orthophosphate, water, filtered, milligrams per liter as phosphorus	mg/L as P	31	0.0025	0.25	0.1
16-Jun-09	13-Dec-11	Hardness, water, milligrams per liter as calcium carbonate	mg/L	31	64	492	229.42
16-Jun-09	14-Dec-10	Calcium, water, filtered, milligrams per liter	mg/L	19	20	160	66
16-Jun-09	14-Dec-10	Magnesium, water, filtered, milligrams per liter	mg/L	19	3.6	25	14.78
16-Jun-09	14-Dec-10	Chloride, water, filtered, milligrams per liter	mg/L	19	42	3800	409.37
16-Jun-09	14-Dec-10	Arsenic, water, filtered, micrograms per liter	µg/L	19	1.1	4.1	1.98
16-Jun-09	14-Dec-10	Arsenic, water, unfiltered, micrograms per liter	µg/L	19	1.4	3.7	2.13
16-Jun-09	14-Dec-10	Beryllium, water, filtered, micrograms per liter	µg/L	19	0.006	0.06	0.01
16-Jun-09	14-Dec-10	Beryllium, water, unfiltered, recoverable, micrograms per liter	µg/L	19	0.006	0.19	0.02
16-Jun-09	13-Dec-11	Cadmium, water, filtered, micrograms per liter	µg/L	31	0.00395	0.66	0.08
16-Jun-09	14-Dec-10	Cadmium, water, unfiltered, micrograms per liter	µg/L	19	0.0041	0.75	0.12
16-Jun-09	13-Dec-11	Chromium, water, filtered, micrograms per liter	µg/L	31	2.2	76	9.92
16-Jun-09	14-Dec-10	Chromium, water, unfiltered, recoverable, micrograms per liter	µg/L	19	2.3	90	11.07
16-Jun-09	13-Dec-11	Copper, water, filtered, micrograms per liter	µg/L	31	2	44	6.31
16-Jun-09	14-Dec-10	Copper, water, unfiltered, recoverable, micrograms per liter	µg/L	19	2.5	48	8.57
16-Jun-09	14-Dec-10	Iron, water, unfiltered, recoverable, micrograms per liter	µg/L	19	64	4900	483.16
16-Jun-09	13-Dec-11	Iron, water, filtered, micrograms per liter	µg/L	31	11	160	45.68
16-Jun-09	13-Dec-11	Lead, water, filtered, micrograms per liter	µg/L	31	0.0016	0.34	0.09
16-Jun-09	14-Dec-10	Lead, water, unfiltered, recoverable, micrograms per liter	µg/L	19	0.12	11	1.11
16-Jun-09	14-Dec-10	Manganese, water, unfiltered, recoverable, micrograms per liter	µg/L	19	16	590	110.89
16-Jun-09	14-Dec-10	Manganese, water, filtered, micrograms per liter	µg/L	19	10	540	91.58
16-Jun-09	13-Dec-11	Nickel, water, filtered, micrograms per liter	µg/L	31	1.4	9.7	5.22
16-Jun-09	14-Dec-10	Nickel, water, unfiltered, recoverable, micrograms per liter	µg/L	19	2.8	12	6.51
16-Jun-09	14-Dec-10	Silver, water, filtered, micrograms per liter	µg/L	19	0.00475	0.1	0.02
16-Jun-09	14-Dec-10	Silver, water, unfiltered, recoverable, micrograms per liter	µg/L	19	0.00475	0.1	0.02
16-Jun-09	13-Dec-11	Zinc, water, filtered, micrograms per liter	µg/L	31	0.0095	29	10.29
16-Jun-09	14-Dec-10	Zinc, water, unfiltered, recoverable, micrograms per liter	µg/L	19	5.3	110	25.06
16-Jun-09	14-Dec-10	Aluminum, water, unfiltered, recoverable, micrograms per liter	µg/L	19	18	5000	357.21
16-Jun-09	14-Dec-10	Aluminum, water, filtered, micrograms per liter	µg/L	19	0.008	130	20.72
16-Jun-09	13-Dec-11	Selenium, water, filtered, micrograms per liter	µg/L	31	0.76	5.2	2.24
16-Jun-09	14-Dec-10	Selenium, water, unfiltered, micrograms per liter	µg/L	19	0.8	8.8	2.65
16-Jun-09	15-Dec-09	Fecal coliform, M-FC MF (0.45 micron) method, water, colonies per 100 milliliters	cfu/100mL	7	350	85500	24921.43
12-Apr-11	04-Jun-12	Fecal streptococci, m-enterococcus MF method, water, colonies per 100 milliliters	cfu/100mL	10	140	220000	27316
19-Jan-10	04-Jun-12	Escherichia coli, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	22	30	38700	4625.41
16-Jun-09	14-Dec-10	Mercury, water, unfiltered, recoverable, micrograms per liter	µg/L	19	0.0155	0.1	0.03
16-Jun-09	15-Dec-09	Escherichia coli, modified m-TEC MF method, water, colonies per 100 milliliters	cfu/100mL	7	220	28000	7708.57
18-Jan-11	04-Jun-12	Chloride, water, unfiltered, milligrams per liter	mg/L	18	41	1200	229.61
19-Jan-10	18-Oct-11	Enterococci, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	19	5	34500	3149.47

River Des Peres

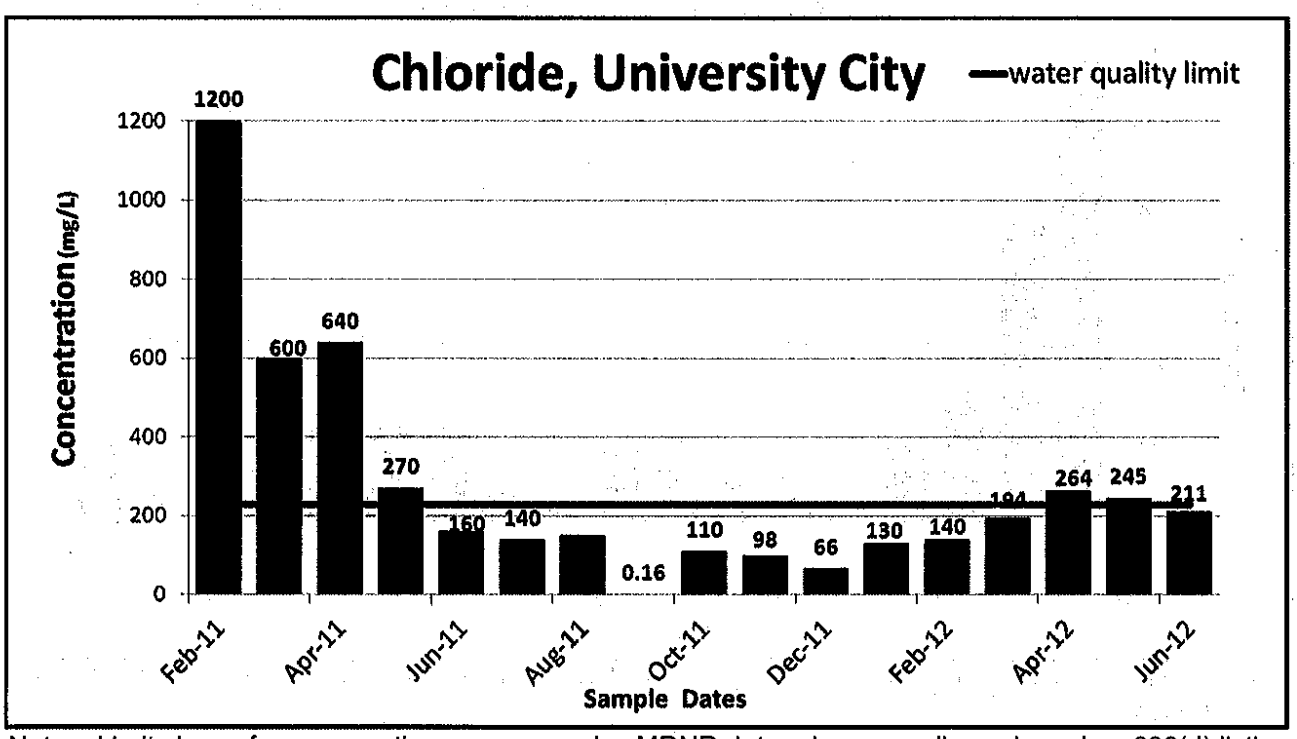


Note – Limit shown for comparative purposes only. MDNR determines compliance based on 303(d) listing methodology



Note – Limit shown for comparative purposes only. MDNR determines compliance based on 303(d) listing methodology

River Des Peres



Note – Limit shown for comparative purposes only. MDNR determines compliance based on 303(d) listing methodology

Sample Summary and Statistics

Shady Grove Creek at Thornton & Waymire Ave

Begin Date	End Date	Parameter Description	Units	Count	Min	Max	Average
07-Mar-11	12-Mar-12	Temperature, water, degrees Celsius	°C	5	6	20	12.3
07-Mar-11	12-Mar-12	Dissolved oxygen, water, unfiltered, milligrams per liter	mg/L	4	7.6	10.06	8.46
07-Mar-11	12-Mar-12	Chemical oxygen demand, high level, water, unfiltered, milligrams per liter	mg/L	4	16	46	31.75
09-May-11	12-Mar-12	pH, water, unfiltered, field, standard units	SU	3	7.41	7.8	7.63
07-Mar-11	12-Mar-12	Residue, total nonfilterable, milligrams per liter	mg/L	4	4	37	13.75
17-Jan-12	12-Mar-12	Ammonia, water, filtered, milligrams per liter as nitrogen	mg/L as N	2	0.14	0.156	0.15
07-Mar-11	25-Apr-11	Ammonia plus organic nitrogen, water, unfiltered, milligrams per liter as nitrogen	mg/L	2	1.5	1.5	1.5
07-Mar-11	25-Apr-11	Nitrate plus nitrite, water, unfiltered, milligrams per liter as nitrogen	mg/L as	2	1.5	2.71	2.1
07-Mar-11	25-Apr-11	Phosphorus, water, unfiltered, milligrams per liter as phosphorus	mg/L	2	0.125	0.125	0.12
07-Mar-11	25-Apr-11	Orthophosphate, water, filtered, milligrams per liter as phosphorus	mg/L as P	2	0.015	0.1	0.06
07-Mar-11	25-Apr-11	Hardness, water, milligrams per liter as calcium carbonate	mg/L	2	296.8	422.8	359.8
07-Mar-11	25-Apr-11	Cadmium, water, filtered, micrograms per liter	µg/L	2	0.00015	0.00015	0
07-Mar-11	25-Apr-11	Chromium, water, filtered, micrograms per liter	µg/L	2	0.003	0.003	0
07-Mar-11	25-Apr-11	Copper, water, filtered, micrograms per liter	µg/L	2	0.0012	0.0012	0
07-Mar-11	25-Apr-11	Iron, water, filtered, micrograms per liter	µg/L	2	0.03	0.03	0.03
07-Mar-11	25-Apr-11	Lead, water, filtered, micrograms per liter	µg/L	2	0.00045	0.00045	0
07-Mar-11	25-Apr-11	Nickel, water, filtered, micrograms per liter	µg/L	2	0.0135	0.0135	0.01
07-Mar-11	25-Apr-11	Zinc, water, filtered, micrograms per liter	µg/L	2	0.0105	0.079	0.04
25-Apr-11	25-Apr-11	Fecal streptococci, m-enterococcus MF method, water, colonies per 100 milliliters	cfu/100mL	1	270	270	270
07-Mar-11	12-Mar-12	Chloride, water, unfiltered, milligrams per liter	mg/L	4	86	185	134
25-Apr-11	25-Apr-11	Enterococci, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	1	464	464	464

Sample Summary and Statistics

Smith Creek at Bellerive Country Club

BeginDate	EndDate	ParameterDescription	Units	Count	Min	Max	Average
07-Jul-09	12-Jun-12	Temperature, water, degrees Celsius	°C	37	1	27	13.97
07-Jul-09	12-Jun-12	Dissolved oxygen, water, unfiltered, milligrams per liter	mg/L	37	1.63	13.2	7.27
07-Jul-09	12-Jun-12	Chemical oxygen demand, high level, water, unfiltered, milligrams per liter	mg/L	37	15	80	34.76
07-Jul-09	12-Jun-12	pH, water, unfiltered, field, standard units	SU	68	5.5	8.1	6.41
08-Feb-11	12-Jun-12	Residue, total nonfilterable, milligrams per liter	mg/L	17	0.5	258	24.71
09-May-11	12-Jun-12	Ammonia, water, filtered, milligrams per liter as nitrogen	mg/L as N	13	0.075	3.69	0.64
08-Feb-11	12-Dec-11	Ammonia plus organic nitrogen, water, unfiltered, milligrams per liter as nitrogen	mg/L	10	1.5	4.48	2.17
08-Feb-11	12-Dec-11	Nitrate plus nitrite, water, unfiltered, milligrams per liter as nitrogen	mg/L as	11	0.1	0.86	0.51
08-Feb-11	12-Dec-11	Phosphorus, water, unfiltered, milligrams per liter as phosphorus	mg/L	11	0.125	0.978	0.3
07-Mar-11	12-Dec-11	Orthophosphate, water, filtered, milligrams per liter as phosphorus	mg/L as P	10	0.03	0.409	0.17
07-Jul-09	12-Dec-11	Hardness, water, milligrams per liter as calcium carbonate	mg/L	31	140.8	464	293.46
07-Jul-09	12-Dec-11	Cadmium, water, filtered, micrograms per liter	µg/L	31	0.00015	0.15	0.06
07-Jul-09	12-Dec-11	Chromium, water, filtered, micrograms per liter	µg/L	31	0.003	30	2.03
07-Jul-09	12-Dec-11	Copper, water, filtered, micrograms per liter	µg/L	31	0.0012	8.2	0.89
07-Jul-09	12-Dec-11	Iron, water, filtered, micrograms per liter	µg/L	31	0.03	69	13.89
07-Jul-09	12-Dec-11	Lead, water, filtered, micrograms per liter	µg/L	31	0.00045	0.45	0.17
07-Jul-09	12-Dec-11	Nickel, water, filtered, micrograms per liter	µg/L	31	0.0135	13.5	5.24
07-Jul-09	12-Dec-11	Zinc, water, filtered, micrograms per liter	µg/L	31	0.0105	61	9.79
07-Jul-09	07-Oct-09	Fecal coliform, M-FC MF (0.7 micron) method, water, colonies per 100 milliliters	cfu/100 mL	5	110	6700	2188
07-Jul-09	12-Jun-12	Fecal streptococci, m-enterococcus MF method, water, colonies per 100 milliliters	cfu/100mL	22	9.1	29000	4313.28
07-Apr-10	12-Jun-12	Escherichia coli, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	16	41	36300	8374.31
07-Jul-09	12-Jun-12	Chloride, water, unfiltered, milligrams per liter	mg/L	37	19	1670	177.67
07-Apr-10	10-Oct-11	Enterococci, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	14	10	36294	6164.21

Sample Summary and Statistics

Spring Branch at New Ballwin Rd

Begin Date	End Date	Parameter Description	Units	Count	Min	Max	Average
29-Jul-09	06-Jun-12	Temperature, water, degrees Celsius	°C	36	2	27	14.06
29-Jul-09	06-Jun-12	Dissolved oxygen, water, unfiltered, milligrams per liter	mg/L	36	5.6	15.2	9.52
29-Jul-09	06-Jun-12	Chemical oxygen demand, high level, water, unfiltered, milligrams per liter	mg/L	36	4	39	15
29-Jul-09	06-Jun-12	pH, water, unfiltered, field, standard units	SU	66	6.3	8.7	6.97
22-Feb-11	06-Jun-12	Residue, total nonfilterable, milligrams per liter	mg/L	16	0.5	19	6.25
17-May-11	06-Jun-12	Ammonia, water, filtered, milligrams per liter as nitrogen	mg/L as N	14	0.025	0.124	0.04
22-Feb-11	06-Dec-11	Ammonia plus organic nitrogen, water, unfiltered, milligrams per liter as nitrogen	mg/L	10	1.5	1.5	1.5
22-Feb-11	06-Dec-11	Nitrate plus nitrite, water, unfiltered, milligrams per liter as nitrogen	mg/L as	10	0.245	1.13	0.73
22-Feb-11	06-Dec-11	Phosphorus, water, unfiltered, milligrams per liter as phosphorus	mg/L	10	0.125	0.125	0.12
05-Apr-11	06-Dec-11	Orthophosphate, water, filtered, milligrams per liter as phosphorus	mg/L as P	9	0.04	0.389	0.1
29-Jul-09	06-Dec-11	Hardness, water, milligrams per liter as calcium carbonate	mg/L	30	155.2	320	247.73
29-Jul-09	06-Dec-11	Cadmium, water, filtered, micrograms per liter	µg/L	29	0.00015	0.15	0.06
29-Jul-09	06-Dec-11	Chromium, water, filtered, micrograms per liter	µg/L	30	0.003	3	1.2
29-Jul-09	06-Dec-11	Copper, water, filtered, micrograms per liter	µg/L	30	0.0012	12	0.98
29-Jul-09	06-Dec-11	Iron, water, filtered, micrograms per liter	µg/L	30	0.03	30	12.02
29-Jul-09	06-Dec-11	Lead, water, filtered, micrograms per liter	µg/L	30	0.00045	0.45	0.18
29-Jul-09	06-Dec-11	Nickel, water, filtered, micrograms per liter	µg/L	30	0.0135	13.5	5.41
29-Jul-09	06-Dec-11	Zinc, water, filtered, micrograms per liter	µg/L	30	0.0105	33	6.56
29-Jul-09	05-Jan-11	Aluminum, water, filtered, micrograms per liter	µg/L	20	0.0645	64.5	38.73
29-Jul-09	06-Oct-09	Fecal coliform, M-FC MF (0.7 micron) method, water, colonies per 100 milliliters	cfu/100 mL	4	210	1700	695
29-Jul-09	06-Jun-12	Fecal streptococci, m-enterococcus MF method, water, colonies per 100 milliliters	cfu/100mL	22	9	9802	2078.05
06-Apr-10	06-Jun-12	Escherichia coli, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	18	5	2400	485.78
29-Jul-09	06-Jun-12	Chloride, water, unfiltered, milligrams per liter	mg/L	36	31	85	54.14
06-Apr-10	04-Oct-11	Enterococci, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	15	5	19863	2091.53

Sample Summary and Statistics

Sugar Creek I at Barrett Station Rd

Begin Date	End Date	Parameter Description	Units	Count	Min	Max	Average
28-Jul-09	04-Jun-12	Temperature, water, degrees Celsius	°C	37	2	30	14.87
28-Jul-09	04-Jun-12	Dissolved oxygen, water, unfiltered, milligrams per liter	mg/L	37	3.1	12.54	7.81
28-Jul-09	04-Jun-12	Chemical oxygen demand, high level, water, unfiltered, milligrams per liter	mg/L	37	2	62	25.35
28-Jul-09	04-Jun-12	pH, water, unfiltered, field, standard units	SU	76	6.27	8.4	7.09
16-Feb-11	04-Jun-12	Residue, total nonfilterable, milligrams per liter	mg/L	16	0.5	26	9.34
02-May-11	04-Jun-12	Ammonia, water, filtered, milligrams per liter as nitrogen	mg/L as N	13	0.025	0.368	0.15
16-Feb-11	05-Dec-11	Ammonia plus organic nitrogen, water, unfiltered, milligrams per liter as nitrogen	mg/L	9	1.5	3	1.67
16-Feb-11	05-Dec-11	Nitrate plus nitrite, water, unfiltered, milligrams per liter as nitrogen	mg/L as	10	0.1	1.3	0.58
16-Feb-11	05-Dec-11	Phosphorus, water, unfiltered, milligrams per liter as phosphorus	mg/L	10	0.125	0.285	0.17
01-Mar-11	05-Dec-11	Orthophosphate, water, filtered, milligrams per liter as phosphorus	mg/L as P	9	0.01	0.246	0.08
28-Jul-09	05-Dec-11	Hardness, water, milligrams per liter as calcium carbonate	mg/L	31	220	590	432.75
28-Jul-09	05-Dec-11	Cadmium, water, filtered, micrograms per liter	µg/L	31	0.00015	0.15	0.05
28-Jul-09	05-Dec-11	Chromium, water, filtered, micrograms per liter	µg/L	31	0.003	3	1.07
28-Jul-09	05-Dec-11	Copper, water, filtered, micrograms per liter	µg/L	31	0.0012	12.2	0.92
28-Jul-09	05-Dec-11	Iron, water, filtered, micrograms per liter	µg/L	31	0.03	141	16.58
28-Jul-09	05-Dec-11	Lead, water, filtered, micrograms per liter	µg/L	31	0.00045	0.45	0.16
28-Jul-09	05-Dec-11	Nickel, water, filtered, micrograms per liter	µg/L	31	0.0135	13.5	4.8
28-Jul-09	05-Dec-11	Zinc, water, filtered, micrograms per liter	µg/L	31	0.0105	85	8.24
28-Jul-09	08-Sep-09	Fecal coliform, M-FC MF (0.7 micron) method, water, colonies per 100 milliliters	cfu/100 mL	3	1200	3000	1833.33
28-Jul-09	04-Jun-12	Fecal streptococci, m-enterococcus MF method, water, colonies per 100 milliliters	cfu/100mL	20	5	160000	12334.25
12-Apr-10	04-Jun-12	Escherichia coli, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	19	31	23800	3201.47
28-Jul-09	04-Jun-12	Chloride, water, unfiltered, milligrams per liter	mg/L	37	46	392	122.49
12-Apr-10	03-Oct-11	Enterococci, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	16	75	15500	3184.19

Sample Summary and Statistics

Sugar Creek II at Christopher Rd

Begin Date	End Date	Parameter Description	Units	Count	Min	Max	Average
28-Jul-09	04-Jun-12	Temperature, water, degrees Celsius	°C	38	1	24	13.16
28-Jul-09	04-Jun-12	Dissolved oxygen, water, unfiltered, milligrams per liter	mg/L	38	6	14	9.07
28-Jul-09	04-Jun-12	Chemical oxygen demand, high level, water, unfiltered, milligrams per liter	mg/L	38	2	47	18.58
28-Jul-09	04-Jun-12	pH, water, unfiltered, field, standard units	SU	74	6.1	8.4	7.3
16-Feb-11	04-Jun-12	Residue, total nonfilterable, milligrams per liter	mg/L	17	0.5	30	9.09
02-May-11	04-Jun-12	Ammonia, water, filtered, milligrams per liter as nitrogen	mg/L as N	14	0.025	0.0991	0.06
16-Feb-11	05-Dec-11	Ammonia plus organic nitrogen, water, unfiltered, milligrams per liter as nitrogen	mg/L	11	1.5	3	1.64
16-Feb-11	05-Dec-11	Nitrate plus nitrite, water, unfiltered, milligrams per liter as nitrogen	mg/L as	11	0.201	1.4	0.75
16-Feb-11	05-Dec-11	Phosphorus, water, unfiltered, milligrams per liter as phosphorus	mg/L	11	0.125	0.125	0.12
01-Mar-11	05-Dec-11	Orthophosphate, water, filtered, milligrams per liter as phosphorus	mg/L as P	10	0.05	0.368	0.18
28-Jul-09	05-Dec-11	Hardness, water, milligrams per liter as calcium carbonate	mg/L	32	232	531.6	344.66
28-Jul-09	05-Dec-11	Cadmium, water, filtered, micrograms per liter	µg/L	32	0.00015	0.15	0.05
28-Jul-09	05-Dec-11	Chromium, water, filtered, micrograms per liter	µg/L	32	0.003	3	1.13
28-Jul-09	05-Dec-11	Copper, water, filtered, micrograms per liter	µg/L	32	0.0012	3.2	0.51
28-Jul-09	05-Dec-11	Iron, water, filtered, micrograms per liter	µg/L	32	0.03	30	11.27
28-Jul-09	05-Dec-11	Lead, water, filtered, micrograms per liter	µg/L	32	0.00045	4.5	0.3
28-Jul-09	05-Dec-11	Nickel, water, filtered, micrograms per liter	µg/L	32	0.0135	13.5	5.07
28-Jul-09	05-Dec-11	Zinc, water, filtered, micrograms per liter	µg/L	32	0.0105	10.5	3.95
28-Jul-09	21-Oct-09	Fecal coliform, M-FC MF (0.7 micron) method, water, colonies per 100 milliliters	cfu/100 mL	5	330	1200	697.8
28-Jul-09	04-Jun-12	Fecal streptococci, m-enterococcus MF method, water, colonies per 100 milliliters	cfu/100mL	21	36	330000	16418.1
12-Apr-10	04-Jun-12	Escherichia coli, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	17	121	24000	2477.12
28-Jul-09	04-Jun-12	Chloride, water, unfiltered, milligrams per liter	mg/L	38	22	910	117.47
12-Apr-10	03-Oct-11	Enterococci, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	14	74	12030	2142.86

Sample Summary and Statistics

Twomile Creek at Overbrook Dr

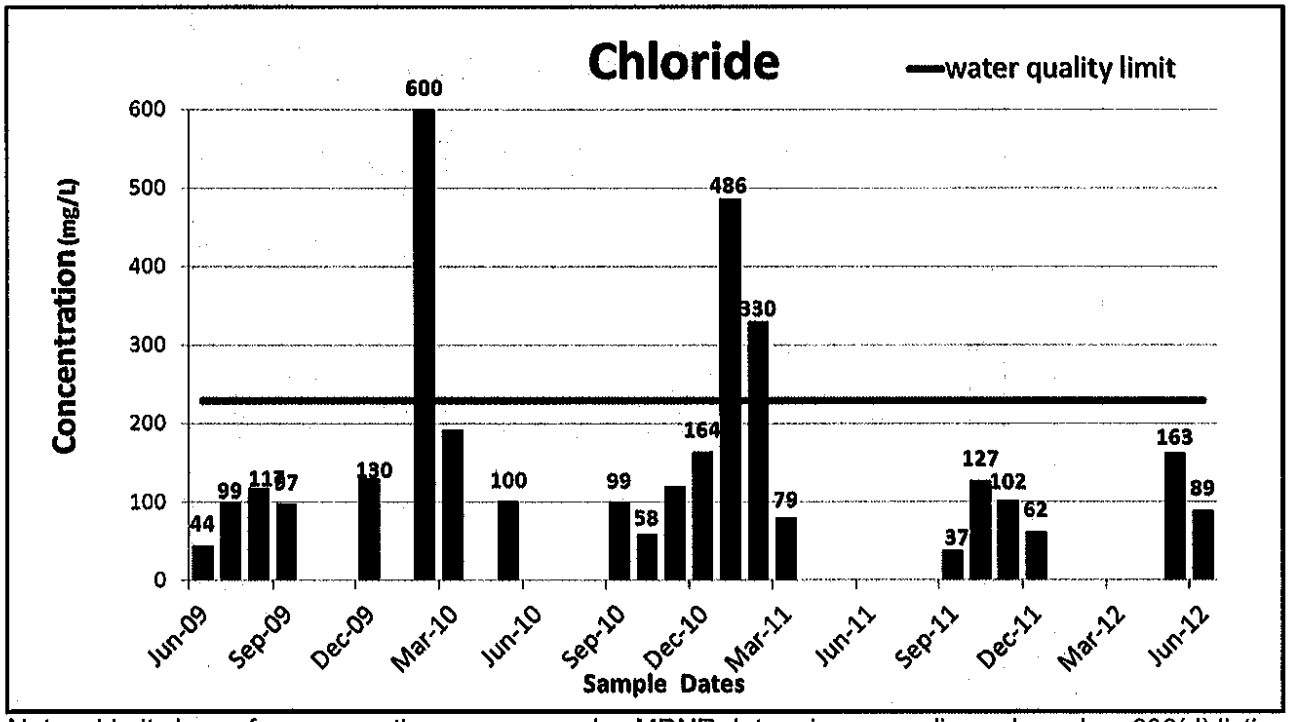
Begin Date	End Date	Parameter Description	Units	Count	Min	Max	Average
04-Nov-09	12-Mar-12	Temperature, water, degrees Celsius	°C	15	1	20	9.87
04-Nov-09	12-Mar-12	Dissolved oxygen, water, unfiltered, milligrams per liter	mg/L	16	1	13.1	8.26
04-Nov-09	12-Mar-12	Chemical oxygen demand, high level, water, unfiltered, milligrams per liter	mg/L	15	16	57	28.33
04-Nov-09	12-Mar-12	pH, water, unfiltered, field, standard units	SU	36	6.2	8	7.34
24-Feb-11	12-Mar-12	Residue, total nonfilterable, milligrams per liter	mg/L	7	6	86	21.57
09-May-11	12-Mar-12	Ammonia, water, filtered, milligrams per liter as nitrogen	mg/L as N	4	0.057	0.153	0.09
24-Feb-11	08-Nov-11	Ammonia plus organic nitrogen, water, unfiltered, milligrams per liter as nitrogen	mg/L	5	1.5	3.36	1.87
24-Feb-11	08-Nov-11	Nitrate plus nitrite, water, unfiltered, milligrams per liter as nitrogen	mg/L as	5	0.478	2.79	1.14
24-Feb-11	08-Nov-11	Phosphorus, water, unfiltered, milligrams per liter as phosphorus	mg/L	5	0.125	0.325	0.2
07-Mar-11	08-Nov-11	Orthophosphate, water, filtered, milligrams per liter as phosphorus	mg/L as P	4	0.07	0.22	0.15
04-Nov-09	08-Nov-11	Hardness, water, milligrams per liter as calcium carbonate	mg/L	13	168	311.2	250.71
04-Nov-09	08-Nov-11	Cadmium, water, filtered, micrograms per liter	µg/L	13	0.00015	0.15	0.05
04-Nov-09	08-Nov-11	Chromium, water, filtered, micrograms per liter	µg/L	13	0.003	3	0.93
04-Nov-09	08-Nov-11	Copper, water, filtered, micrograms per liter	µg/L	13	0.0012	2.7	0.49
04-Nov-09	08-Nov-11	Iron, water, filtered, micrograms per liter	µg/L	13	0.03	30	9.26
04-Nov-09	08-Nov-11	Lead, water, filtered, micrograms per liter	µg/L	13	0.00045	0.45	0.14
04-Nov-09	08-Nov-11	Nickel, water, filtered, micrograms per liter	µg/L	13	0.0135	13.5	4.16
04-Nov-09	08-Nov-11	Zinc, water, filtered, micrograms per liter	µg/L	13	0.0105	10.5	3.24
07-Apr-10	09-May-11	Fecal streptococci, m-enterococcus MF method, water, colonies per 100 milliliters	cfu/100mL	4	210	46000	12172.5
07-Apr-10	09-May-11	Escherichia coli, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	3	443	36294	12411
04-Nov-09	12-Mar-12	Chloride, water, unfiltered, milligrams per liter	mg/L	15	26	221	65
07-Apr-10	09-May-11	Enterococci, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	4	213	24196	6815.5

Sample Summary and Statistics

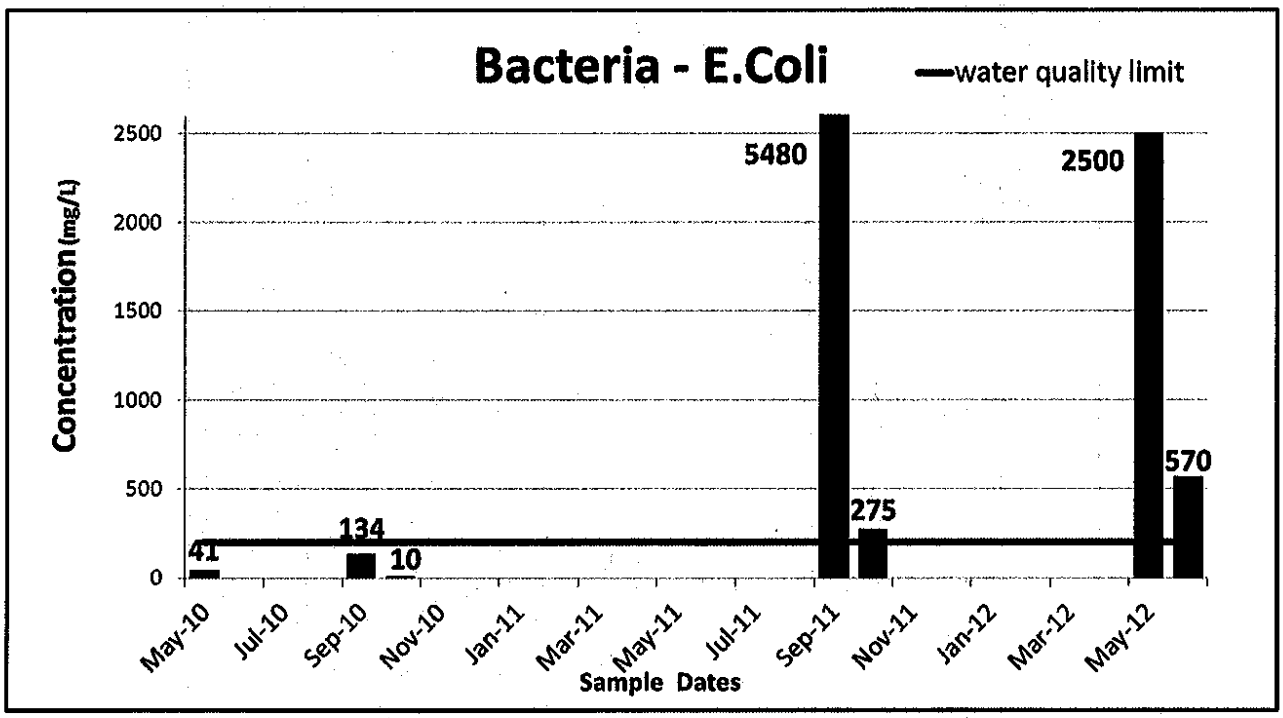
Watkins Creek at Riverview Drive

Begin Date	End Date	Parameter Description	Units	Count	Min	Max	Average
03-Jun-09	18-Jun-12	Temperature, water, degrees Celsius	°C	23	1	24.7	12.64
03-Jun-09	18-Jun-12	Dissolved oxygen, water, unfiltered, milligrams per liter	mg/L	24	1	13	8.46
03-Jun-09	18-Jun-12	Chemical oxygen demand, high level, water, unfiltered, milligrams per liter	mg/L	23	2	66	30.13
03-Jun-09	18-Jun-12	pH, water, unfiltered, field, standard units	SU	44	5.7	8.1	7.48
15-Feb-11	18-Jun-12	Residue, total nonfilterable, milligrams per liter	mg/L	8	11	57	30.38
19-Sep-11	18-Jun-12	Ammonia, water, filtered, milligrams per liter as nitrogen	mg/L as N	6	0.025	0.092	0.06
15-Feb-11	19-Dec-11	Ammonia plus organic nitrogen, water, unfiltered, milligrams per liter as nitrogen	mg/L	6	1.5	1.5	1.5
15-Feb-11	19-Dec-11	Nitrate plus nitrite, water, unfiltered, milligrams per liter as nitrogen	mg/L as	5	0.28	0.818	0.66
15-Feb-11	19-Dec-11	Phosphorus, water, unfiltered, milligrams per liter as phosphorus	mg/L	6	0.125	0.254	0.19
09-Mar-11	19-Dec-11	Orthophosphate, water, filtered, milligrams per liter as phosphorus	mg/L as P	6	0.015	0.163	0.09
03-Jun-09	19-Dec-11	Hardness, water, milligrams per liter as calcium carbonate	mg/L	21	100.8	536.8	334.47
03-Jun-09	19-Dec-11	Cadmium, water, filtered, micrograms per liter	µg/L	21	0.00015	0.15	0.06
03-Jun-09	19-Dec-11	Chromium, water, filtered, micrograms per liter	µg/L	21	0.003	3	1.34
03-Jun-09	19-Dec-11	Copper, water, filtered, micrograms per liter	µg/L	21	0.0012	87.7	4.98
03-Jun-09	19-Dec-11	Iron, water, filtered, micrograms per liter	µg/L	21	0.03	339	29.06
03-Jun-09	19-Dec-11	Lead, water, filtered, micrograms per liter	µg/L	21	0.00045	3.5	0.35
03-Jun-09	19-Dec-11	Nickel, water, filtered, micrograms per liter	µg/L	21	0.0135	13.5	6.01
03-Jun-09	19-Dec-11	Zinc, water, filtered, micrograms per liter	µg/L	21	0.0105	87	11.12
03-Jun-09	23-Sep-09	Fecal coliform, M-FC MF (0.7 micron) method, water, colonies per 100 milliliters	cfu/100 mL	5	18	71000	14997.6
03-Jun-09	18-Jun-12	Fecal streptococci, m-enterococcus MF method, water, colonies per 100 milliliters	cfu/100mL	12	5	79000	8954.83
10-May-10	18-Jun-12	Escherichia coli, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	7	10	5480	1287.14
03-Jun-09	18-Jun-12	Chloride, water, unfiltered, milligrams per liter	mg/L	23	33	600	155.35
10-May-10	17-Oct-11	Enterococci, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	5	105	7700	1704

Watkins Creek



Note – Limit shown for comparative purposes only. MDNR determines compliance based on 303(d) listing methodology



Note – Limit shown for comparative purposes only. MDNR determines compliance based on 303(d) listing methodology

Sample Summary and Statistics

Wildhorse Creek at Wildhorse Creek Rd

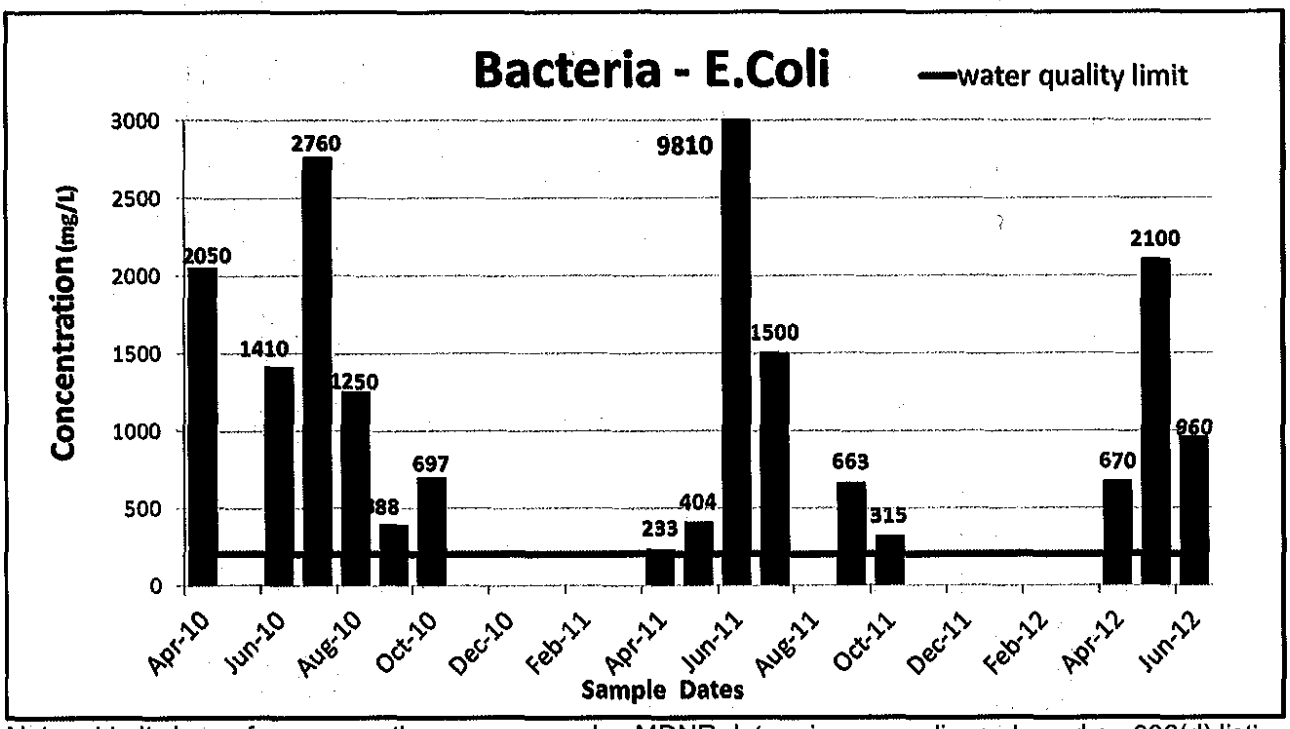
Begin Date	End Date	Parameter Description	Units	Count	Min	Max	Average
14-Jul-09	13-Jun-12	Temperature, water, degrees Celsius	°C	35	1	26	13.86
14-Jul-09	13-Jun-12	Dissolved oxygen, water, unfiltered, milligrams per liter	mg/L	35	6	15.7	8.7
14-Jul-09	13-Jun-12	Chemical oxygen demand, high level, water, unfiltered, milligrams per liter	mg/L	35	5	80	17.66
14-Jul-09	13-Jun-12	pH, water, unfiltered, field, standard units	SU	62	6.1	8.2	7.63
09-Feb-11	13-Jun-12	Residue, total nonfilterable, milligrams per liter	mg/L	16	0.5	85	17.53
10-May-11	13-Jun-12	Ammonia, water, filtered, milligrams per liter as nitrogen	mg/L as N	14	0.025	0.102	0.05
09-Feb-11	14-Dec-11	Ammonia plus organic nitrogen, water, unfiltered, milligrams per liter as nitrogen	mg/L	11	1.5	1.5	1.5
09-Feb-11	14-Dec-11	Nitrate plus nitrite, water, unfiltered, milligrams per liter as nitrogen	mg/L as	11	0.1	4.39	0.75
09-Feb-11	14-Dec-11	Phosphorus, water, unfiltered, milligrams per liter as phosphorus	mg/L	11	0.125	0.125	0.12
08-Mar-11	14-Dec-11	Orthophosphate, water, filtered, milligrams per liter as phosphorus	mg/L as P	9	0.01	0.1	0.06
14-Jul-09	14-Dec-11	Hardness, water, milligrams per liter as calcium carbonate	mg/L	29	108.4	285	218.54
14-Jul-09	14-Dec-11	Cadmium, water, filtered, micrograms per liter	µg/L	29	0.00015	0.15	0.06
14-Jul-09	14-Dec-11	Chromium, water, filtered, micrograms per liter	µg/L	29	0.003	3	1.24
14-Jul-09	14-Dec-11	Copper, water, filtered, micrograms per liter	µg/L	29	0.0012	10.4	0.87
14-Jul-09	14-Dec-11	Iron, water, filtered, micrograms per liter	µg/L	29	0.03	113	15.3
14-Jul-09	14-Dec-11	Lead, water, filtered, micrograms per liter	µg/L	29	0.00045	0.45	0.19
14-Jul-09	14-Dec-11	Nickel, water, filtered, micrograms per liter	µg/L	29	0.0135	13.5	5.6
14-Jul-09	14-Dec-11	Zinc, water, filtered, micrograms per liter	µg/L	29	0.0105	36	6.89
14-Jul-09	12-Oct-09	Fecal coliform, M-FC MF (0.7 micron) method, water, colonies per 100 milliliters	cfu/100 mL	5	9	18000	3760.4
14-Jul-09	13-Jun-12	Fecal streptococci, m-enterococcus MF method, water, colonies per 100 milliliters	cfu/100mL	20	73	170000	9269.85
19-Apr-10	13-Jun-12	Escherichia coli, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	14	20	1720	223.86
14-Jul-09	13-Jun-12	Chloride, water, unfiltered, milligrams per liter	mg/L	35	33	485	73.45
19-Apr-10	11-Oct-11	Enterococci, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	13	20	15500	1697.85

Sample Summary and Statistics

Williams Creek at Simpson Quarry

Begin Date	End Date	Parameter Description	Units	Count	Min	Max	Average
29-Jul-09	06-Jun-12	Temperature, water, degrees Celsius	°C	36	6	25	13.69
29-Jul-09	06-Jun-12	Dissolved oxygen, water, unfiltered, milligrams per liter	mg/L	36	6.4	12	8.73
29-Jul-09	06-Jun-12	Chemical oxygen demand, high level, water, unfiltered, milligrams per liter	mg/L	36	2	60	14.69
29-Jul-09	06-Jun-12	pH, water, unfiltered, field, standard units	SU	69	6.2	8.4	7.7
22-Feb-11	06-Jun-12	Residue, total nonfilterable, milligrams per liter	mg/L	16	1	47	10.5
17-May-11	06-Jun-12	Ammonia, water, filtered, milligrams per liter as nitrogen	mg/L as N	14	0.025	0.025	0.02
22-Feb-11	06-Dec-11	Ammonia plus organic nitrogen, water, unfiltered, milligrams per liter as nitrogen	mg/L	10	1.5	1.5	1.5
22-Feb-11	06-Dec-11	Nitrate plus nitrite, water, unfiltered, milligrams per liter as nitrogen	mg/L as	9	0.827	3.443	1.42
22-Feb-11	06-Dec-11	Phosphorus, water, unfiltered, milligrams per liter as phosphorus	mg/L	10	0.125	0.279	0.14
05-Apr-11	06-Dec-11	Orthophosphate, water, filtered, milligrams per liter as phosphorus	mg/L as P	9	0.05	0.125	0.09
29-Jul-09	06-Dec-11	Hardness, water, milligrams per liter as calcium carbonate	mg/L	30	102	356	255.49
29-Jul-09	06-Dec-11	Cadmium, water, filtered, micrograms per liter	µg/L	30	0.00015	0.15	0.05
29-Jul-09	06-Dec-11	Chromium, water, filtered, micrograms per liter	µg/L	30	0.003	30	2
29-Jul-09	06-Dec-11	Copper, water, filtered, micrograms per liter	µg/L	30	0.0012	105	3.9
29-Jul-09	06-Dec-11	Iron, water, filtered, micrograms per liter	µg/L	30	0.03	69	12.33
29-Jul-09	06-Dec-11	Lead, water, filtered, micrograms per liter	µg/L	30	0.00045	2.5	0.26
29-Jul-09	06-Dec-11	Nickel, water, filtered, micrograms per liter	µg/L	30	0.0135	13.5	4.96
29-Jul-09	06-Dec-11	Zinc, water, filtered, micrograms per liter	µg/L	30	0.0105	120	8.36
29-Jul-09	06-Oct-09	Fecal coliform, M-FC MF (0.7 micron) method, water, colonies per 100 milliliters	cfu/100 mL	4	390	20000	5375
29-Jul-09	06-Jun-12	Fecal streptococci, m-enterococcus MF method, water, colonies per 100 milliliters	cfu/100mL	22	36	34000	2991.68
06-Apr-10	06-Jun-12	Escherichia coli, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	18	52	9810	1440.78
29-Jul-09	06-Jun-12	Chloride, water, unfiltered, milligrams per liter	mg/L	36	24	109	50.19
06-Apr-10	04-Oct-11	Enterococci, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	15	30	4110	1282.47

Williams Creek



Note – Limit shown for comparative purposes only. MDNR determines compliance based on 303(d) listing methodology

Sample Summary and Statistics

Yarnell Creek at Hwy 30

Begin Date	End Date	Parameter Description	Units	Count	Min	Max	Average
02-Jun-09	04-Jun-12	Temperature, water, degrees Celsius	°C	26	1.1	23.9	11.34
02-Jun-09	04-Jun-12	Dissolved oxygen, water, unfiltered, milligrams per liter	mg/L	26	6	14.1	9.66
02-Jun-09	04-Jun-12	Chemical oxygen demand, high level, water, unfiltered, milligrams per liter	mg/L	26	7	55	23.46
02-Jun-09	04-Jun-12	pH, water, unfiltered, field, standard units	SU	38	6.2	9.2	7.93
16-Feb-11	04-Jun-12	Residue, total nonfilterable, milligrams per liter	mg/L	11	2	115	33.27
06-Sep-11	04-Jun-12	Ammonia, water, filtered, milligrams per liter as nitrogen	mg/L as N	10	0.025	0.159	0.08
16-Feb-11	05-Dec-11	Ammonia plus organic nitrogen, water, unfiltered, milligrams per liter as nitrogen	mg/L	5	1.5	1.5	1.5
16-Feb-11	05-Dec-11	Nitrate plus nitrite, water, unfiltered, milligrams per liter as nitrogen	mg/L as	5	0.1	0.478	0.27
06-Sep-11	05-Dec-11	Phosphorus, water, unfiltered, milligrams per liter as phosphorus	mg/L	4	0.125	0.125	0.12
06-Sep-11	05-Dec-11	Orthophosphate, water, filtered, milligrams per liter as phosphorus	mg/L as P	4	0.051	0.137	0.08
02-Jun-09	05-Dec-11	Hardness, water, milligrams per liter as calcium carbonate	mg/L	20	96	459.6	301.88
02-Jun-09	05-Dec-11	Cadmium, water, filtered, micrograms per liter	µg/L	19	0.00015	0.15	0.08
02-Jun-09	05-Dec-11	Chromium, water, filtered, micrograms per liter	µg/L	20	0.003	3	1.6
02-Jun-09	05-Dec-11	Copper, water, filtered, micrograms per liter	µg/L	20	0.0012	1.2	0.72
02-Jun-09	05-Dec-11	Iron, water, filtered, micrograms per liter	µg/L	20	0.03	90	23.58
02-Jun-09	05-Dec-11	Lead, water, filtered, micrograms per liter	µg/L	20	0.00045	0.45	0.24
02-Jun-09	05-Dec-11	Nickel, water, filtered, micrograms per liter	µg/L	20	0.0135	13.5	7.21
02-Jun-09	05-Dec-11	Zinc, water, filtered, micrograms per liter	µg/L	20	0.0105	72	15.71
02-Jun-09	29-Sep-09	Fecal coliform, M-FC MF (0.7 micron) method, water, colonies per 100 milliliters	cfu/100 mL	6	5	33000	5980.83
02-Jun-09	04-Jun-12	Fecal streptococci, m-enterococcus MF method, water, colonies per 100 milliliters	cfu/100mL	11	163	320000	32556.64
06-Sep-11	04-Jun-12	Escherichia coli, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	5	98	24000	5148.2
02-Jun-09	04-Jun-12	Chloride, water, unfiltered, milligrams per liter	mg/L	26	14	660	149.62
06-Sep-11	03-Oct-11	Enterococci, Defined Substrate Technology, water, most probable number per 100 milliliters	MPN/100 mL	2	121	609	365

APPENDICES

Outlets

OUTLET LOCATIONS FOR THE ST. LOUIS COUNTY PLAN AREA
SEPTEMBER 2012

	SWO ID Number	Longitude	Latitude	1/4	1/4	Section		Township/ Range	Creek Name	Receiving Water	Municipality
1	SWO-B-13E2-001	-90:12:52.220	38:43:36.726	SE	NW	15	*	T46NR7E	Maline	Mississippi River	St. Louis
2	SWO-B-10D2-002	-90:10:39.472	38:46:07.217	NE	SW	36	*	T47NR7E		Mississippi River	St. Louis
3	SWO-B-09C4-003	-90:10:29.592	38:46:24.598	SW	NE	36	*	T47NR7E	Watkins	Mississippi River	St. Louis County
4	SWO-B-09C4-004	-90:10:12.275	38:46:37.091	SE	SE	25	*	T47NR7E		Mississippi River	St. Louis County
5	SWO-B-08B2-005	-90:07:54.941	38:47:39.523	NW	SE	20	*	T47NR8E		Mississippi River	St. Louis County
6	SWO-B-12E3-006	-90:12:41.344	38:43:58.859	NW	NE	15	*	T46NR7E		Mississippi River	St. Louis
7	SWO-B-12E3-007	-90:12:30.712	38:44:10.464	SW	SE	10	*	T46NR7E		Mississippi River	St. Louis
8	SWO-B-12D1-008	-90:12:06.684	38:44:26.26	NE	SE	10	*	T46NR7E		Mississippi River	St. Louis
9	SWO-B-12D1-009	-90:11:46.656	38:44:39.469	SE	NW	11	*	T46NR7E		Mississippi River	St. Louis
10	SWO-B-06D4-010	-90:11:26.986	38:49:01.752	SW	NE	14	*	T47NR7E		Missouri River	St. Louis County
11	SWO-B-06E2-011	-90:12:16.268	38:49:24.542	SE	SE	10	*	T47NR7E	Spanish Lake	Missouri River	St. Louis County
12	SWO-B-12D1-012	-90:11:51.627	38:44:36.151	SW	NW	11	*	T46NR7E		Mississippi River	St. Louis
13	SWO-C-06E2-001	-90:12:33.340	38:49:34.479	NW	SE	10	*	T47NR7E		Missouri River	St. Louis County
14	SWO-C-05E4-002	-90:13:06.023	38:49:54.049	SW	NW	10	*	T47NR7E	Coldwater	Missouri River	St. Louis County
15	SWO-C-04G2-008	-90:15:55.088	38:51:14.436	SW	SE	31	*	T48NR7E	Mill	Missouri River	St. Louis County
16	SWO-C-03H2-009	-90:17:09.784	38:51:45.190	SW	NE	36	*	T48NR6E		Missouri River	St. Louis County
17	SWO-C-03H2-010	-90:17:10.890	38:51:46.358	SE	NW	36	*	T48NR6E		Missouri River	St. Louis County
18	SWO-C-02H4-011	-90:18:09.701	38:52:06.139	SW	SE	26	*	T48NR6E		Missouri River	St. Louis County

OUTLET LOCATIONS FOR THE ST. LOUIS COUNTY PLAN AREA
SEPTEMBER 2012

	SWO ID Number	Longitude	Latitude	1/4	1/4	Section		Township/ Range	Creek Name	Receiving Water	Municipality
19	SWO-C-02J3-012	-90:18:27.101	38:52:05.846	SE	SW	26	*	T48NR6E		Missouri River	St. Louis County
20	SWO-C-02J3-013	-90:18:29.049	38:52:05.991	SE	SW	26	*	T48NR6E		Missouri River	St. Louis County
21	SWO-C-02J3-014	-90:18:32.485	38:52:06.160	SE	SW	26	*	T48NR6E		Missouri River	St. Louis County
22	SWO-C-02J3-015	-90:18:51.183	38:52:07.898	SW	SW	26	*	T48NR6E		Missouri River	St. Louis County
23	SWO-C-02J3-016	-90:18:55.989	38:52:08.602	SE	SE	27	*	T48NR6E		Missouri River	St. Louis County
24	SWO-C-02J3-017	-90:19:05.966	38:52:10.817	SE	SE	27	*	T48NR6E		Missouri River	St. Louis County
25	SWO-C-02J4-018	-90:19:18.559	38:52:12.879	SW	SE	27	*	T48NR6E		Missouri River	St. Louis County
26	SWO-C-02J4-019	-90:19:34.161	38:52:14.876	NE	SW	27	*	T48NR6E		Missouri River	St. Louis County
27	SWO-C-02K3-020	-90:20:19.611	38:52:14.101	SW	SE	28	*	T48NR6E		Missouri River	St. Louis County
28	SWO-C-03K2-021	-90:20:21.950	38:51:41.643	SW	NE	33	*	T48NR6E		Missouri River	St. Louis County
29	SWO-C-03K3-022	-90:20:19.835	38:51:27.751	NW	SE	33	*	T48NR6E	Betty Jane	Missouri River	St. Louis County
30	SWO-C-04K3-023	-90:20:38.622	38:50:37.008	SE	SW	4	*	T47NR6E		Missouri River	St. Louis County
31	SWO-C-04K3-024	-90:20:43.397	38:50:30.708	SE	SW	4	*	T47NR6E		Missouri River	St. Louis County
32	SWO-C-05K1-025	-90:20:57.309	38:50:15.390	NW	NW	9	*	T47NR6E		Missouri River	St. Louis County
33	SWO-C-05K1-026	-90:21:02.203	38:50:09.008	SW	NW	9	*	T47NR6E		Missouri River	St. Louis County
34	SWO-C-05K4-027	-90:21:08.782	38:49:59.780	SW	NW	9	*	T47NR6E		Missouri River	St. Louis County
35	SWO-C-05K4-028	-90:21:12.364	38:49:55.794	NE	SE	8	*	T47NR6E		Missouri River	Florissant
36	SWO-C-05K4-029	-90:21:18.430	38:49:50.120	NW	NE	8	*	T47NR6E		Missouri River	Florissant

OUTLET LOCATIONS FOR THE ST. LOUIS COUNTY PLAN AREA
SEPTEMBER 2012

	SWO ID Number	Longitude	Latitude	1/4	1/4	Section		Township/ Range	Creek Name	Receiving Water	Municipality
37	SWO-L-31G4-001	-90:16:53.747	38:28:36.443	NE	SW	7	*	T43NR7E		Mississippi River	St. Louis County
38	SWO-L-30G4-002	-90:16:47.526	38:29:02.747	NE	NW	7	*	T43NR7E	Martigney	Mississippi River	St. Louis County
39	SWO-L-29G1-003	-90:16:25.302	38:30:19.223	SW	NE	31	*	T44NR7E		Mississippi River	St. Louis County
40	SWO-L-29G1-004	-90:16:19.573	38:30:31.604	SE	NE	31	*	T44NR7E		Mississippi River	St. Louis County
41	SWO-L-27G2-005	-90:15:38.094	38:31:58.397	NE	SW	20	*	T44NR7E	R. Des Peres	Mississippi River	St. Louis County
42	SWO-L-28G2-006	-90:16:04.514	38:31:16.538	NE	SE	24	*	T44NR6E		Mississippi River	St. Louis County
43	SWO-L-28G2-007	-90:16:00.896	38:31:23.085	SE	NE	24	*	T44NR6E		Mississippi River	St. Louis County
44	SWO-L-28G2-008	-90:16:00.576	38:31:24.090	SE	NE	24	*	T44NR6E		Mississippi River	St. Louis County
45	SWO-M-37K3-001	-90:20:39.161	38:23:24.814	SW	NW	10	*	T42NR6E	Meramec River	Mississippi River	St. Louis County
46	SWO-M-36J4-002	-90:19:25.369	38:24:27.634	NW	NW	2	*	T42NR6E		Mississippi River	St. Louis County
47	SWO-M-36J2-003	-90:19:10.249	38:24:44.198	SE	SW	35	*	T43NR6E		Mississippi River	St. Louis County
48	SWO-M-35J3-004	-90:18:52.785	38:24:59.346	NW	SE	35	*	T43NR6E		Mississippi River	St. Louis County
49	SWO-M-37K3-005	-90:20:28.875	38:23:32.596	SE	NW	10	*	T42NR6E		Mississippi River	St. Louis County
50	SWO-M-36K4-006	-90:20:51.832	38:24:22.791	SE	NE	4	*	T42NR6E		Meramec River	St. Louis County
51	SWO-M-36K1-007	-90:20:52.250	38:24:31.038	NE	NE	4	*	T42NR6E		Meramec River	St. Louis County
52	SWO-M-35J3-008	-90:18:39.576	38:25:12.955	SW	NE	35	*	T43NR6E		Mississippi River	St. Louis County
53	SWO-M-35K4-009	-90:20:45.545	38:25:08.438	SE	NE	33	*	T43NR6E		Meramec River	St. Louis County
54	SWO-M-35K4-010	-90:20:47.871	38:25:18.847	SE	NE	33	*	T43NR6E		Meramec River	St. Louis County

OUTLET LOCATIONS FOR THE ST. LOUIS COUNTY PLAN AREA
SEPTEMBER 2012

	SWO ID Number	Longitude	Latitude	1/4	1/4	Section		Township/ Range	Creek Name	Receiving Water	Municipality
55	SWO-M-34K4-011	-90:20:51.398	38:25:57.633	NE	SE	28	*	T43NR6E		Meramec River	St. Louis County
56	SWO-M-34K2-012	-90:20:34.435	38:26:17.819	NW	NW	27	*	T43NR6E		Meramec River	St. Louis County
57	SWO-M-32H3-013	-90:17:12.247	38:27:31.392	SW	SW	18	*	T43NR7E		Mississippi River	St. Louis County
58	SWO-M-33K3-014	-90:20:17.894	38:26:35.764	SE	SW	22	*	T43NR6E		Meramec River	St. Louis County
59	SWO-M-33K3-015	-90:20:16.950	38:26:37.394	SE	SW	22	*	T43NR6E		Meramec River	St. Louis County
60	SWO-M-33K3-016	-90:20:06.985	38:26:51.308	NE	SW	22		T43NR6E		Meramec River	St. Louis County
61	SWO-M-33K3-017	-90:20:05.773	38:26:54.109	SE	NW	22		T43NR6E		Meramec River	St. Louis County
62	SWO-M-33K2-018	-90:20:10.775	38:27:18.699	NE	NW	22	*	T43NR6E		Meramec River	St. Louis County
63	SWO-M-32K4-019	-90:21:02.995	38:27:30.887	SW	SE	16	*	T43NR6E		Meramec River	St. Louis County
64	SWO-M-32L3-020	-90:21:43.323	38:27:24.589	SW	SW	16	*	T43NR6E		Meramec River	St. Louis County
65	SWO-M-33L2-021	-90:22:13.869	38:27:16.908	NW	NE	20	*	T43NR6E		Meramec River	St. Louis County
66	SWO-M-32M3-022	-90:23:24.774	38:27:23.679	SW	SE	18	*	T43NR6E		Meramec River	St. Louis County
67	SWO-M-32M3-023	-90:23:40.439	38:27:31.568	SE	SW	18	*	T43NR6E		Meramec River	St. Louis County
68	SWO-M-30M4-024	-90:24:21.976	38:29:04.838	NW	NE	12	*	T43NR5E		Meramec River	St. Louis County
69	SWO-M-30M4-025	-90:24:16.516	38:29:17.562	SW	SE	1	*	T43NR5E		Meramec River	St. Louis County
70	SWO-M-30M4-026	-90:24:19.614	38:29:23.572	NW	SE	1	*	T43NR5E		Meramec River	St. Louis County
71	SWO-M-30M1-027	-90:24:14.904	38:29:41.522	SW	NE	1	*	T43NR5E		Meramec River	St. Louis County
72	SWO-M-29M4-028	-90:24:17.132	38:29:52.436	NW	NE	1	*	T43NR5E		Meramec River	St. Louis County

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	SWO ID Number	Longitude	Latitude	1/4	1/4	Section		Township/ Range	Creek Name	Receiving Water	Municipality
73	SWO-M-29M4-029	-90:24:19.076	38:30:10.487	SW	SE	36	*	T44NR5E		Meramec River	St. Louis County
74	SWO-M-33M1-030	-90:23:52.464	38:27:26.920	SW	SW	18	*	T43NR6E		Meramec River	St. Louis County
75	SWO-M-29M1-031	-90:24:31.340	38:30:18.318	NE	SW	36	*	T44NR5E		Meramec River	Sunset Hills
76	SWO-M-29N2-032	-90:24:50.751	38:30:17.081	NW	SW	36	*	T44NR5E		Meramec River	Sunset Hills
77	SWO-M-29N2-033	-90:25:25.774	38:30:25.541	NW	SE	35	*	T44NR5E	Fenton	Meramec River	St. Louis County
78	SWO-M-29N1-034	-90:25:39.472	38:30:40.561	SE	NW	35	*	T44NR5E		Meramec River	Sunset Hills
79	SWO-M-28N4-035	-90:26:10.075	38:30:59.632	SW	SW	26	*	T44NR5E	Yarnell	Meramec River	Fenton
80	SWO-M-27N4-036	-90:26:07.156	38:31:54.211	SW	SW	23	*	T44NR5E		Meramec River	Fenton
81	SWO-M-27N1-037	-90:26:04.104	38:31:56.709	SW	SW	23	*	T44NR5E		Meramec River	Sunset Hills
82	SWO-M-27N1-038	-90:26:03.371	38:32:09.679	NW	SW	23	*	T44NR5E		Meramec River	Sunset Hills
83	SWO-M-26N4-039	-90:26:00.505	38:32:33.106	NW	NW	23	*	T44NR5E		Meramec River	Sunset Hills
84	SWO-M-26N4-040	-90:26:02.901	38:32:34.306	NW	NW	23	*	T44NR5E		Meramec River	Fenton
85	SWO-M-26N4-041	-90:26:00.723	38:32:39.100	NW	NW	23	*	T44NR5E		Meramec River	Sunset Hills
86	SWO-M-26N4-042	-90:26:03.812	38:32:38.537	NW	NW	23	*	T44NR5E		Meramec River	Sunset Hills
87	SWO-M-26N1-043	-90:26:04.664	38:32:48.010	SW	SW	14		T44NR5E		Meramec River	Sunset Hills
88	SWO-M-26N1-044	-90:26:11.851	38:32:55.471	NE	SE	15		T44NR5E		Meramec River	St. Louis County
89	SWO-M-25O3-045	-90:26:22.763	38:33:21.983	NE	NE	15		T44NR5E		Meramec River	Kirkwood
90	SWO-M-25O3-046	-90:26:25.110	38:33:26.467	NW	NE	15		T44NR5E		Meramec River	Kirkwood

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	SWO ID Number	Longitude	Latitude	1/4	1/4	Section		Township/ Range	Creek Name	Receiving Water	Municipality
91	SWO-M-25O3-047	-90:26:31.781	38:33:32.416	NW	NE	15		T44NR5E		Meramec River	Kirkwood
92	SWO-M-25O2-048	-90:26:35.919	38:33:34.608	NW	NE	15		T44NR5E		Meramec River	Kirkwood
93	SWO-M-25O2-049	-90:26:42.534	38:33:33.904	NE	NW	15		T44NR5E		Meramec River	Kirkwood
94	SWO-M-25O3-050	-90:26:54.312	38:33:26.918	NE	NW	15		T44NR5E		Meramec River	Fenton
95	SWO-M-25O4-051	-90:27:15.272	38:33:16.850	SE	NE	16	*	T44NR5E		Meramec River	Fenton
96	SWO-M-25O4-052	-90:27:21.929	38:33:14.954	SE	NE	16	*	T44NR5E		Meramec River	Fenton
97	SWO-M-25O4-053	-90:27:26.425	38:33:13.677	SE	NE	16	*	T44NR5E		Meramec River	Fenton
98	SWO-M-25O4-054	-90:27:47.384	38:33:10.581	SW	NE	16		T44NR5E	Grand Glaize	Meramec River	Valley Park
99	SWO-M-26O1-055	-90:27:49.177	38:33:07.058	NW	SE	16	*	T44NR5E		Meramec River	Fenton
100	SWO-M-26P2-056	-90:28:35.093	38:32:44.521	SE	SE	17	*	T44NR5E		Meramec River	St. Louis County
101	SWO-M-26Q2-057	-90:29:38.378	38:32:45.711	SE	SE	18	*	T44NR5E		Meramec River	St. Louis County
102	SWO-M-26Q2-058	-90:29:46.496	38:32:48.057	SE	SE	18	*	T44NR5E	Fishpot	Meramec River	Valley Park
103	SWO-M-26Q2-059	-90:29:59.909	38:32:48.423	SW	SE	18	*	T44NR5E		Meramec River	Valley Park
104	SWO-M-32M3-060	-90:23:56.043	38:27:20.432	NW	NW	19		T43NR6E		Meramec River	St. Louis County
105	SWO-M-26Q1-061	-90:30:20.605	38:32:46.464	SE	SW	18	*	T44NR5E		Meramec River	Valley Park
106	SWO-M-26Q1-062	-90:30:46.008	38:32:47.206	SE	SE	13	*	T44NR4E		Meramec River	Valley Park
107	SWO-M-26Q1-063	-90:30:49.189	38:32:44.750	SE	SE	13	*	T44NR4E	Williams	Meramec River	St. Louis County
108	SWO-M-26Q1-064	-90:30:54.661	38:32:47.930	SE	SE	13	*	T44NR4E		Meramec River	Valley Park

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	SWO ID Number	Longitude	Latitude	1/4	1/4	Section		Township/ Range	Creek Name	Receiving Water	Municipality
109	SWO-M-26R2-065	-90:31:03.113	38:32:48.857	SW	SE	13	*	T44NR4E		Meramec River	Valley Park
110	SWO-M-26R2-066	-90:31:13.034	38:32:49.952	SE	SW	13	*	T44NR4E		Meramec River	Valley Park
111	SWO-M-26R2-067	-90:31:24.726	38:32:51.676	SE	SW	13	*	T44NR4E		Meramec River	St. Louis County
112	SWO-M-26R1-068	-90:31:50.801	38:32:55.165	SE	SE	14	*	T44NR4E		Meramec River	St. Louis County
113	SWO-M-26R1-069	-90:32:02.777	38:32:54.314	SE	SE	14	*	T44NR4E	Kiefer	Meramec River	St. Louis County
114	SWO-M-26R4-071	-90:31:55.377	38:32:26.165	SE	NE	23	*	T44NR4E		Meramec River	St. Louis County
115	SWO-M-26R4-072	-90:32:10.092	38:32:24.356	SW	NE	23	*	T44NR4E		Meramec River	St. Louis County
116	SWO-M-26R4-073	-90:32:15.010	38:32:27.142	SW	NE	23	*	T44NR4E		Meramec River	St. Louis County
117	SWO-M-26S1-074	-90:33:27.408	38:32:46.596	SW	SE	15	*	T44NR4E		Meramec River	St. Louis County
118	SWO-M-26S4-075	-90:33:29.452	38:32:34.739	NE	NW	22	*	T44NR4E		Meramec River	St. Louis County
119	SWO-M-26S4-076	-90:33:43.477	38:32:23.564	SE	NW	22		T44NR4E		Meramec River	St. Louis County
120	SWO-M-27S1-077	-90:33:54.486	38:32:13.043	NW	SW	22		T44NR4E		Meramec River	St. Louis County
121	SWO-M-27S1-078	-90:34:02.892	38:32:10.756	NE	SE	21	*	T44NR4E		Meramec River	St. Louis County
122	SWO-M-27S1-079	-90:34:03.832	38:32:06.757	NE	SE	21	*	T44NR4E		Meramec River	St. Louis County
123	SWO-M-27T2-080	-90:34:17.343	38:31:57.323	SE	SE	21	*	T44NR4E		Meramec River	St. Louis County
124	SWO-M-27T2-081	-90:34:15.736	38:31:55.482	SE	SE	21		T44NR4E		Meramec River	St. Louis County
125	SWO-M-27T2-082	-90:34:46.261	38:32:02.836	SE	SW	21	*	T44NR4E		Meramec River	St. Louis County
126	SWO-M-26P1-083	-90:28:53.142	38:32:46.629	SW	SE	17	*	T44NR5E		Meramec River	Valley Park

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	SWO ID Number	Longitude	Latitude	1/4	1/4	Section		Township/ Range	Creek Name	Receiving Water	Municipality
127	SWO-M-27T1-084	-90:35:01.189	38:31:58.946	SW	SW	21	*	T44NR4E		Meramec River	St. Louis County
128	SWO-M-27T1-085	-90:35:38.111	38:32:16.667	NW	SE	20		T44NR4E		Meramec River	St. Louis County
129	SWO-M-27T1-086	-90:35:41.619	38:32:12.441	NW	SE	20		T44NR4E		Meramec River	St. Louis County
130	SWO-M-26U3-087	-90:36:14.127	38:32:27.496	SW	NW	20		T44NR4E		Meramec River	Wildwood
131	SWO-M-26U3-088	-90:36:15.680	38:32:27.652	SW	NW	20		T44NR4E		Meramec River	Wildwood
132	SWO-M-26U3-089	-90:36:18.271	38:32:27.800	SW	NW	20		T44NR4E		Meramec River	Wildwood
133	SWO-M-26U3-090	-90:36:24.149	38:32:29.178	SE	NE	19		T44NR4E		Meramec River	Wildwood
134	SWO-M-26U4-091	-90:37:00.589	38:32:36.315	NE	NW	19		T44NR4E		Meramec River	Wildwood
135	SWO-M-27V2-092	-90:37:33.739	38:32:00.265	SE	SE	24		T44NR3E		Meramec River	St. Louis County
136	SWO-M-28U1-093	-90:36:59.881	38:31:15.369	NE	SW	30		T44NR4E		Meramec River	St. Louis County
137	SWO-M-28U1-094	-90:36:54.108	38:31:11.095	SE	SW	30		T44NR4E		Meramec River	St. Louis County
138	SWO-M-28U3-095	-90:36:25.052	38:31:00.654	SE	SE	30		T44NR4E		Meramec River	St. Louis County
139	SWO-M-29T1-096	-90:35:43.729	38:30:36.288	SW	NE	32		T44NR4E		Meramec River	St. Louis County
140	SWO-M-29T4-097	-90:35:25.252	38:30:12.901	SE	SE	32		T44NR4E	Antire	Meramec River	St. Louis County
141	SWO-M-26P1-098	-90:29:11.342	38:32:48.169	SE	SW	17	*	T44NR5E		Meramec River	Valley Park
142	SWO-M-26Q2-099	-90:29:40.705	38:32:49.916	SE	SE	18	*	T44NR5E		Meramec River	Valley Park
143	SWO-M-26U1-100	-90:37:02.280	38:32:58.598	SE	SW	18		T44NR4E		Meramec R. via Unamed Tributary	Wildwood
144	SWO-M-26U1-101	-90:37:03.581	38:32:58.595	SE	SW	18		T44NR4E		Meramec R. via Unamed Tributary	Wildwood

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	SWO ID Number	Longitude	Latitude	1/4	1/4	Section		Township/ Range	Creek Name	Receiving Water	Municipality
145	SWO-M-32K4-102	-90:21:12.876	38:27:31.712	SE	NW	4	*	T43NR6E		Meramec River	St. Louis County
146	SWO-M-32K4-103	-90:21:26.509	38:27:29.579	SW	NW	4	*	T43NR6E		Meramec River	St. Louis County
147	SWO-M-29O3-104	-90:26:40.123	38:30:04.050	NE	NW	3	*	T43NR5E		Meramec R. via Unamed Tributary	Fenton
148	SWO-M-29P4-105	-90:28:48.652	38:30:04.338	NW	NE	5	*	T43NR5E		Saline Creek	St. Louis County
149	SWO-M-25O3-106	-90:26:21.630	38:33:16.417	SE	SE	9		T44NR5E		Meramec River	St. Louis County
150	SWO-M-29N2-107	-90:25:32.131	38:30:35.772	SW	NE	9		T44NR5E		Meramec River	Sunset Hills
151	SWO-M-29N1-108	-90:25:35.427	38:30:38.226	SW	NE	35	*	T44NR5E		Meramec River	Sunset Hills
152	SWO-R-06K1-001	-90:21:32.704	38:49:37.275	SW	SE	8	*	T47NR6E		Missouri River	Florissant
153	SWO-R-06L2-002	-90:21:34.722	38:49:33.653	SW	SE	8	*	T47NR6E		Missouri River	Florissant
154	SWO-R-06L2-003	-90:21:38.883	38:49:30.203	NW	NE	17	*	T47NR6E		Missouri River	Florissant
155	SWO-R-06L2-004	-90:21:42.131	38:49:27.757	NW	NE	17	*	T47NR6E		Missouri River	Florissant
156	SWO-R-06L2-005	-90:21:46.968	38:49:25.729	NE	NW	17	*	T47NR6E		Missouri River	St. Louis County
157	SWO-R-06L2-006	-90:21:56.908	38:49:22.037	NE	NW	17	*	T47NR6E		Missouri River	St. Louis County
158	SWO-R-06L2-007	-90:22:02.077	38:49:19.969	NE	NW	17	*	T47NR6E		Missouri River	St. Louis County
159	SWO-R-06L2-008	-90:22:11.348	38:49:16.280	SW	NW	17	*	T47NR6E		Missouri River	St. Louis County
160	SWO-R-06L1-009	-90:22:26.159	38:49:12.848	SE	NE	18	*	T47NR6E		Missouri River	St. Louis County
161	SWO-R-06L4-010	-90:22:36.976	38:49:12.421	SE	NE	18	*	T47NR6E		Missouri River	St. Louis County
162	SWO-R-06L4-011	-90:22:52.033	38:49:10.657	SW	NE	18	*	T47NR6E		Missouri River	St. Louis County

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	SWO ID Number	Longitude	Latitude	1/4	1/4	Section		Township/ Range	Creek Name	Receiving Water	Municipality
163	SWO-R-06L4-012	-90:22:56.625	38:49:10.517	SE	NW	18	*	T47NR6E		Missouri River	St. Louis County
164	SWO-R-06L4-013	-90:22:59.145	38:49:10.720	SE	NW	18	*	T47NR6E		Missouri River	St. Louis County
165	SWO-R-06L4-014	-90:23:07.813	38:49:10.852	SE	NW	18	*	T47NR6E		Missouri River	St. Louis County
166	SWO-R-06M3-015	-90:23:19.252	38:49:06.818	SW	NW	18	*	T47NR6E	Cowmire	Missouri River	Hazelwood
167	SWO-R-06M4-016	-90:24:43.454	38:49:08.439	SE	NE	14	*	T47NR5E		Missouri River	Hazelwood
168	SWO-R-09P2-017	-90:28:24.065	38:46:55.242	SW	SE	29	*	T47NR5E		Missouri River	Bridgeton
169	SWO-R-10P2-018	-90:28:40.704	38:46:10.566	SW	SE	32	*	T47NR5E		Missouri River	St. Louis County
170	SWO-R-11P1-019	-90:29:04.376	38:45:23.492	NW	SW	5	*	T46NR5E		Missouri River	Maryland Heigths
171	SWO-R-11Q3-020	-90:29:30.541	38:44:56.638	NE	NE	7	*	T46NR5E	Creve Coeur	Missouri River	Maryland Heigths
172	SWO-R-15R2-021	-90:31:43.186	38:42:04.657	SE	NE	26	*	T46NR4E		Missouri River	Maryland Heigths
173	SWO-R-15R3-022	-90:31:50.232	38:41:36.584	SE	SE	26	*	T46NR4E		Missouri River	Maryland Heigths
174	SWO-R-16R1-023	-90:32:14.423	38:41:07.666	NE	SW	35	*	T46NR4E		Missouri River	Maryland Heigths
175	SWO-R-23V1-024	-90:38:36.033	38:35:36.312	SE	SE	35		T44NR3E		Missouri River via Bonhomme Creek	Wildwood
176	SWO-R-16S4-025	-90:33:30.871	38:40:46.246	SE	SW	34	*	T46NR4E		Missouri River	Chesterfield
177	SWO-R-16T3-026	-90:34:14.101	38:40:41.369	NW	NE	4	*	T45NR4E	Bonhomme	Missouri River	Chesterfield
178	SWO-R-16T4-027	-90:35:02.970	38:40:45.292	SW	SW	33	*	T46NR4E		Missouri River	Chesterfield
179	SWO-R-16U4-028	-90:36:56.970	38:40:54.707	SW	SW	31	*	T46NR4E		Missouri River	Chesterfield
180	SWO-R-23V1-029	-90:38:29.725	38:35:35.679	SE	SE	35		T45NR3E		Missouri River via Bonhomme Creek	Wildwood

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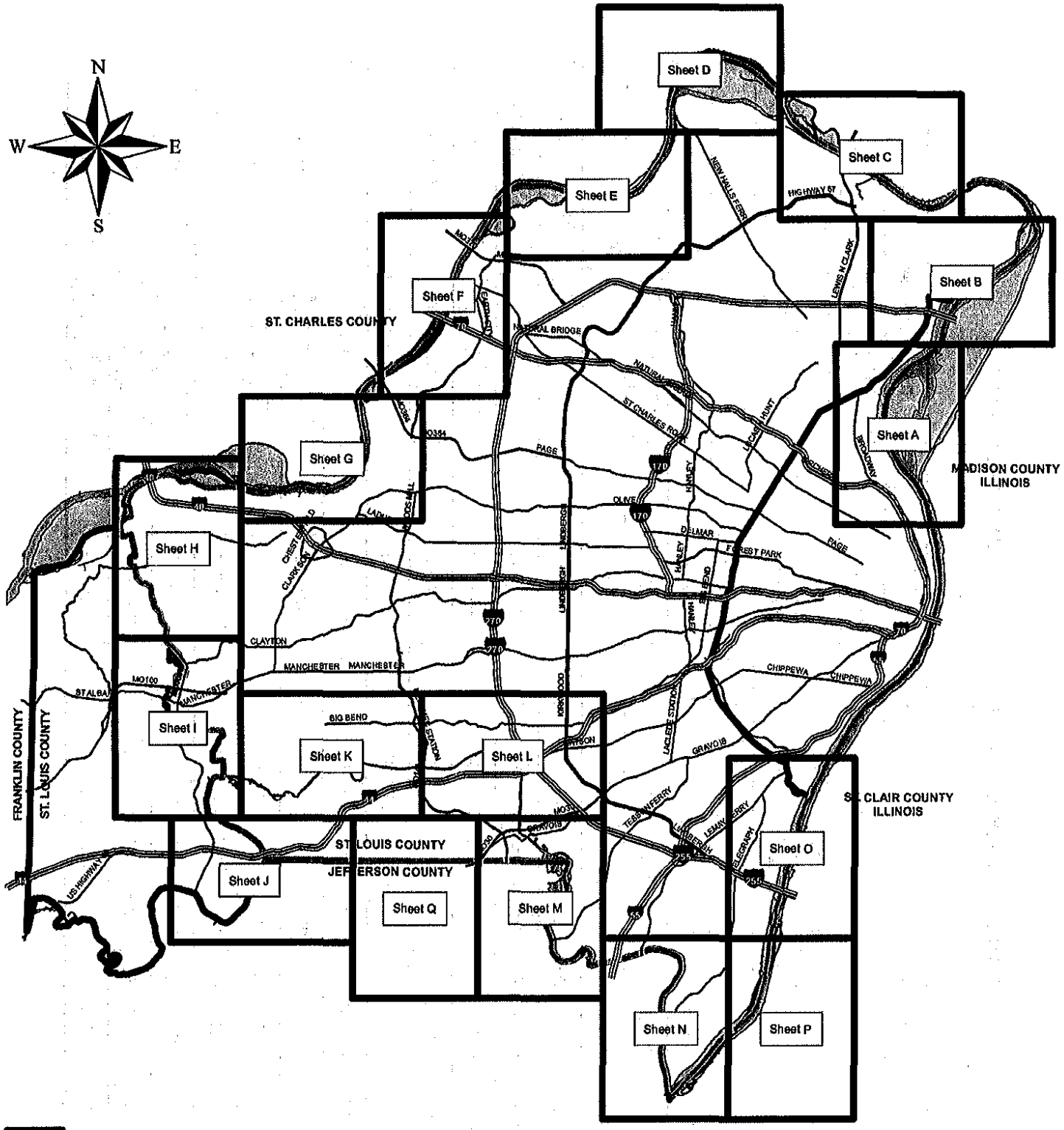
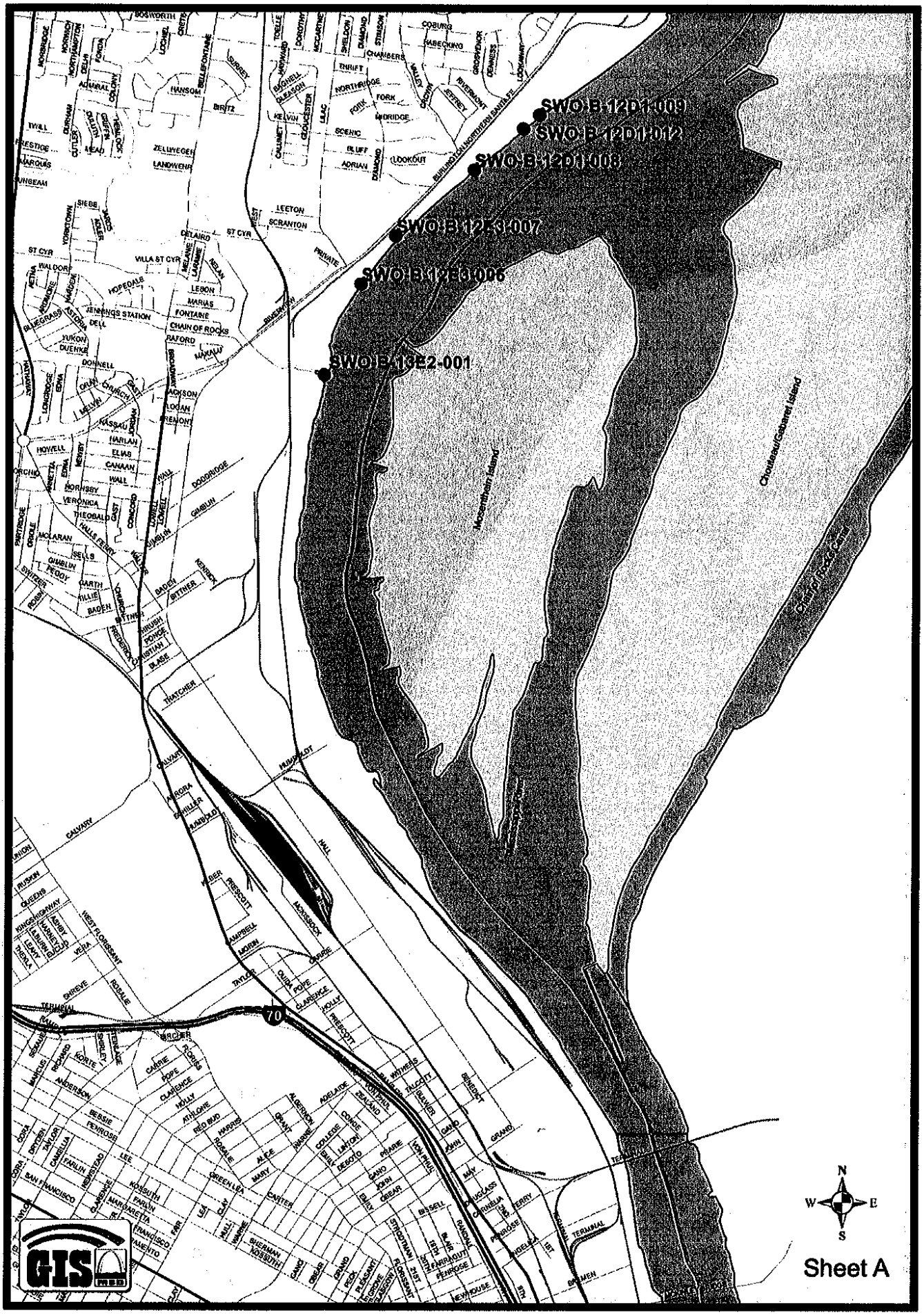
	SWO ID Number	Longitude	Latitude	1/4	1/4	Section		Township/ Range	Creek Name	Receiving Water	Municipality
181	SWO-R-16W2-030	-90:39:30.432	38:41:09.550	NE	SE	34	*	T46NR3E		Missouri River	Chesterfield
182	SWO-R-18W4-031	-90:40:20.634	38:38:56.127	NE	NW	15	*	T45NR3E		Missouri River via Unamed Tributary	Wildwood
183	SWO-R-20W2-032	-90:39:40.122	38:37:48.053	SE	NE	22	*	T45NR3E		Missouri River via Bonhomme Creek	Wildwood
184	SWO-R-20W3-033	-90:39:36.419	38:37:39.477	NE	SE	22		T45NR3E		Missouri River via Bonhomme Creek	Wildwood
185	SWO-R-20W3-034	-90:39:35.146	38:37:35.988	NE	SE	22		T45NR3E		Missouri River via Bonhomme Creek	Wildwood
186	SWO-R-20W3-035	-90:39:33.001	38:37:28.172	NE	SE	22		T45NR3E		Missouri River via Bonhomme Creek	Wildwood
187	SWO-R-20W3-036	-90:39:26.420	38:37:22.679	SW	SW	23		T45NR3E		Missouri River via Bonhomme Creek	Wildwood
188	SWO-R-21W2-037	-90:39:20.217	38:37:13.464	SW	SW	23		T45NR3E		Missouri River via Bonhomme Creek	Wildwood
189	SWO-R-22W2-038	-90:39:01.194	38:36:10.917	NE	NW	35		T45NR3E		Missouri River via Bonhomme Creek	Wildwood
190	SWO-R-22W2-039	-90:39:01.306	38:36:05.197	SE	NW	35		T45NR3E		Missouri River via Bonhomme Creek	Wildwood
191	SWO-R-22W3-040	-90:39:01.456	38:35:53.631	SE	NW	35		T45NR3E		Missouri River via Bonhomme Creek	Wildwood
192	SWO-R-22V4-041	-90:38:52.333	38:35:53.388	NW	SE	35		T45NR3E		Missouri River via Bonhomme Creek	Wildwood
193	SWO-R-22V4-042	-90:38:44.499	38:35:50.781	NW	SE	35		T45NR3E		Missouri River via Bonhomme Creek	Wildwood
194	SWO-R-23V1-043	-90:38:23.590	38:35:33.379	SW	SW	36		T45NR3E		Missouri River via Bonhomme Creek	Wildwood
195	SWO-R-22V4-044	-90:38:32.221	38:35:44.204	NE	SE	35		T45NR3E		Missouri River via Bonhomme Creek	Wildwood
196	SWO-R-23V1-045	-90:38:39.140	38:35:26.887	NE	NE	2		T44NR3E		Missouri River via Bonhomme Creek	Wildwood
197	SWO-R-23V4-046	-90:38:46.026	38:35:08.792	SW	NE	2		T44NR3E		Missouri River via Bonhomme Creek	Wildwood
198	SWO-R-23V4-047	-90:38:50.766	38:35:03.550	SW	NE	2		T44NR3E	Bonhomme	Missouri River via Bonhomme Creek	Wildwood

OUTLET LOCATIONS FOR THE ST. LOUIS COUNTY PLAN AREA
SEPTEMBER 2012

	SWO ID Number	Longitude	Latitude	1/4	1/4	Section		Township/ Range	Creek Name	Receiving Water	Municipality
199	SWO-R-24V4-050	-90:38:25.840	38:34:07.531	SW	NW	12		T44NR3E		Meramec River via Hamilton and Carr Creeks	Wildwood
200	SWO-R-24V4-051	-90:38:17.216	38:34:07.353	SW	NW	12		T44NR3E		Meramec River via Hamilton and Carr Creeks	Wildwood
201	SWO-R-24V4-052	-90:38:11.570	38:34:07.237	NE	SW	12		T44NR3E		Meramec River via Hamilton and Carr Creeks	Wildwood
202	SWO-R-24V4-053	-90:38:09.688	38:34:16.384	SE	NW	12		T44NR3E		Meramec River via Hamilton and Carr Creeks	Wildwood
203	SWO-R-24V3-055	-90:37:56.127	38:34:19.564	SE	NW	12		T44NR3E		Meramec River via Hamilton and Carr Creeks	Wildwood
204	SWO-R-24V3-056	-90:37:56.208	38:34:16.836	SE	NW	12		T44NR3E		Meramec River via Hamilton and Carr Creeks	Wildwood
205	SWO-R-24V4-057	-90:38:08.542	38:34:00.919	NE	SW	12		T44NR3E		Meramec River via Hamilton and Carr Creeks	Wildwood
206	SWO-R-25V2-058	-90:38:09.078	38:33:53.448	NE	SW	12		T44NR3E		Meramec River via Hamilton and Carr Creeks	Wildwood
207	SWO-R-25V2-060	-90:37:48.867	38:33:49.866	SW	SE	12		T44NR3E		Meramec River via Carr Creek	Wildwood
208	SWO-R-25V2-061	-90:37:47.226	38:33:52.128	SW	SE	12		T44NR3E		Meramec River via Carr Creek	Wildwood
209	SWO-R-16S3-064	-90:33:00.822	38:40:47.887	SE	SE	34	*	T46NR4E		Missouri River	Chesterfield
210	SWO-R-16U3-065	-90:37:30.684	38:40:52.764	SE	SE	36	*	T46NR3E		Missouri River	Chesterfield
211	SWO-R-16V2-066	-90:37:46.816	38:40:55.924	SW	SE	36	*	T44NR3E		Missouri River	Chesterfield
212	SWO-R-24W3-067	-90:38:58.613	38:34:08.027	SE	SW	13		T46NR4E		Meramec River via Hamilton and Carr Creeks	Wildwood
213	SWO-R-24V4-068	-90:38:50.396	38:34:07.935	NE	SE	14		T44NR4E		Meramec River via Hamilton and Carr Creeks	Wildwood
214	SWO-R-24V4-069	-90:38:34.411	38:34:07.776	SW	SE	14		T44NR4E		Meramec River via Hamilton and Carr Creeks	Wildwood
215	SWO-R-24V3-070	-90:38:06.293	38:34:20.213	NE	SE	12		T44NR3E		Meramec River via Hamilton and Carr Creeks	Wildwood
216	SWO-R-25V2-072	-90:37:17.193	38:33:52.016	NW	SW	7		T44NR4E		Meramec River via Hamilton and Carr Creeks	Wildwood
217	SWO-R-25U1-073	-90:37:07.881	38:33:51.905	NW	SW	7		T44NR4E		Meramec River via Hamilton and Carr Creeks	Wildwood

OUTLET INDEX MAP

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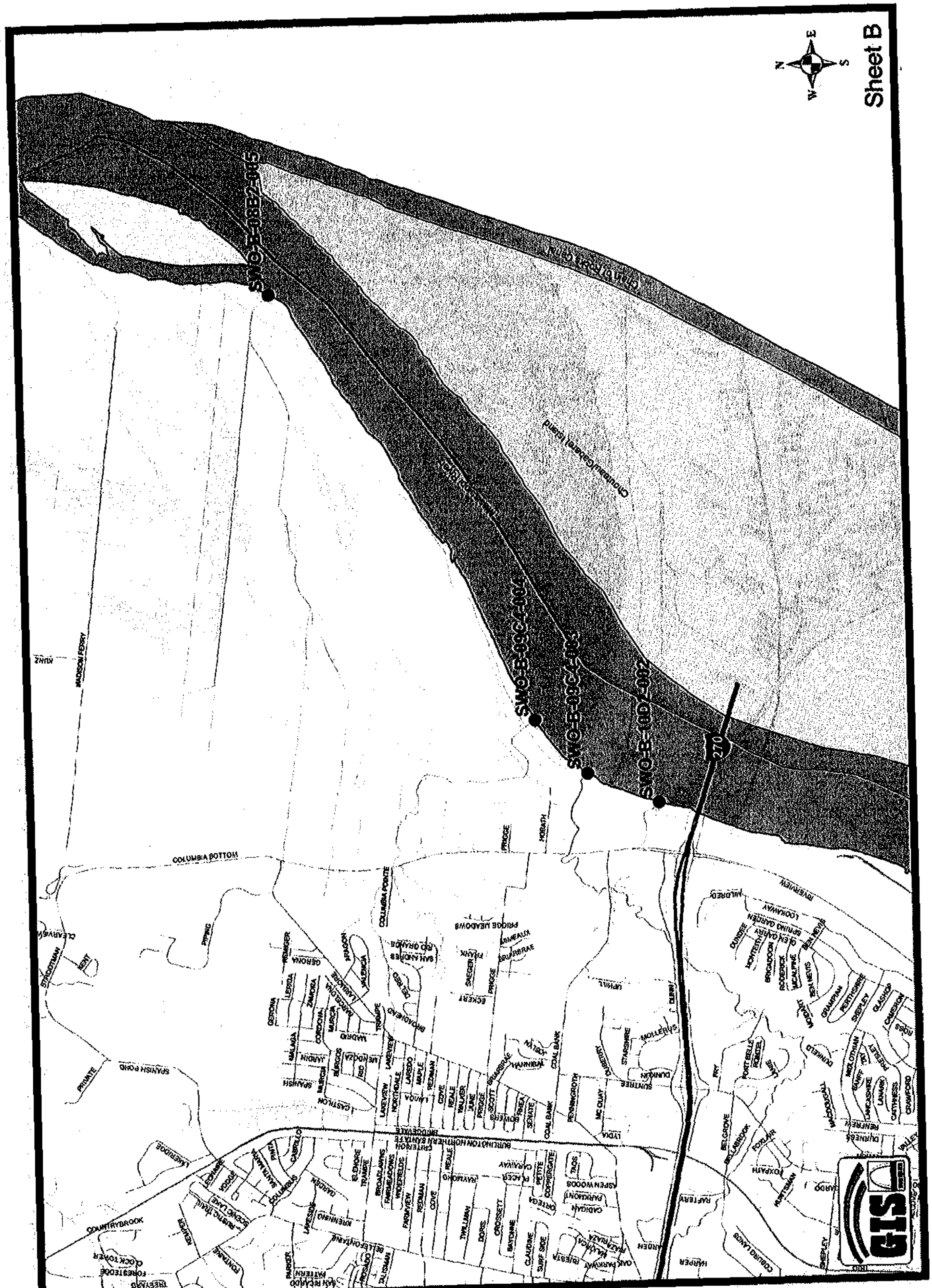
Macarthur Island
Chevalier(Cabinet Island
Grand Rapids Canal
BURLINGTON NORTHERN SANTA FE
70
N
W
E
S
Sheet A
GIS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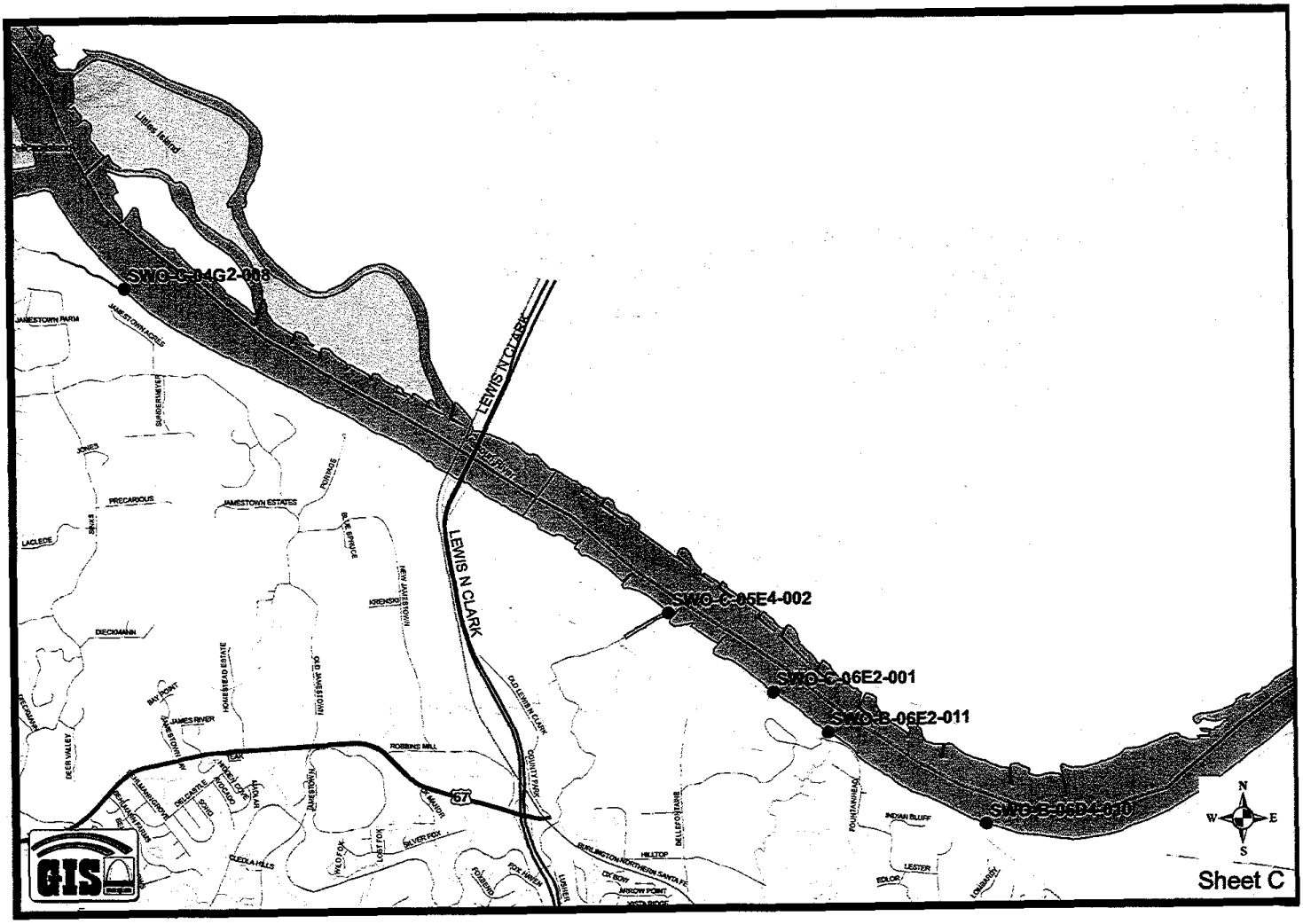
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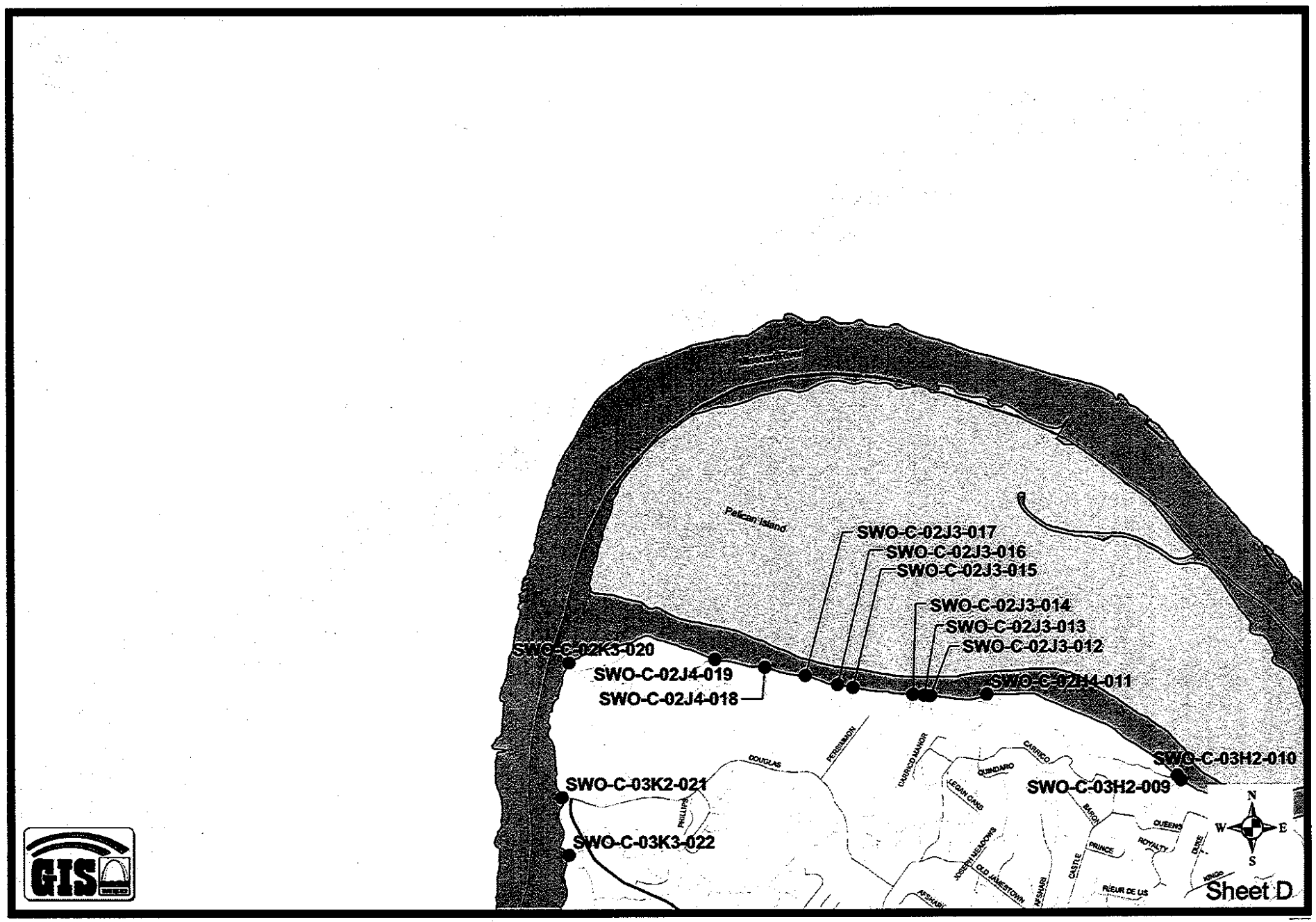
Sheet C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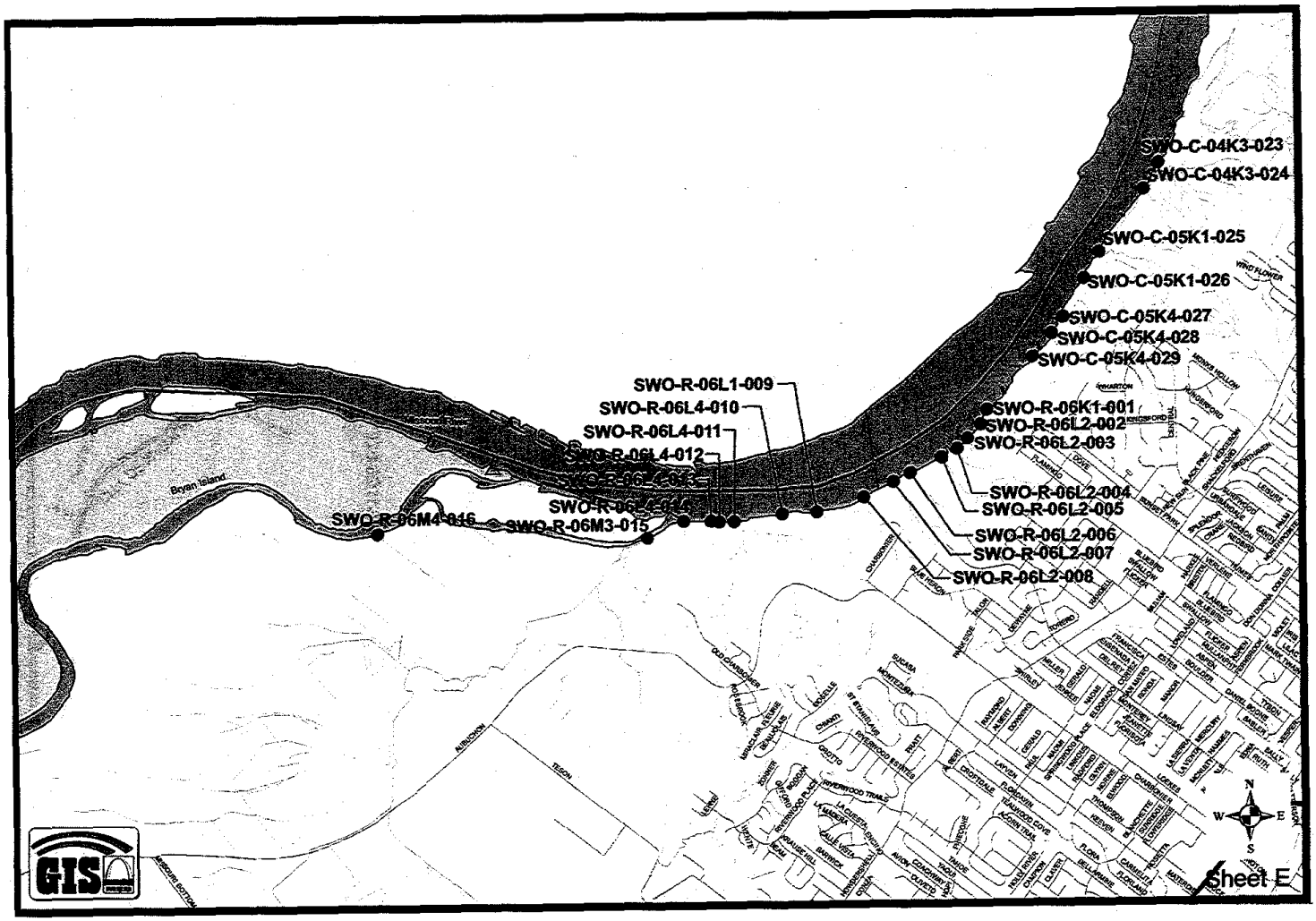
SWO-C-02J3-012
SWO-C-02K3-020
SWO-C-02J4-019
SWO-C-02J4-018
SWO-C-02H4-011
SWO-C-03H2-010
SWO-C-03H2-009
SWO-C-03K2-021
SWO-C-03K3-022
DOUGLAS
PERSIMMON
CABRICO MANOR
CABRICO
QUINDARO
LEGUIN CANO
PHILLIPS
JOSEPH MEADOWS
OLD JAMESTOWN
ARSHADI
M'SHABI
CASTLE
PRINCE
ROYALTY
QUEENS
DUKE
BARON
FLEUR DE LIS
KING
N
W
E
S
Sheet D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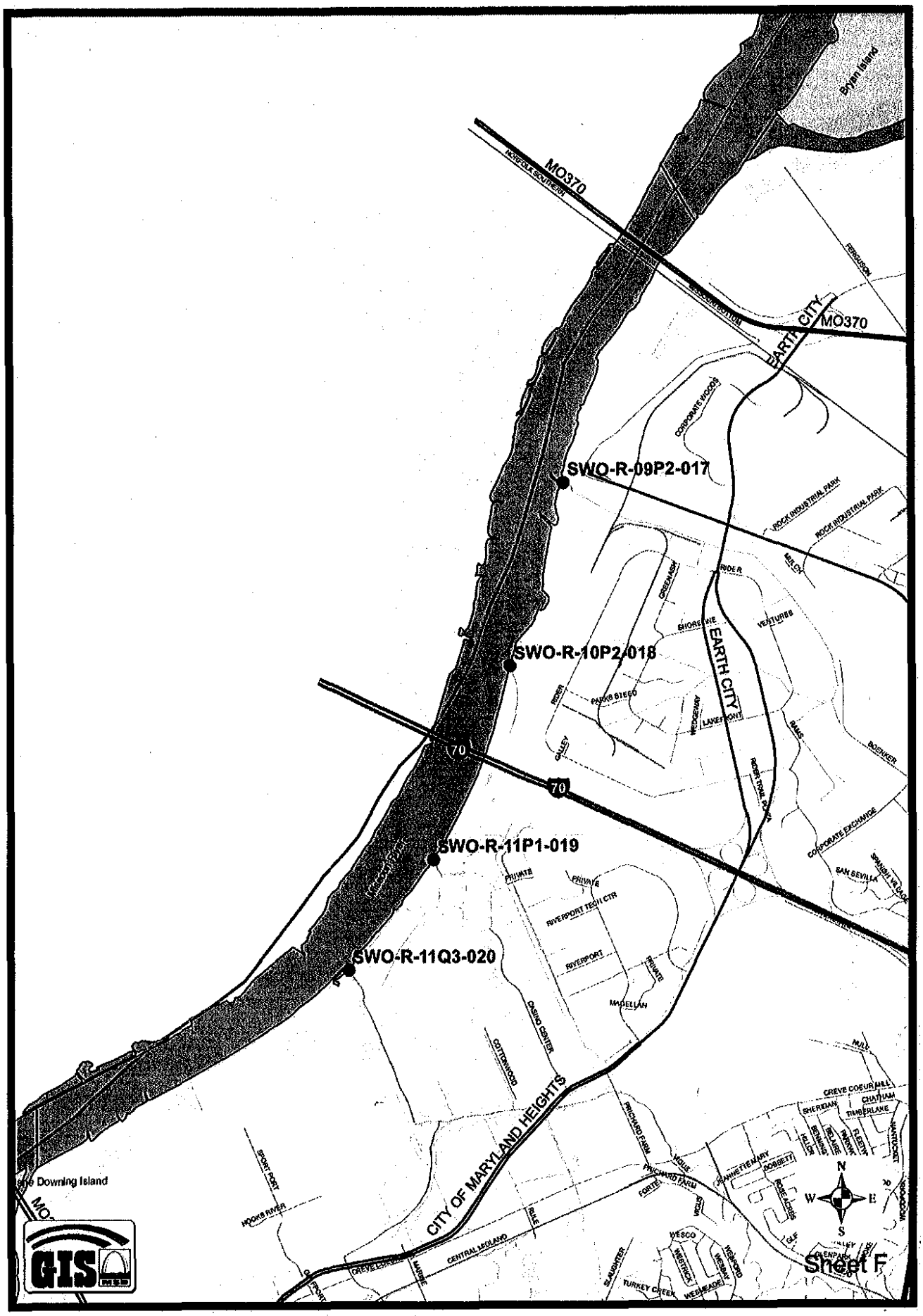
GIS
N
S
E
W
Sheet E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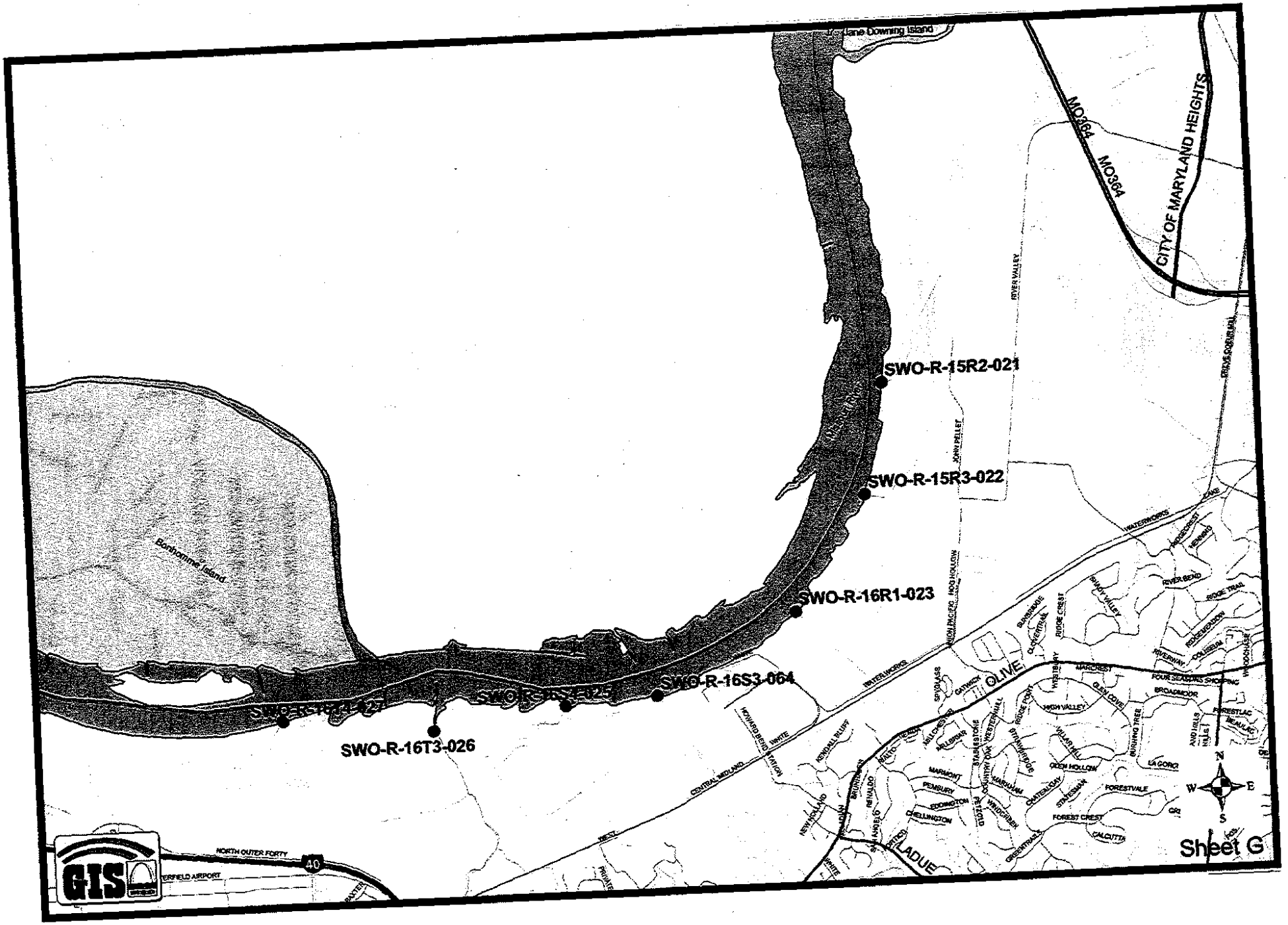
EARTH CITY
CITY OF MARYLAND HEIGHTS
Bryan Island
Downing Island
70
Sheet F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CITY OF MARYLAND HEIGHTS
OLIVE
LADUE
Sheet G
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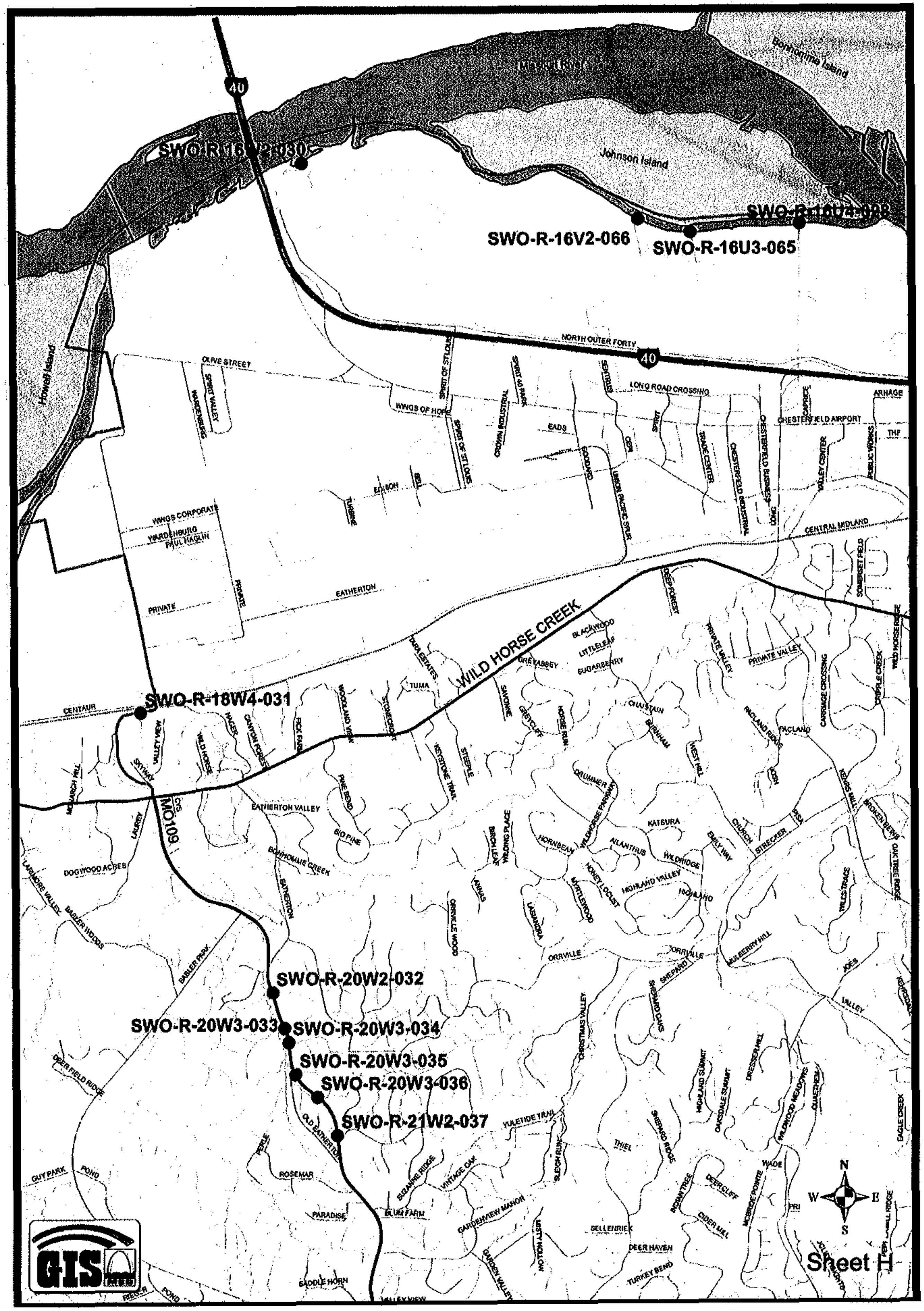
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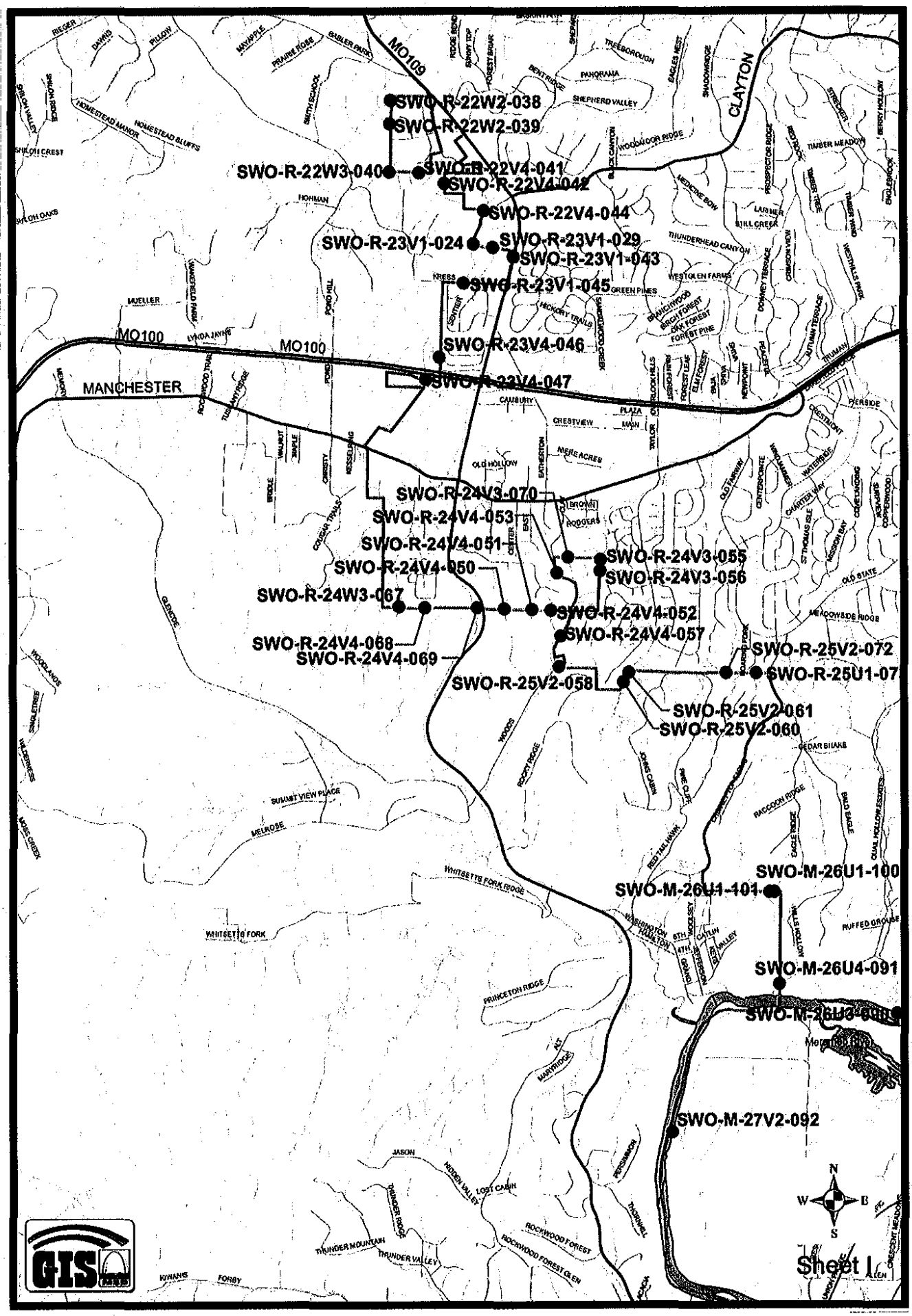
Johnson Island
Bonhomme Island
Howell Island
WILD HORSE CREEK
NORTH OUTER FORTY
40
MO109
Sheet H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SWO-R-24V3-056
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SWO-R-24V4-068
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SWO-R-25V2-072
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MO100
MO100
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CLAYTON
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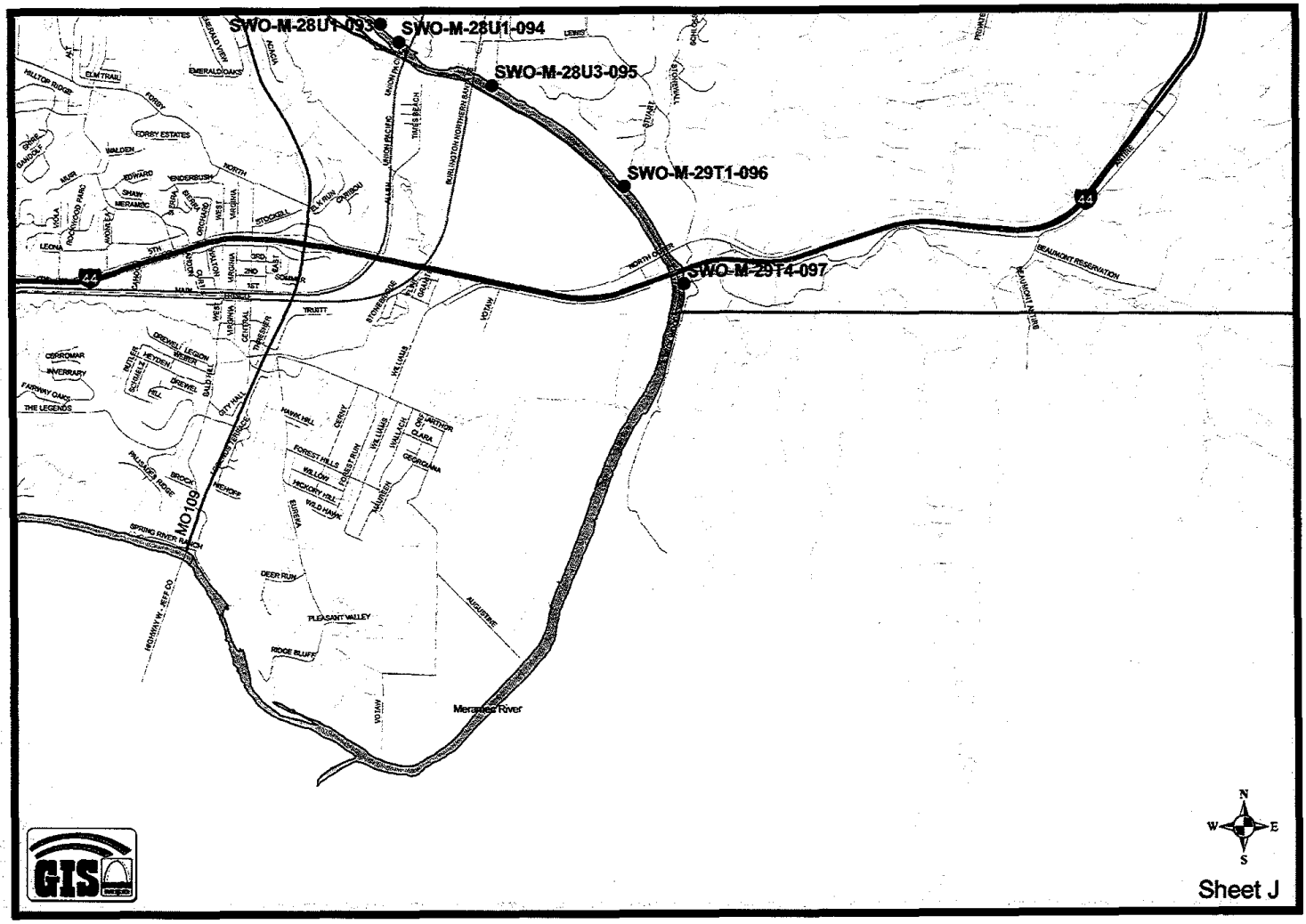
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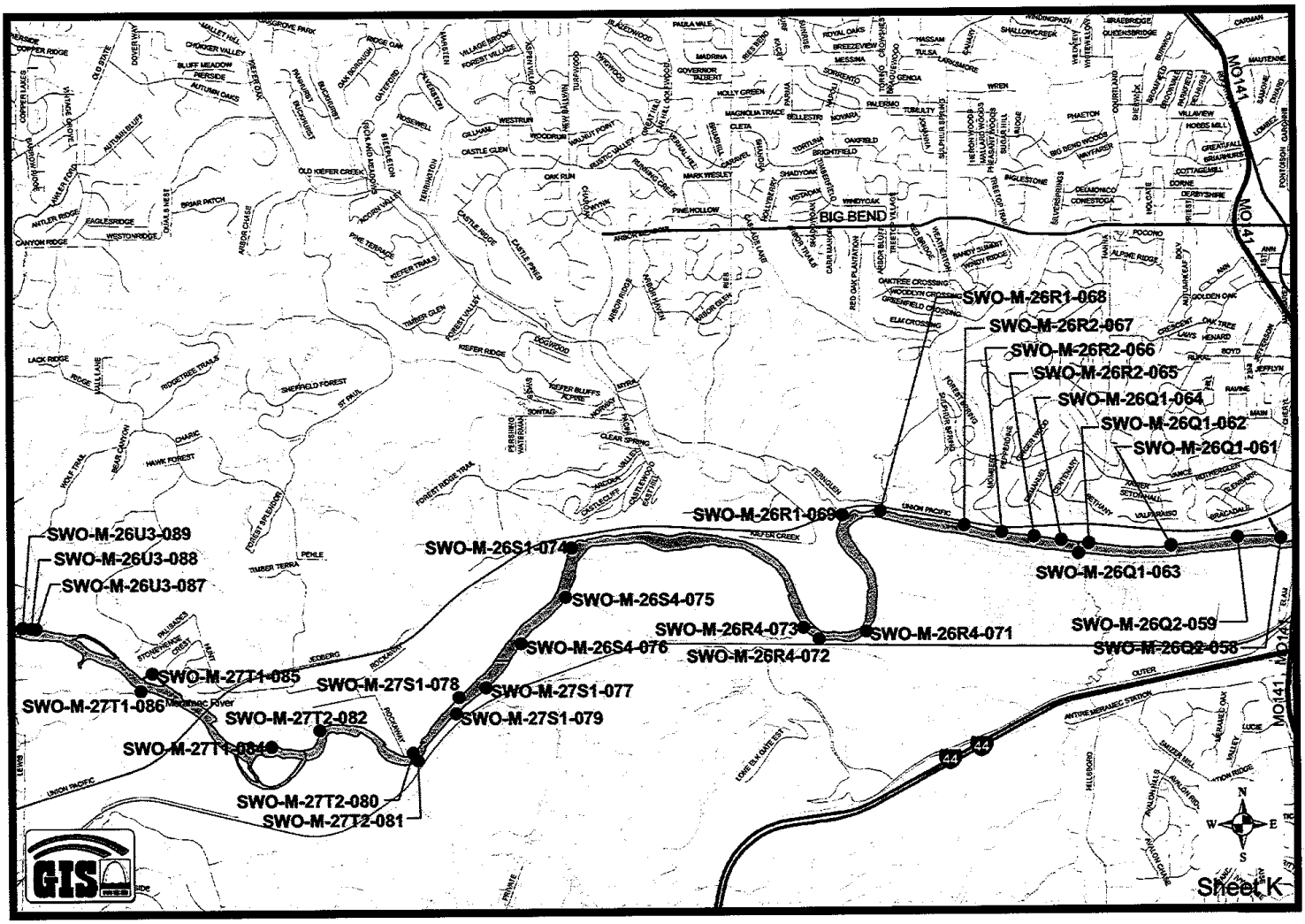
MO109
Meramec River
Sheet J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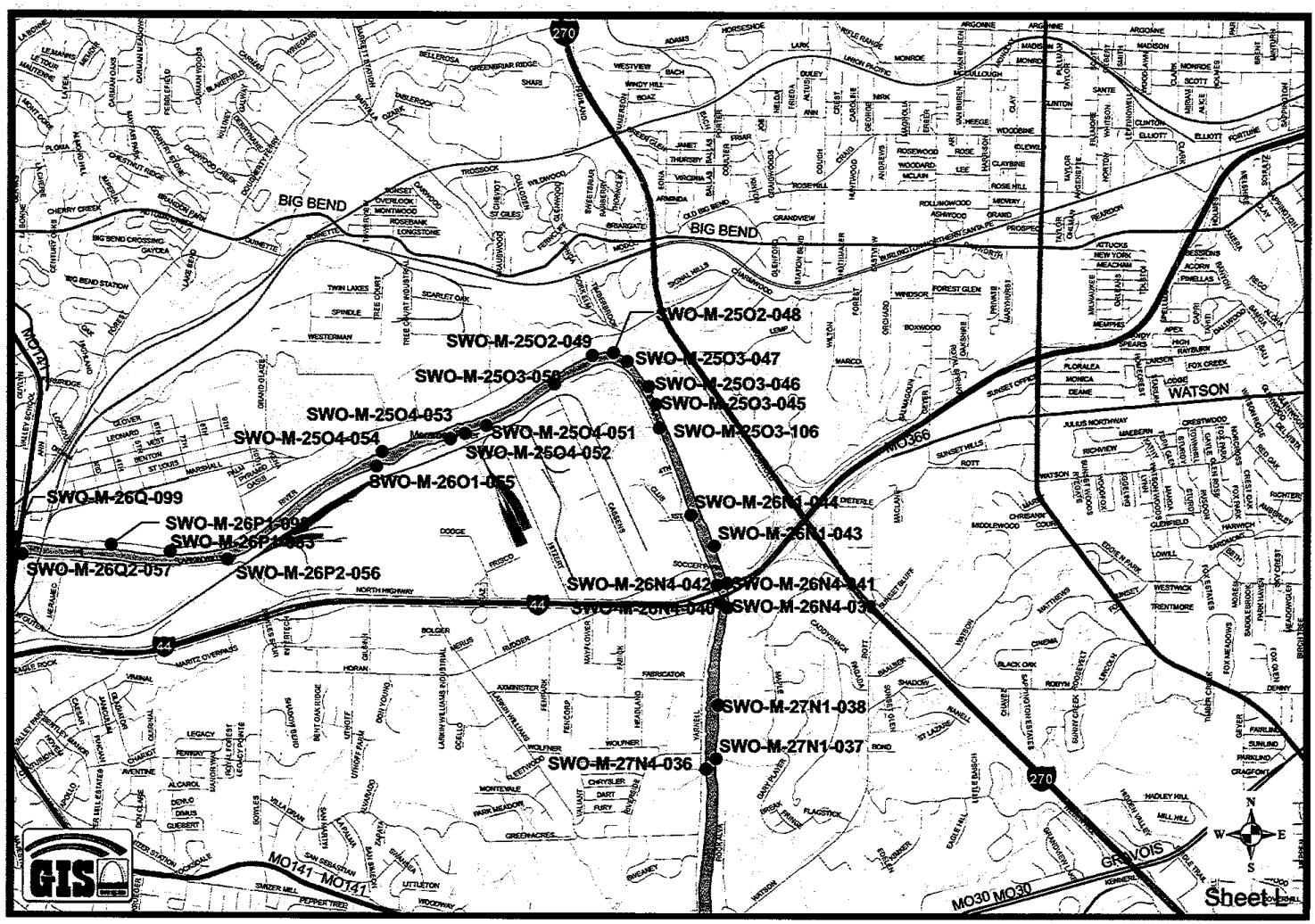
BIG BEND
Meramec River
Sheet K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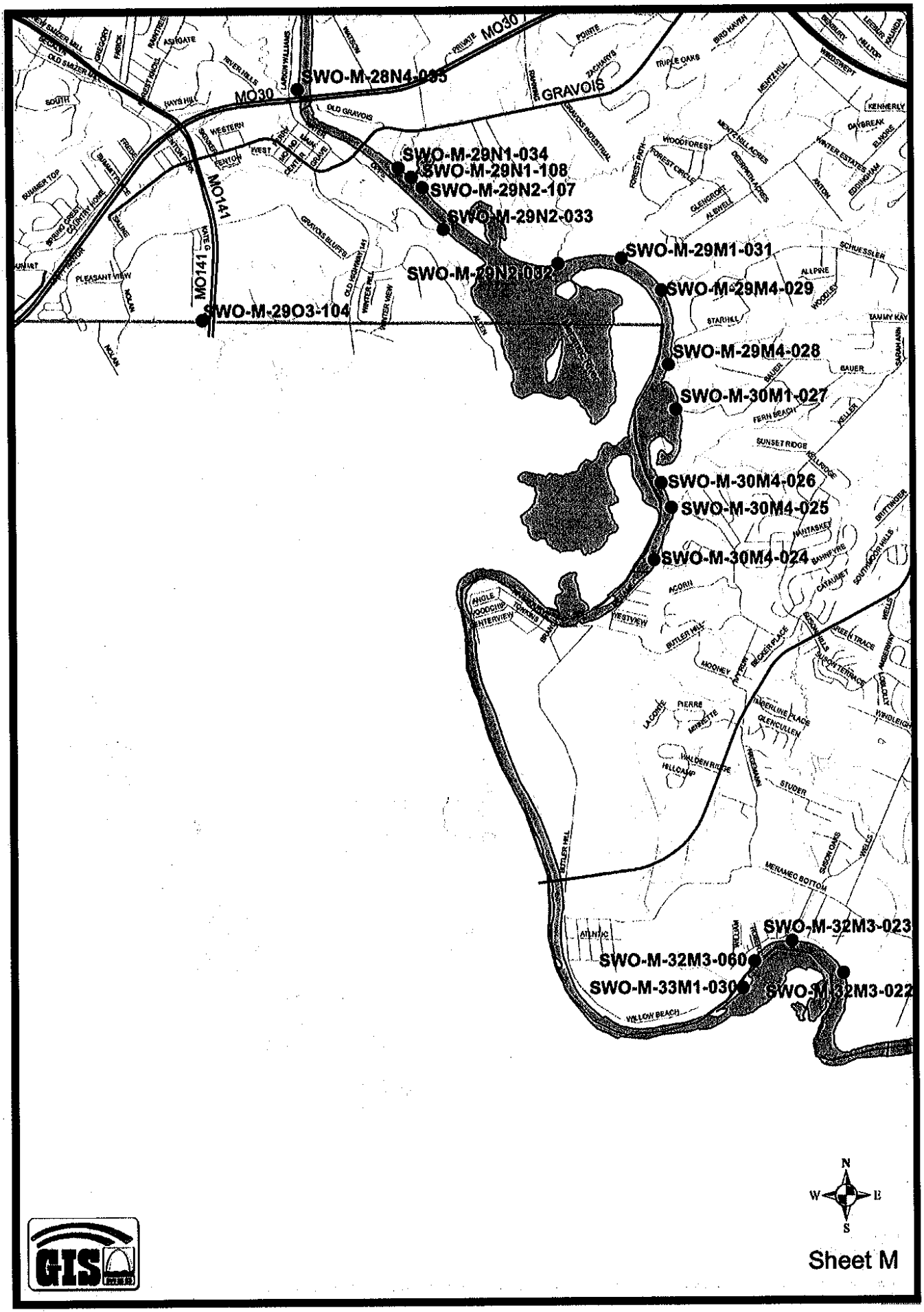
BIG BEND
WATSON
GRAVOIS
MO141
MO30
MO366
Sheet 1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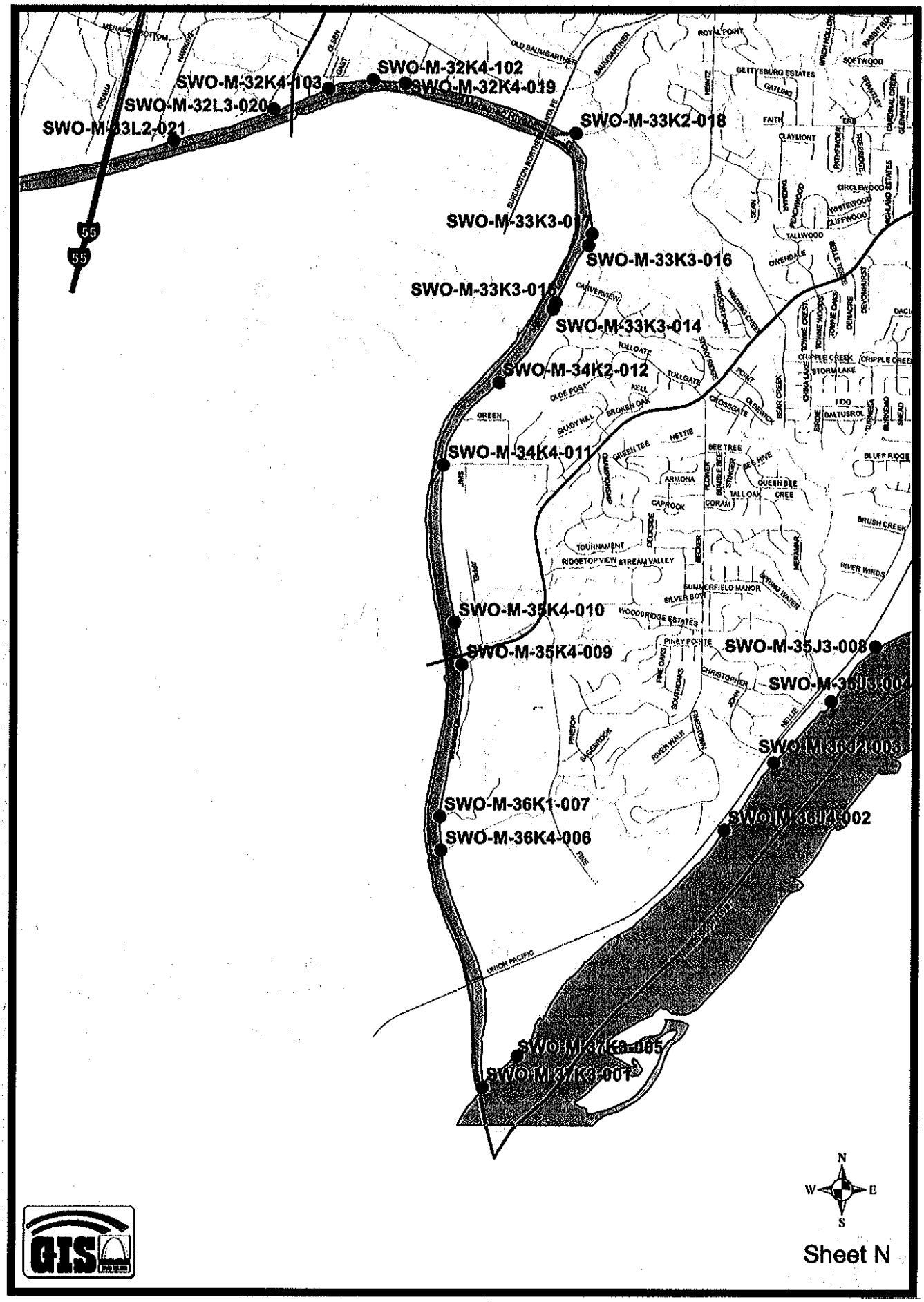
MO30
GRAVOIS
MO141
N
W
E
S
GIS
Sheet M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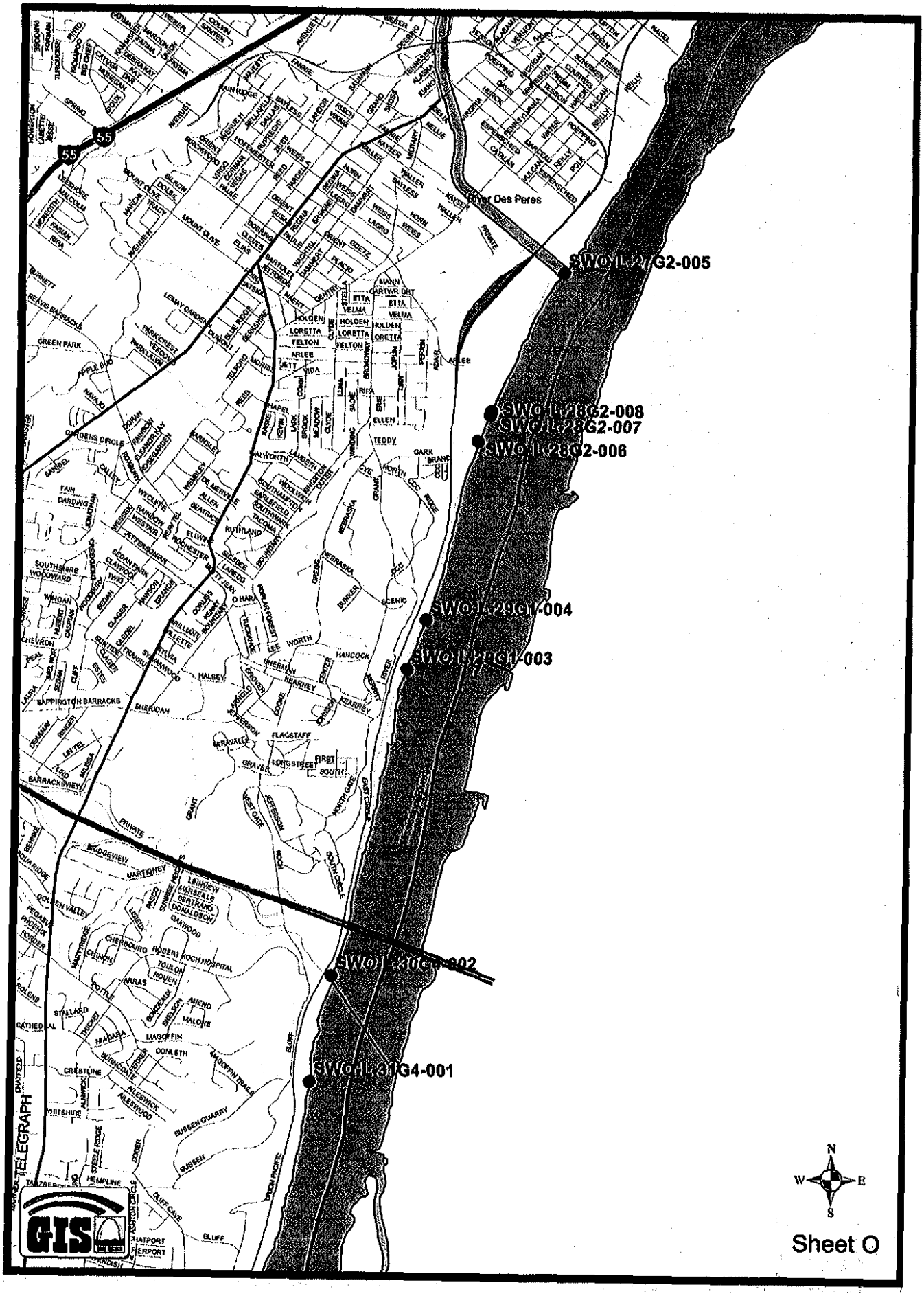
S
Sheet N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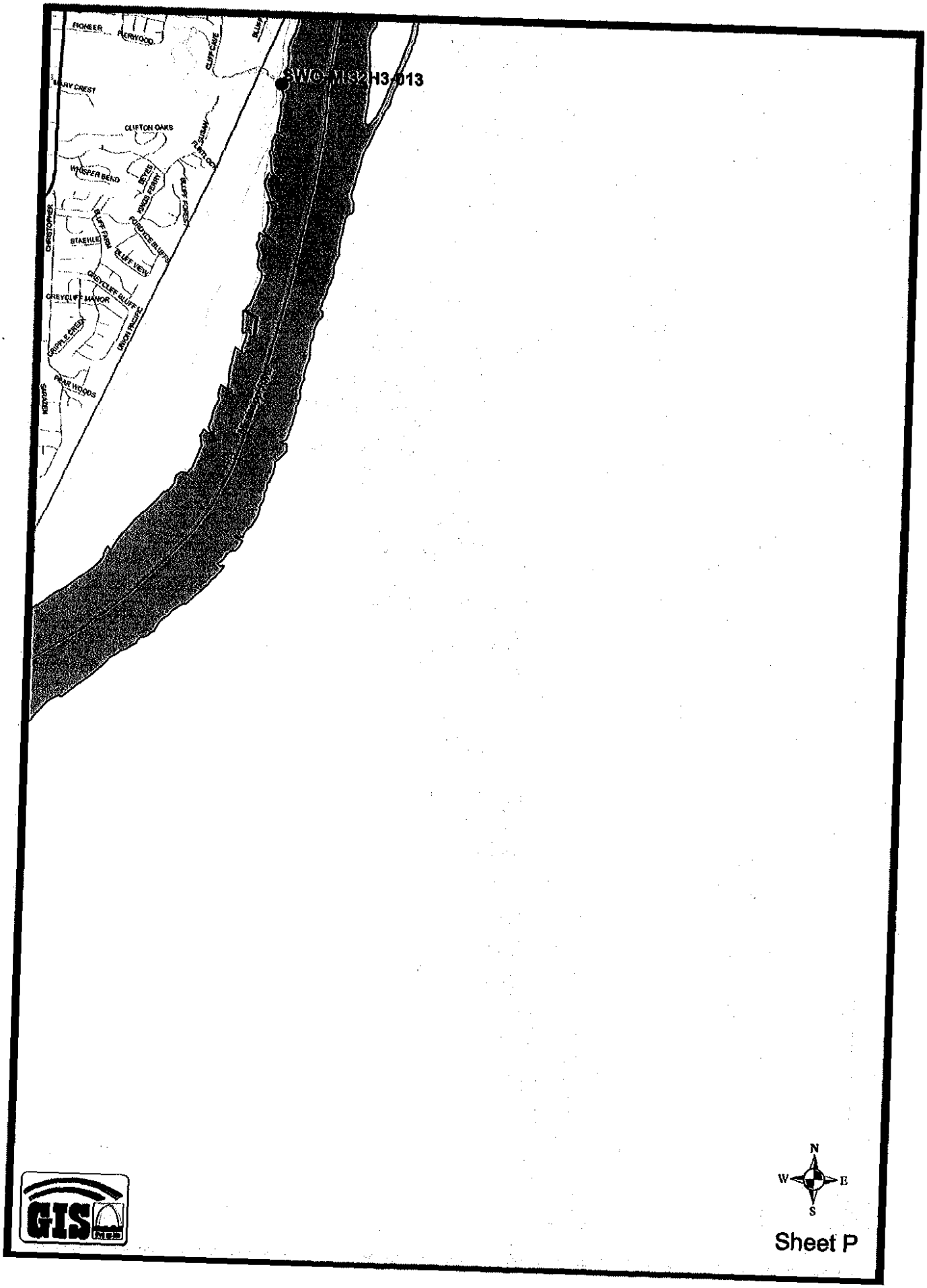
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BLUFF
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WHISPER BEND
RIVER
KINGS FERRY
FAIRLOCK
BLUFF FOREST
CHRISTOPHER
BLUFF FARM
STAEHLE
FOURTH BLUFF
BLUFF VIEW
GREYCLIFF BLUFF
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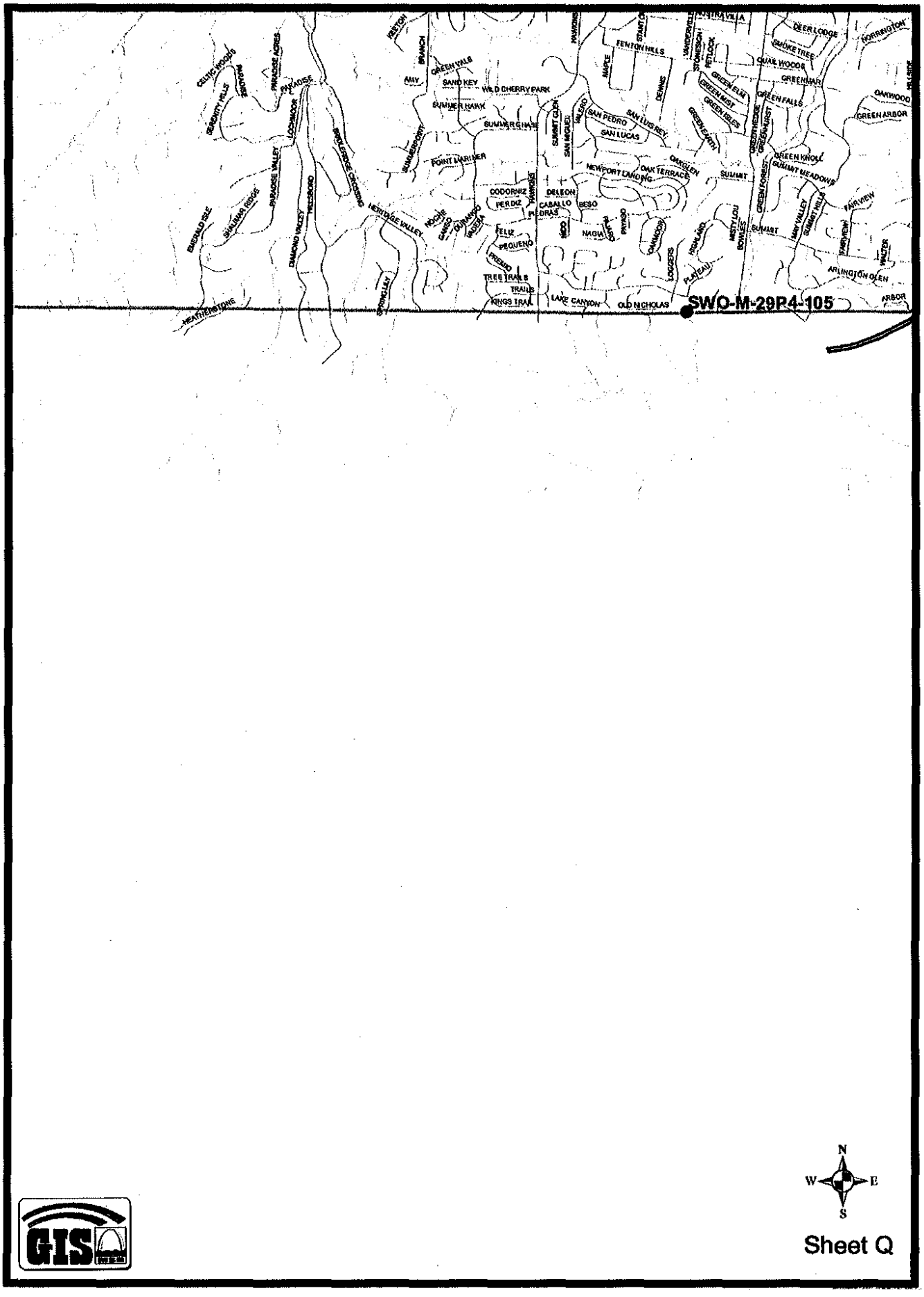
RIPPLE CREEK
UNION PACIFIC
PEAR WOODS
KEIZER
N
W
E
S
Sheet P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