FINAL
TMDLs for Fecal Coliform Bacteria for Selected Subsegments in the Lake Pontchartrain Basin, Louisiana

(040102, 040103, 040201, 040302, 040304, 040305, 040503, 040504, 040505, 040603, 040703, 040909, 040910, 041302, 041401)

Prepared for:

United States Environmental Protection Agency, Region 6
Water Quality Protection Division
Permits, Oversight, and TMDL Team
Dallas, TX 75202

Contract Number EP-C-08-004
Task Order 90

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March 30, 2012

EXECUTIVE SUMMARY

Section 303(d) of the Clean Water Act and the U.S. Environmental Protection Agency's (EPA's) Water Quality Planning and Management Regulations (at Title 40 of the *Code of Federal Regulations* [CFR] section 130.7) for waterbody-pollutant pairs on the approved 303(d) impaired waters list, even if pollutant sources have implemented technology-based controls. A total maximum daily load (TMDL) is a calculation of the maximum amount of a pollutant that a waterbody can assimilate while still meeting the water quality standard for that pollutant. TMDLs provide the scientific basis for a state to establish water quality-based controls to reduce pollution from both point and nonpoint sources to restore and maintain the quality of the state's water resources (USEPA 1991).

A TMDL for a given pollutant and waterbody is composed of the sum of individual wasteload allocations (WLAs) for point sources and load allocations (LAs) for nonpoint sources, and natural background levels. In addition, the TMDL must include an implicit or explicit margin of safety (MOS) to account for the uncertainty in the relationship between pollutant loads and the quality of the receiving waterbody, and it may include a future growth (FG) component. The components of the TMDL calculation are illustrated using the following equation:

$$TMDL = \sum WLAs + \sum LAs + MOS + FG$$

The area for this TMDL includes 15 subsegments in the Lake Pontchartrain Basin in southeastern Louisiana. The Lake Pontchartrain Basin is an estuarine system connected to the Gulf of Mexico (USGS 2002). The northern boundary of the Basin coincides with the Mississippi state line, the Pearl River defines the eastern edge, and the Mississippi River forms the western and southern boundary (LDEQ 2010b). Several large cities and metropolitan regions are in the watershed, including Baton Rouge and New Orleans, with several areas undergoing urban growth (Bourgeois-Calvin 2008).

The upper subsegments within the Lake Pontchartrain Basin (subsegments 040102, 040103, 040201, 040302, 040304, 040305, 040503, 040504, 040505, 040603, and 040703) are mainly forests and wetlands. Several subsegments (040103, 040201, 040302, 040504, 040505, 040603, 040909, 041302, and 041401) have large urban areas incorporating Baton Rouge, Hammond, Slidell, and New Orleans. The lower portion of the Lake Pontchartrain Basin (subsegments 040909, 040910, 041302, and 041401) is dominated by open water and wetlands.

The Louisiana Department of Environmental Quality (LDEQ) has included 15 subsegments in the Lake Pontchartrain Basin on the state's 2010 section 303(d) list of impaired waterbodies (*2010 Integrated Report)*(LDEQ 2010a) for fecal coliform bacteria impairments (Table ES-1). The designated uses for the 15 subsegments in which fecal coliform bacteria is the suspected cause include primary contact recreation (PCR), secondary contact recreation (SCR), fish and wildlife propagation (FWP), and outstanding natural resource (ONR) (subsegment 040102).

Table ES-2 presents the numeric water quality criteria for fecal coliform bacteria that apply to the impaired subsegments in the Lake Pontchartrain Basin and that were used to calculate the total allowable loads.

Table ES-1. Section 303(d) listing information for subsegments included in this report

Subsegment number	Subsegment name	Subsegment description	Designated uses[a,b]				Suspected sources of fecal coliform bacteria impairment
			PCR	SCR	FWP	ONR	
040102	Comite River	From Wilson-Clinton Hwy. to White Bayou (Scenic)	N	F	F	N	Sanitary sewer overflows (collection system failures)
040103	Comite River	From White Bayou to Amite River	N	F	F		On-site treatment systems (septic systems and similar decentralized systems) and sanitary sewer overflows (collection system failures)
040201	Bayou Manchac	From headwaters to Amite River	N	F	N		On-site treatment systems (septic systems and similar decentralized systems) and sanitary sewer overflows (collection system failures)
040302	Amite River	From LA-37 to Amite River Diversion Canal	N	F	N		On-site treatment systems (septic systems and similar decentralized systems)
040304	Grays Creek	From headwaters to Amite River	N	F	N		On-site treatment systems (septic systems and similar decentralized systems)
040305	Colyell Creek	Includes tributaries and Colyell Bay	N	F	N		On-site treatment systems (septic systems and similar decentralized systems)
040503	Natalbany River	From headwaters to Tickfaw River	N	F	N		On-site treatment systems (septic systems and similar decentralized systems)
040504	Yellow Water River	From headwaters to Ponchatoula Creek	N	N	N		On-site treatment systems (septic systems and similar decentralized systems)
040505	Ponchatoula Creek and Ponchatoula River	--	N	N	N		On-site treatment systems (septic systems and similar decentralized systems)
040603	Selsers Creek	From headwaters to South Slough	N	F	N		Source unknown
040703	Big Creek	From headwaters to Tangipahoa River	N	N	F		Dairies (Outside Milk Parlor Areas)
040909	W-14 Main Diversion Canal	From headwaters to Salt Bayou	N	N	N		On-site treatment systems (septic systems and similar decentralized systems), sanitary sewer overflows (collection system failures), and municipal (urbanized high density area)
040910	Salt Bayou	From headwaters to Lake Pontchartrain (Estuarine)	N	F	F		On-site treatment systems (septic systems and similar decentralized systems)
041302	Drainage Canals, Jefferson and Orleans Parishes	Estuarine	N	F	N		Sanitary sewer overflows (collection system failures), municipal (urbanized high density area)
041401	New Orleans East leveed waterbodies	Estuarine	N	N	N		Sanitary sewer overflows (collection system failures), municipal (urbanized high density area)

Source: LDEQ 2010a

[a] PCR = primary contact recreation, SCR = secondary contact recreation, FWP = fish and wildlife propagation, ONR = outstanding natural resource

[b] F = fully supporting designated use, N = not supporting designated use

Table ES-2. Numeric water quality criteria for the listed subsegments

Subsegment number	Subsegment name	Bacteria[a] (colonies/100 mL)
040102	Comite River	400 (5/01–10/31); 2,000 (11/01–4/30)
040103	Comite River	400 (5/01–10/31); 2,000 (11/01–4/30)
040201	Bayou Manchac	400 (5/01–10/31); 2,000 (11/01–4/30)
040302	Amite River	400 (5/01–10/31); 2,000 (11/01–4/30)
040304	Grays Creek	400 (5/01–10/31); 2,000 (11/01–4/30)
040305	Colyell Creek	400 (5/01–10/31); 2,000 (11/01–4/30)
040503	Natalbany River	400 (5/01–10/31); 2,000 (11/01–4/30)
040504	Yellow Water River	400 (5/01–10/31); 2,000 (11/01–4/30)
040505	Ponchatoula Creek and Ponchatoula River	400 (5/01–10/31); 2,000 (11/01–4/30)
040603	Selsers Creek	400 (5/01–10/31); 2,000 (11/01–4/30)
040703	Big Creek	400 (5/01–10/31); 2,000 (11/01–4/30)
040909	W-14 Main Diversion Canal	400 (5/01–10/31); 2,000 (11/01–4/30)
040910	Salt Bayou	400 (5/01–10/31); 2,000 (11/01–4/30)
041302	Drainage Canals, Jefferson and Orleans Parishes	400 (5/01–10/31); 2,000 (11/01–4/30)
041401	New Orleans East leveed waterbodies	400 (5/01–10/31); 2,000 (11/01–4/30)

Source: LDEQ 2011

[a] Criteria for primary and secondary contact recreation: Primary contact recreation: No more than 25 percent of the total samples collected on a monthly basis shall exceed a fecal coliform bacteria density of 400 colonies/100 milliliter (mL). This shall apply only during the defined recreational period of 05/01 through 10/31. For all other periods, a fecal coliform bacteria density of 2,000 colonies/100 mL for secondary contact recreation applies.

The fecal coliform bacteria TMDLs in the Lake Pontchartrain Basin were calculated using both a load reduction approach and load duration curve approach. The load reduction approach was used for subsegments 040201, 040302, 040304, 040305, 040503, 040504, 040505, 040603, 040909, 040910, 041302, and 041401. These segments represent wetlands, where streamflow is a negligible component of hydrology or have tidal influences. Using the load reduction approach, the water quality criteria and the average water yield were multiplied by the calculated drainage area of each subsegment to estimate the total allowable load.

The load duration curve approach was used for subsegments 040102, 040103, and 040703 in the Lake Pontchartrain Basin. The load duration curve methodology illustrates allowable loading over a wide range of streamflow conditions. The steps for applying this methodology were (1) developing a flow duration curve; (2) converting the flow duration curve to load duration curves; (3) plotting observed loads with load duration curves; (4) calculating the TMDL, MOS, FG, WLA, and LA; and (5) calculating percent reductions. Most fecal coliform bacteria TMDLs were developed on a seasonal basis (i.e., calculating allowable loads and percent reductions for both summer and winter) because of the seasonal water quality criteria.

In TMDL development, allowable loadings from all pollutant sources that cumulatively amount to no more than the TMDL must be established and thereby provide the basis for establishing water quality-based controls. WLAs were specified for permitted point source dischargers, including municipal separate storm sewer systems (MS4). A year-round WLA was calculated for point source dischargers using their permit limits. Seasonal WLAs were calculated for MS4s because MS4s are permitted dischargers but function similarly to nonpoint sources (through storm-driven processes). The LAs include background loadings and human-induced nonpoint sources. An explicit MOS of 10 percent was included. An FG component of 10 percent was also included in this TMDL. Summaries of the TMDLs for the subsegments addressed in this report are presented in Table ES-3, which gives the TMDLs to meet summer and winter water quality criteria.

Table ES-3. Summary of fecal coliform bacteria TMDLs, MOS, FG, WLAs, and LAs for the Lake Pontchartrain Basin

Subsegment	Season	TMDL (MPN/day)	WLA (MPN/day)	LA (MPN/day)	Explicit MOS (MPN/day)	FG (MPN/day)	Percent reduction
040102	Summer	1.86E+12	7.52E+10	1.41E+12	1.86E+11	1.86E+11	55.0%
	Winter	2.02E+13	8.06E+11	1.53E+13	2.02E+12	2.02E+12	73.5%
040103	Summer	8.61E+11	4.04E+11	2.85E+11	8.61E+10	8.61E+10	85.0%
	Winter	9.33E+12	4.21E+12	3.25E+12	9.33E+11	9.33E+11	88.8%
040201	Summer	3.92E+12	1.33E+12	1.81E+12	3.92E+11	3.92E+11	76.5%
	Winter	2.48E+13	8.07E+12	1.18E+13	2.48E+12	2.48E+12	97.8%
040302	Summer	6.38E+12	9.61E+11	4.14E+12	6.38E+11	6.38E+11	76.5%
	Winter	4.57E+13	6.77E+12	2.98E+13	4.57E+12	4.57E+12	91.7%
040304	Summer	7.48E+11	1.96E+11	4.02E+11	7.48E+10	7.48E+10	31.0%
	Winter	5.12E+12	1.11E+12	2.99E+12	5.12E+11	5.12E+11	0.0%
040305	Summer	3.99E+12	2.29E+11	2.96E+12	3.99E+11	3.99E+11	20.0%
	Winter	2.89E+13	1.43E+12	2.17E+13	2.89E+12	2.89E+12	0.0%
040503	Summer	3.01E+12	1.86E+11	2.22E+12	3.01E+11	3.01E+11	50.0%
	Winter	2.19E+13	1.30E+12	1.62E+13	2.19E+12	2.19E+12	87.5%
040504	Summer	3.94E+11	2.26E+11	8.97E+10	3.94E+10	3.94E+10	86.7%
	Winter	2.69E+12	1.49E+12	6.66E+11	2.69E+11	2.69E+11	93.3%
040505	Summer	1.20E+12	3.57E+11	6.06E+11	1.20E+11	1.20E+11	92.0%
	Winter	8.74E+12	2.57E+12	4.42E+12	8.74E+11	8.74E+11	87.5%
040603	Summer	3.50E+11	3.39E+10	2.46E+11	3.50E+10	3.50E+10	20.0%
	Winter	2.51E+12	2.04E+11	1.80E+12	2.51E+11	2.51E+11	87.5%
040703	Summer	7.35E+11	6.35E+07	5.88E+11	7.35E+10	7.35E+10	88.0%
	Winter	8.15E+12	6.35E+07	6.52E+12	8.15E+11	8.15E+11	88.8%
040909	Summer	2.97E+11	1.99E+11	3.90E+10	2.97E+10	2.97E+10	95.6%
	Winter	1.84E+12	1.17E+12	2.98E+11	1.84E+11	1.84E+11	60.0%
040910	Summer	3.26E+11	5.23E+08	2.60E+11	3.26E+10	3.26E+10	20.0%
	Winter	2.38E+12	3.02E+09	1.90E+12	2.38E+11	2.38E+11	16.7%
041302	Summer	2.03E+12	1.61E+12	1.63E+10	2.03E+11	2.03E+11	82.6%
	Winter	1.16E+13	9.17E+12	9.28E+10	1.16E+12	1.16E+12	87.5%
041401	Summer	1.27E+12	3.25E+11	6.90E+11	1.27E+11	1.27E+11	97.5%
	Winter	7.23E+12	1.85E+12	3.93E+12	7.23E+11	7.23E+11	87.5%

Note: MPN = most probable number.

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1. Introduction

Section 303(d) of the Clean Water Act and the U.S. Environmental Protection Agency's (EPA's) Water Quality Planning and Management Regulations (at Title 40 of the *Code of Federal Regulations* [CFR] section 130.7) for waterbody-pollutant pairs on the approved 303(d) impaired waters list even if pollutant sources have implemented technology-based controls. A total maximum daily load (TMDL) is a calculation of the maximum allowable load (in mass per unit time) of a pollutant that a waterbody is able to assimilate while still supporting its designated uses. The maximum allowable load is determined on the basis of the relationship between pollutant sources and in-stream water quality. A TMDL provides the scientific basis for a state to establish water quality-based controls to reduce pollution from both point and nonpoint sources to restore and maintain the quality of the state's water resources (USEPA 1991).

The text of 40 CFR 130.7 has been affected by several Federal District Court suits, appeals rulings, and a Supreme Court ruling, mandating that a TMDL must be described in terms of mass per day. According to 40 CFR 130.7, if EPA does not approve a TMDL submitted by a state, EPA is responsible for developing a TMDL. In a District Court case regarding the TMDL program in Louisiana (*Sierra Club and Louisiana Environmental Action Network, Inc. v. EPA*, Civil Action Number: 96-0527), EPA was listed as the sole defendant. That case resulted in the April 1, 2002, consent decree approved by the judge. A consent decree is a negotiated set of actions to satisfy the plaintiff. In many situations, the actions are more stringent than the established regulation. For example, most consent decrees require an annual report to the plaintiff summarizing the work done in the year; that is not required by any regulation and will cease when the consent decree is closed.

The 2002 consent decree between EPA and the plaintiffs establishes a fixed set of waterbody-pollutant pairs for which TMDLs are to be established or approved, and it establishes a timeline for each set of TMDLs. Each set is determined to be complete when every waterbody-pollutant pair either has a TMDL established or approved, or a subsequent approved 303(d) list has removed the waterbody-pollutant pair. The TMDLs in this report are part of that consent decree. Because the original court suit was initiated because of a lack of progress in establishing TMDLs, the date when a TMDL is established or approved is not easy to extend and requires another agreement with the plaintiffs.

In most circumstances, a variety of scientifically acceptable methods can be used for developing a TMDL, wasteload allocation (WLA), and load allocation (LA). For these TMDLs, simple Microsoft Excel-based methods were used according to the resources and data available. It should be noted that because some acceptable TMDL calculation methods appear simple, that does not imply that its results are not valid. Models vary in the amount of necessary resources (e.g. training, setup/computational time, personnel, expense), required input and background data, questions answered, and output capability (e.g., charts, tables, data files). The final result of these TMDLs (and any TMDL) is a plan that is adopted into the Water Quality Management Plan (WQMP) to achieve the TMDL. Stakeholder involvement and additional information, such as monitoring data, might lead to an update of the WQMP to propose a different plan to meet water quality objectives. Such a WQMP update receives the same public participation as the original TMDL and WQMP review and approval.

For the TMDL discussed in this report, monitoring data collected by the Louisiana Department of Environmental Quality (LDEQ) indicate that observed fecal coliform bacteria data sometimes do not meet the state's water quality criteria within the selected subsegments of the Lake Pontchartrain Basin. This report addresses consent decree TMDLs for fecal coliform bacteria within subsegments 040102, 040103, 040201, 040302, 040304, 040305, 040503, 040504, 040505, 040603, 040703, 040909, 040910, 041302, and 041401 (Table 1-1). The impaired designated uses for the 15 subsegments are primary contact recreation, secondary contact recreation, and an outstanding natural resource (subsegment 040102). Fecal coliform bacteria is identified as the pollutant causing impairments for primary and secondary contact recreation. The subsegments are listed as not supporting the designated uses in Louisiana's 2010 Clean Water Act section 303(d) list (as included in the *2010 Integrated*

Report). The suspected causes for the fecal coliform bacteria impairments are presented in Table 1-1. See section 2.5 for a more detailed discussion of point and nonpoint sources.

Table 1-1. Subsegments and fecal coliform bacteria impairments addressed in this report

Subsegment number	Subsegment name	Subsegment description	Designated uses[a,b]				Suspected sources of impairment
			PCR	SCR	FWP	ONR	
040102	Comite River	From Wilson-Clinton Hwy. to White Bayou (Scenic)	N	F	F	N	Sanitary sewer overflows (collection system failures)
040103	Comite River	From White Bayou to Amite River	N	F	F		On-site treatment systems (septic systems and similar decentralized systems) and sanitary sewer overflows (collection system failures)
040201	Bayou Manchac	From headwaters to Amite River	N	F	N		On-site treatment systems (septic systems and similar decentralized systems) and sanitary sewer overflows (collection system failures)
040302	Amite River	From LA-37 to Amite River Diversion Canal	N	F	N		On-site treatment systems (septic systems and similar decentralized systems)
040304	Grays Creek	From headwaters to Amite River	N	F	N		On-site treatment systems (septic systems and similar decentralized systems)
040305	Colyell Creek	Includes tributaries and Colyell Bay	N	F	N		On-site treatment systems (septic systems and similar decentralized systems)
040503	Natalbany River	From headwaters to Tickfaw River	N	F	N		On-site treatment systems (septic systems and similar decentralized systems)
040504	Yellow Water River	From headwaters to Ponchatoula Creek	N	N	N		On-site treatment systems (septic systems and similar decentralized systems)
040505	Ponchatoula Creek and Ponchatoula River	--	N	N	N		On-site treatment systems (septic systems and similar decentralized systems)
040603	Selsers Creek	From headwaters to South Slough	N	F	N		Source unknown
040703	Big Creek	From headwaters to Tangipahoa River	N	N	F		Dairies (Outside Milk Parlor Areas)
040909	W-14 Main Diversion Canal	From headwaters to Salt Bayou	N	N	N		On-site treatment systems (septic systems and similar decentralized systems), sanitary sewer overflows (collection system failures), and municipal (urbanized high density area)
040910	Salt Bayou	From headwaters to Lake Pontchartrain (Estuarine)	N	F	F		On-site treatment systems (septic systems and similar decentralized systems)
041302	Drainage Canals, Jefferson and Orleans Parishes	Estuarine	N	F	N		Sanitary sewer overflows (collection system failures), municipal (urbanized high density area)
041401	New Orleans East leveed waterbodies	Estuarine	N	N	N		Sanitary sewer overflows (collection system failures), municipal (urbanized high density area)

[a] PCR = primary contact recreation, SCR = secondary contact recreation, FWP = fish and wildlife propagation, ONR = outstanding natural resource

[b] F = fully supporting designated use, N = not supporting designated use

Source: LDEQ 2010a

2. Background Information

2.1 General Description

The 15 subsegments addressed in this TMDL report are in the Lake Pontchartrain Basin in southeastern Louisiana in portions of U.S. Geological Survey (USGS) hydrologic unit codes (HUC) 08070202, 08070203, 08070204, 08070205, 08090201, and 08090203. The subsegments are in portions of Ascension, East Baton Rouge, East Feliciana, Iberville, Jefferson, Livingston, Orleans, St. Helena, St. Tammany, and Tangipahoa parishes. Table 2-1 lists the parishes in which the subsegments are located and the drainage area of each subsegment.

Table 2-1. Parish and drainage area for each impaired subsegment

Subsegment number	Subsegment name	Parish	Drainage area (acres)
040102	Comite River	East Feliciana, East Baton Rouge	113,796
040103	Comite River	East Baton Rouge	48,908
040201	Bayou Manchac	Ascension, Iberville, East Baton Rouge	110,391
040302	Amite River	Ascension, East Feliciana, St. Helena, Livingston, East Baton Rouge	189,225
040304	Grays Creek	Livingston	21,027
040305	Colyell Creek	St. Helena, Livingston	119,675
040503	Natalbany River	St. Helena, Livingston, Tangipahoa	90,787
040504	Yellow Water River	Tangipahoa	11,047
040505	Ponchatoula Creek and Ponchatoula River	Tangipahoa	36,246
040603	Selsers Creek	Tangipahoa	10,376
040703	Big Creek	Tangipahoa	52,486
040909	W-14 Main Diversion Canal	St. Tammany	7,419
040910	Salt Bayou	St. Tammany	9,869
041302	Drainage Canals, Jefferson and Orleans Parishes	Jefferson, Orleans	55,947
041401	New Orleans East leveed waterbodies	Orleans	34,906

The Lake Pontchartrain Basin is an estuarine system covering approximately 4,700 square miles (mi^2), within which river, canals, wetlands, and bayous drain the southeastern portion of Louisiana into a series of connected lakes, and eventually flow into the Gulf of Mexico (USGS 2002). The basin's northern boundary is defined by the Mississippi state line, the Mississippi River levees form the western and southern border of the basin, the Pearl forms the eastern edge, and the Breton and Chandeleur sounds are on the southeastern portion of the Lake Pontchartrain Basin (LDEQ 2010b, LPBF 2009). The three lakes in the watershed, from west to east, are Lakes Maurepas, Pontchartrain, and Borgne. The main rivers contributing fresh water to Lake Maurepas are the Amite, Tickfaw, Natalbany, and Comite Rivers. Lake Maurepas and the Tangipahoa, Tchefuncte, and Bogue Falaya Rivers flow into Lake Pontchartrain. The lakes themselves contain brackish water due to mixing with waters from the Gulf (USGS 2002). Portions of several rivers within the selected subsegments of the Lake Pontchartrain Basin are tidally influenced. Land in the northern part of the basin includes forests, pastures, and dairies, whereas the southern section contains large areas of brackish and saline marshes (LDEQ 2010b). Figure 2-1 shows locations of the listed subsegments within the Lake Pontchartrain Basin.

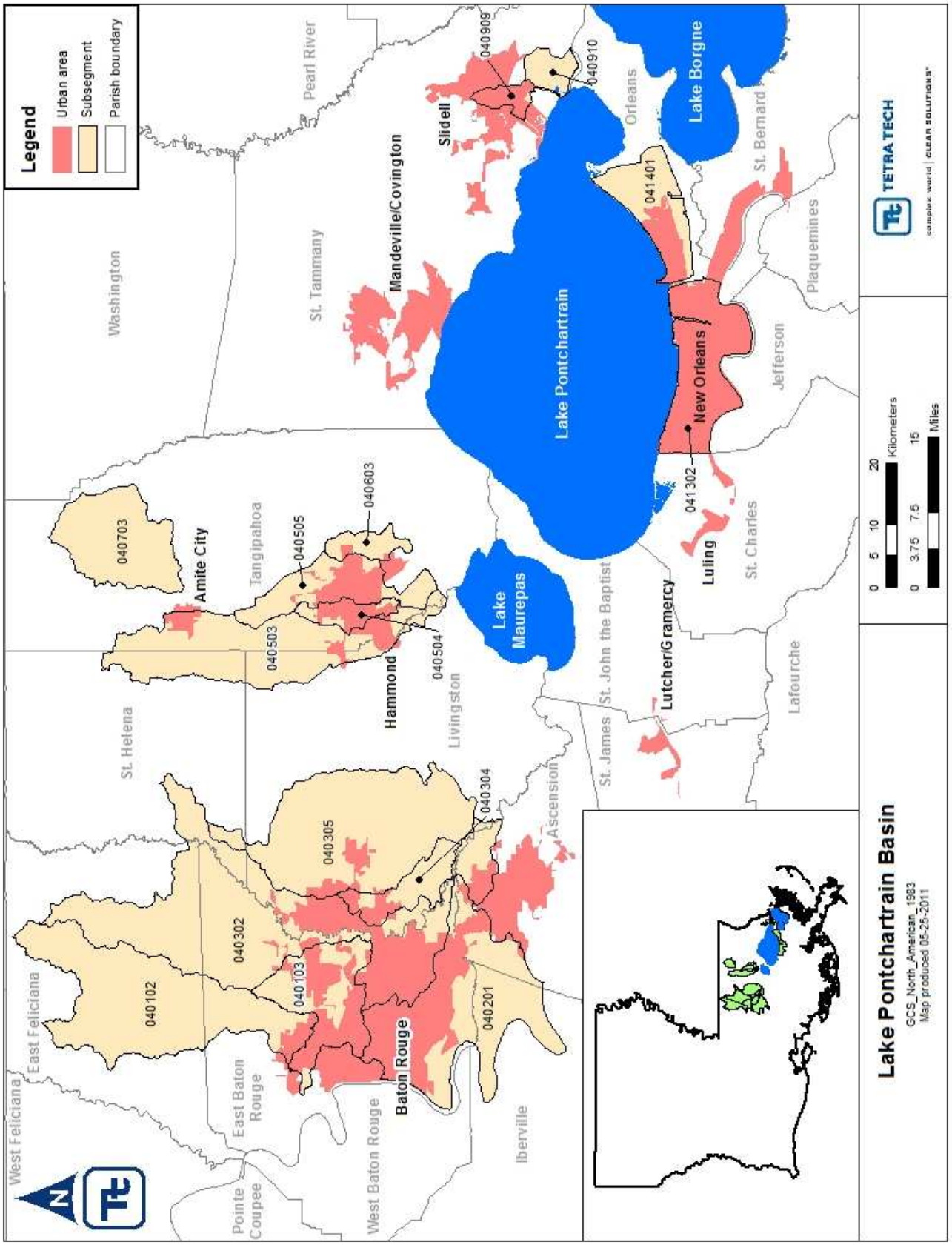

Figure 2-1. Location of selected Lake Pontchartrain Basin subsegments.

2.2 Land Use

Land use data were obtained from the 2006 U.S. Geological Survey (USGS) National Land Cover Data set (NLCD). Table 2-2 lists the percentage of each land use by subsegment, and Figures 2-2, 2-3, and 2-4 show the land use coverage for the northwestern, northeastern, and southeastern Lake Pontchartrain Basin, respectively.

The subsegments within the northwestern portion of the Lake Pontchartrain Basin (subsegments 040102, 040103, 040201, 040302, 040304, and 040305) are mostly dominated by wetlands, with some large areas of developed land in several of these subsegments. The percentage of developed land in these subsegments ranges from 5.77 percent in subsegment 040102 to 45 percent in subsegment 040201. Moderate amounts of forest, grass/shrub, and agricultural land uses are in the northwestern portion of the Basin.

The subsegments within the northeastern portion of the Lake Pontchartrain Basin (subsegments 040503, 040504, 040505, 040603, and 040703) are covered mainly in wetlands, forests, and grass/shrub land types, with moderate amounts of agricultural land. Several of the subsegments have a larger concentration of developed land as part of Hammond or Amite City.

The southeastern portion of the Lake Pontchartrain Basin (subsegments 040909, 040910, 041302, and 041401) is dominated by wetlands and developed land. Subsegment 041302 is almost entirely developed land (99.1 percent), as the City of New Orleans lies within the subsegment's boundaries. New Orleans overlaps subsegment 041401, with the remainder of that subsegment's land cover mostly wetlands. Subsegment 040909 contains portions of Slidell, which accounts for 79 percent of its area.

Several areas within the Lake Pontchartrain Basin are undergoing population growth and urban development. Rapid development is occurring in St. Tammany, Ascension, Iberville, and Livingston parishes. Population growth within Tangipahoa Parish has also been noticeable following Hurricane Katrina. Most of this growth has involved conversion of agricultural land uses to urban land types (Bourgeois-Calvin 2008).

Table 2-2. Percent land use per subsegment

Northwest subsegments						
	Percent coverage by subsegment number					
Land use	040102	040103	040201	040302	040304	040305
Open water	0.75	0.60	0.51	2.39	0.78	0.36
Developed	5.77	41.28	45.21	18.69	24.84	10.85
Barren land	0.39	0.33	0.08	1.54	0.27	0.63
Forest	14.15	1.79	1.13	15.05	10.20	23.01
Grass/shrub	13.35	5.10	1.61	14.37	13.46	22.58
Pasture/hay	20.41	14.06	11.55	11.67	10.59	7.04
Cultivated crops	8.78	2.10	9.46	2.79	3.27	1.17
Wetlands	36.39	34.73	30.45	33.50	36.59	34.35
Total	100.00	100.00	100.00	100.00	100.00	100.00

Northeast subsegments					
	Percent coverage by subsegment number				
Land use	040503	040504	040505	040603	040703
Open water	0.57	0.62	0.87	0.13	0.09
Developed	9.06	43.30	33.18	35.60	4.18
Barren land	0.42	0.86	0.61	0.36	0.05
Forest	23.44	12.95	13.96	19.63	20.58
Grass/shrub	22.12	8.45	10.00	14.59	20.91
Pasture/hay	12.42	11.52	9.59	8.66	18.65
Cultivated crops	2.42	0.81	0.56	0.83	11.18
Wetlands	29.56	21.50	31.22	20.21	24.35
Total	100.00	100.00	100.00	100.00	100.00

Southeast subsegments					
	Percent coverage by subsegment number				
Land use	040909	040910	041302	041401	040909
Open water	2.31	11.08	0.62	11.05	2.31
Developed	79.19	5.42	99.10	39.86	79.19
Barren land	0.18	0.00	0.00	0.59	0.18
Forest	6.61	7.09	0.17	0.12	6.61
Grass/shrub	0.20	0.07	0.02	0.20	0.20
Pasture/hay	0.97	0.15	0.01	0.23	0.97
Cultivated crops	0.00	0.12	0.00	0.86	0.00
Wetlands	10.55	76.07	0.07	47.09	10.55
Total	100.00	100.00	100.00	100.00	100.00

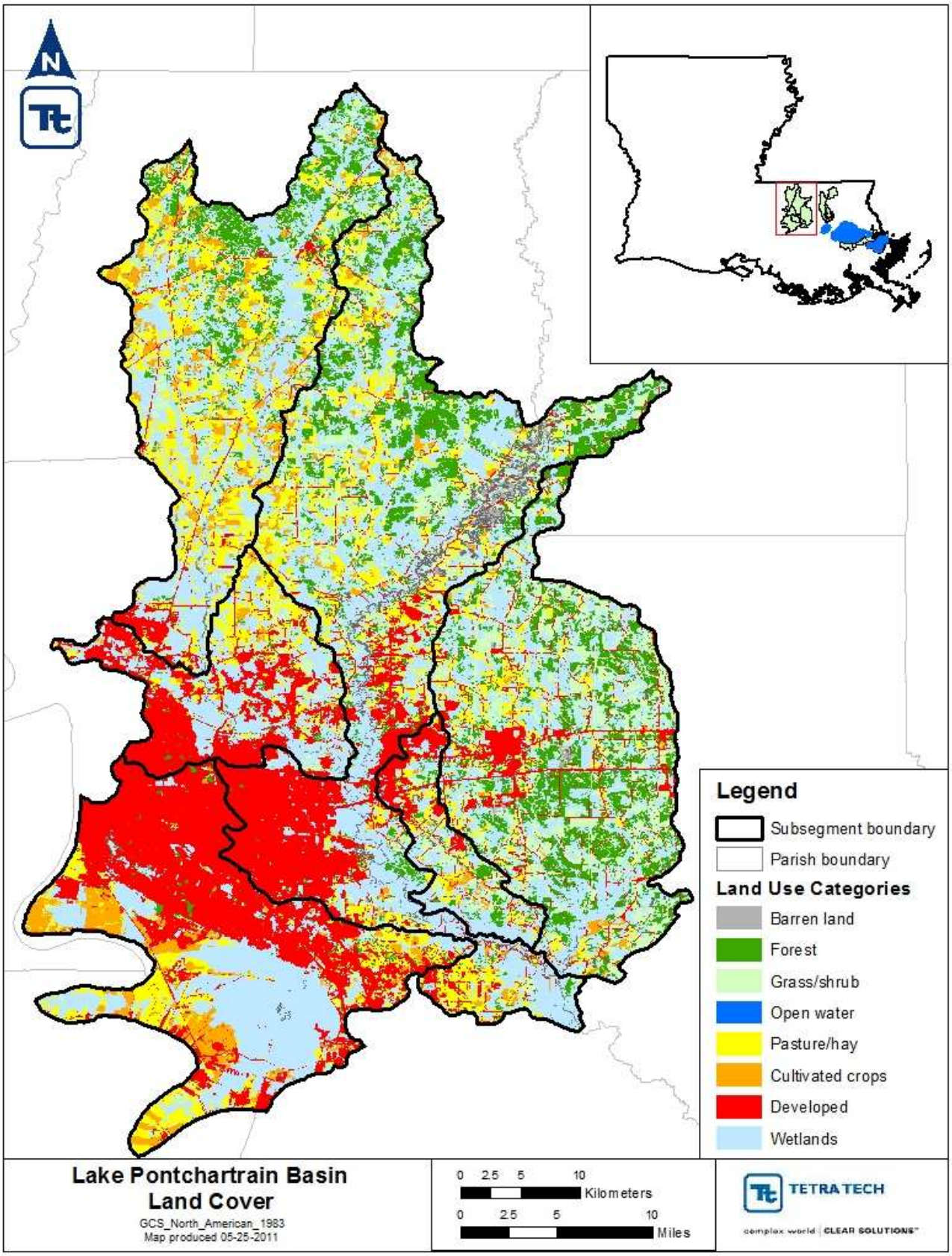

Figure 2-2. Land use in selected western Lake Pontchartrain subsegments.

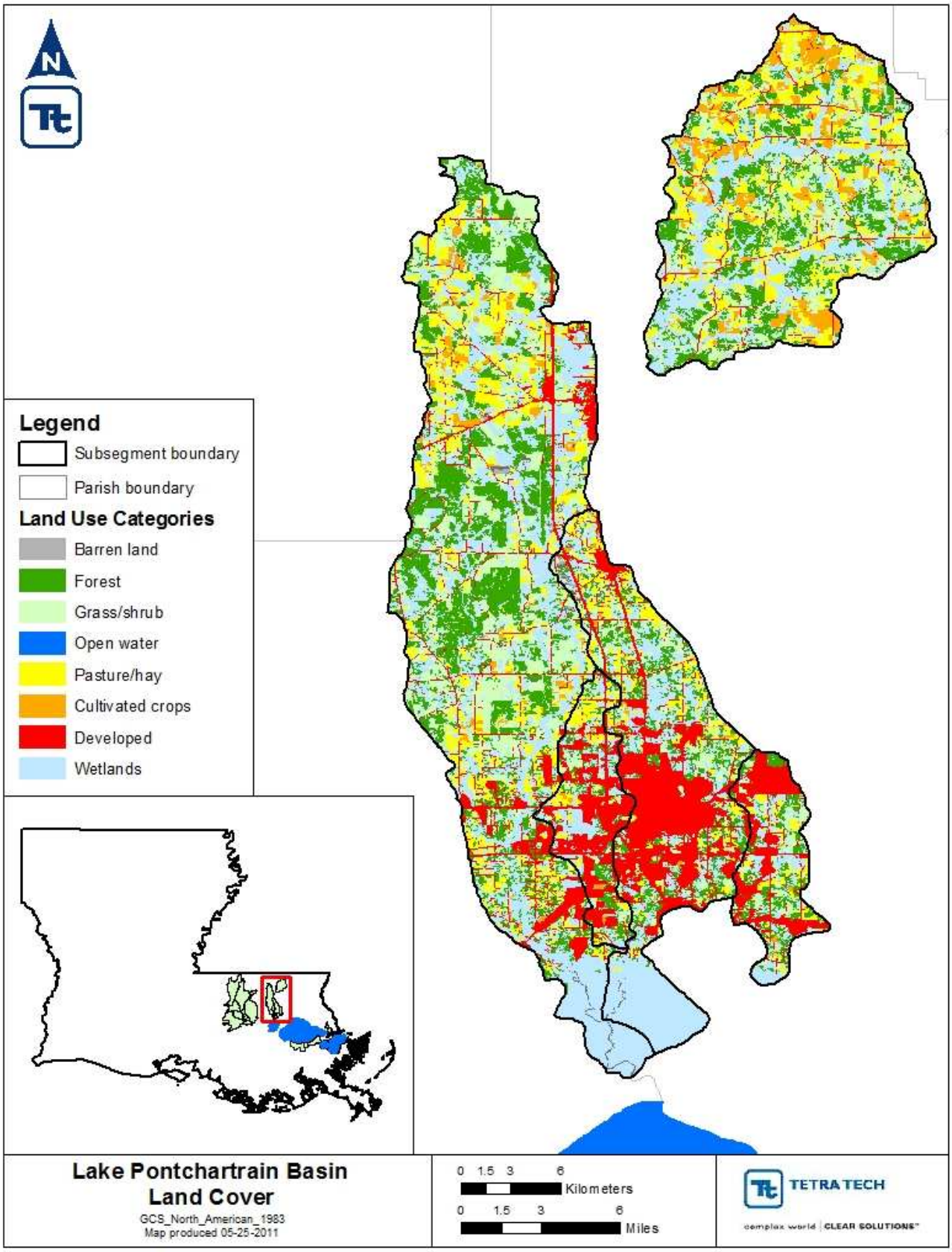

Figure 2-3. Land use in selected northeastern Lake Pontchartrain subsegments.

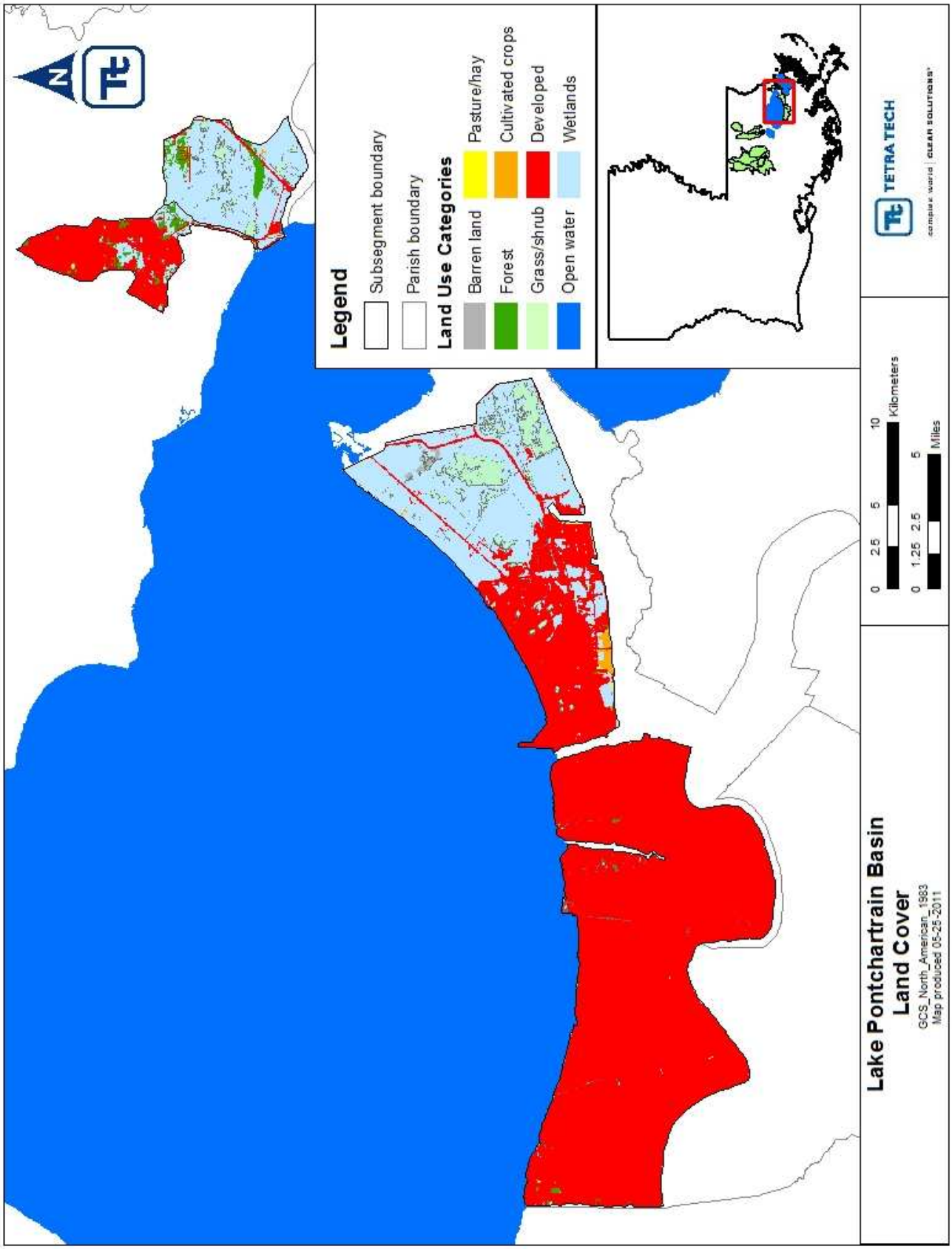

Figure 2-4. Land use in selected southeastern Lake Pontchartrain subsegments.

2.3 Flow Characteristics

Historical data are available from six active USGS flow-monitoring gages and three other stations within or near the listed subsegments of the Lake Pontchartrain Basin. The gage list was reduced by restricting both the type of data considered (only gages with daily discharge data) and the period of data considered (only gages from which recent data were available). Table 2-3 presents information for the nearby flow gages and figure 2-6 shows the location of the selected USGS stations.

Table 2-3. Nearby USGS flow gages

Station number	Station name	Date Range of available data	Drainage area (sq. mi.)	Average flow (cfs)
07375800	Tickfaw River at Liverpool, LA	04/01/56 - 02/10/11[a]	89.70	107.47
07375960	Tickfaw River at Montpelier, LA	05/17/01 - 02/10/11[a]	220.00	320.55
07376000	Tickfaw River at Holden, LA	10/01/40 - 02/10/11[a]	247.00	376.06
07376500	Natalbany River at Baptist, LA	09/01/43 - 02/10/11[a]	79.50	115.24
07377000	Amite River near Darlington, LA	10/01/50 - 02/10/11[a]	580.00	908.21
07377240	Little Sandy Creek near Greenwell Springs, LA	10/01/74 - 09/30/85	28.20	56.34
07377500	Comite River near Olive Branch, LA	10/01/42 - 02/10/11[a]	145.00	233.30
07378000	Comite River near Comite, LA	10/01/44 - 09/30/10	284.00	480.70
07379960	Dawson Creek at Bluebonnet Blvd near Baton Rouge, LA	10/01/02 - 09/30/05	15.11	35.59

[a] Data pull date. More recent data are now available

The seasonal distribution of flow at a representative gaging station is shown on Figure 2-5. The gaging station, USGS gage 07377500, is on the Comite River and is within subsegment 040102. Low flow occurs in the summer and early fall, and high flow tends to occur in late winter and early spring.

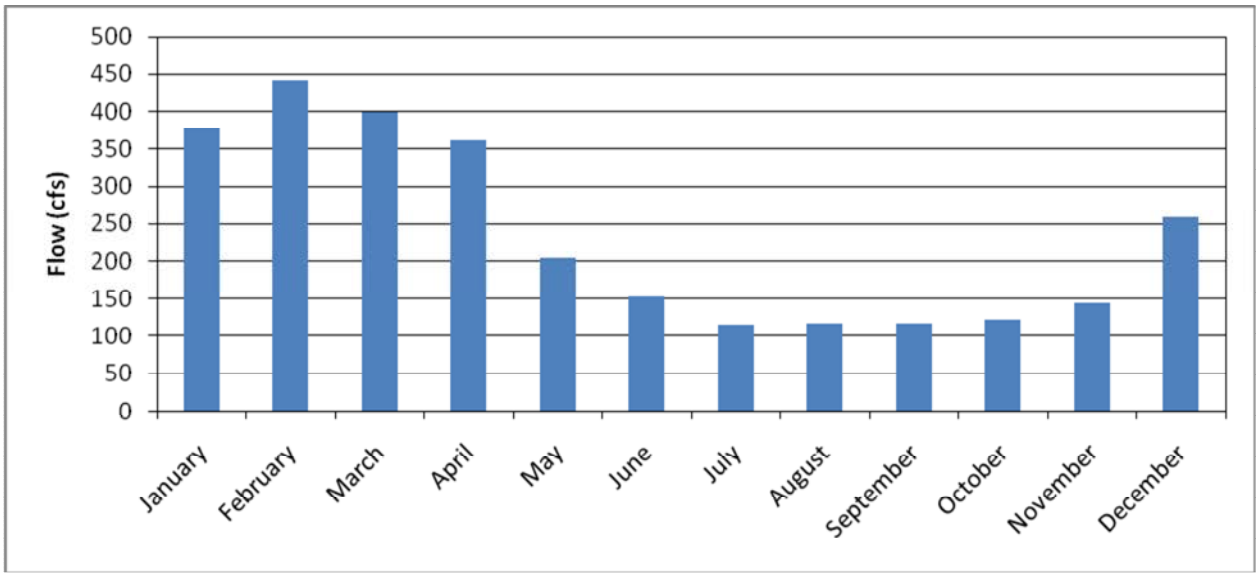

Figure 2-5. Average monthly flow at Comite River near Olive Branch, Louisiana (USGS 07377500) for 1942 through 2011.

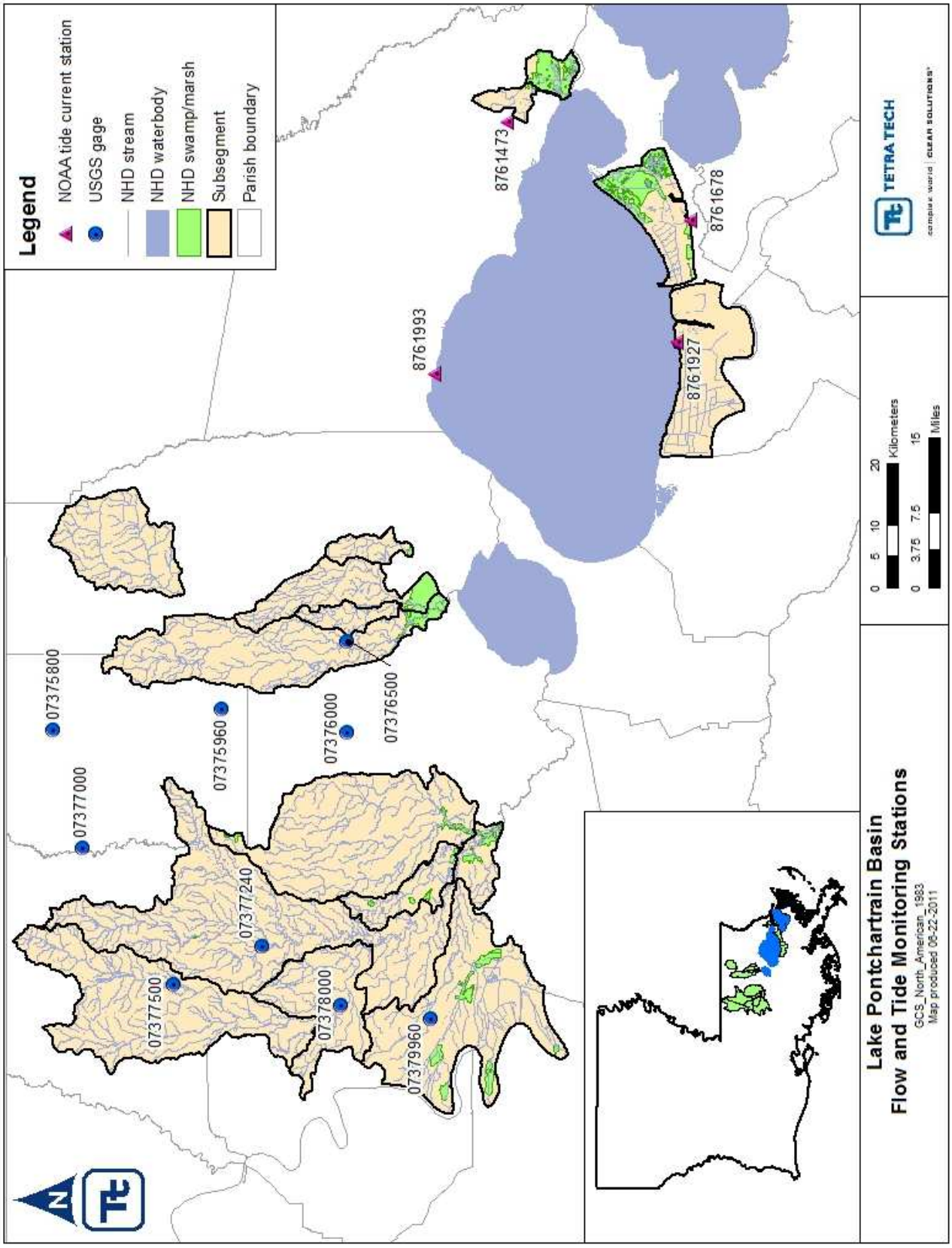

Figure 2-6. Location of USGS flow-monitoring gages and NOAA tide stations in the Lake Pontchartrain Basin.

2.3.1 Tidal Influences

As an estuarine system, portions of waterbodies within the Lake Pontchartrain Basin subsegments are influenced by tidal action, especially those close to Lake Maurepas, Pontchartrain, or Borgne. Table 2-4 describes tidal influences on waterbodies within selected subsegments in the Lake Pontchartrain Basin. The Comite River (subsegments 040102 and 040103) and Big Creek (subsegment 040703) are not known to be affected by tides (Max Forbes, retired USGS staff, personal communication, May 31, 2011; for the complete transcript, see Appendix A).

Table 2-4. Description of tidal influences on waterbodies within selected subsegments in the Lake Pontchartrain Basin

Subsegment	Waterbody	Tidal Influences
040102	Comite River	Non-tidal
040103	Comite River	Non-tidal
040201	Bayou Manchac	When Amite River is low, tidal action from Lake Maurepas
040302	Amite River	When River is low, tidal impacts noticeable at Port Vincent (USGS station 07380120); however, the effect likely weakens before the USGS gage in Denham Springs (07378500)
040304	Gray's Creek	Tidal action estimated in last 3 miles of lower reaches
040305	Colyell Creek	Tidal action in lower reaches, south of approximately the 30° 22' 30" latitude
040503	Natalbany River	Tidal action estimated south of Interstate 12
040504	Yellow Water River	Tidal action estimated south of Louisiana State Highway 22
040505	Ponchatoula Creek and River	Tidal action estimated south of U.S. Route 61
040603	Selser's Creek	Tidal action estimated south of Louisiana State Highway 22
040703	Big Creek	Non-tidal
040909	W-14 Canal	Tidal action estimated south of Daney Street in Slidell, LA
040910	Salt Bayou	Estimated entirely tidal
041302	Lake Pontchartrain Drainage Canals	Leveed area. Rainfall runoff is pumped into Lake Pontchartrain when water levels reach a certain height. The boundaries are considered free flow.
041401	New Orleans East leveed waterbodies	Leveed area. Rainfall runoff is pumped into Lake Pontchartrain when water levels reach a certain height. The boundaries are considered free flow.

Source: Max Forbes; see Appendix A

The National Oceanic and Atmospheric Administration's (NOAA) Center for Operational Oceanographic Products and Services (CO-OPS) has several tidal current stations in or around the Lake Pontchartrain Basin (Table 2-5, Figure 2-6). NOAA maintains stations known as *reference stations* and makes adjustments specific to additional stations, known as *subordinate stations*, for daily tide predictions (NOAA CO-OPS 2007). Using data collected from tidal current stations, CO-OPS computes 6-minute and hourly tidal predictions using an equation based on factors including variation in positioning of the earth, moon, and sun (NOAA CO-OPS 2011a, b). Table 2-5 lists subordinate stations within or near the Lake Pontchartrain Basin.

Table 2-5. Nearby NOAA CO-OPS tidal current stations

Station name	Station number	Mean range (ft)	Diurnal range (ft)	Mean tide level (ft)
Bayou BonFouca, Route 433	8761473	0.53	0.53	0.26
Tchefuncte River, Lake Pontchartrain	8761993	0.57	0.57	0.28
New Canal USCG station, Lake Pontchartrain	8761927	0.51	0.52	0.26
Michoud Substation, ICWW	8761678	1.23	1.39	0.7

Source: NOAA CO-OPS 2010.

2.4 Designated Uses and Water Quality Criteria

Louisiana's 2010 Clean Water Act section 303(d) list (as included in the *2010 Integrated Report*) indicates that designated uses of the subsegments are primary contact recreation, secondary contact recreation, fish and wildlife propagation, and an outstanding natural resource (subsegment 040102) (Table 1-1). Water quality criteria for fecal coliform bacteria in these subsegments are presented in Table 2-6.

Table 2-6. Numeric criteria for the subsegments of concern in the Lake Pontchartrain Basin

Subsegment number	Subsegment name	Bacteria[a] (colonies/100 mL)
040102	Comite River	400 (5/01–10/31); 2,000 (11/01–4/30)
040103	Comite River	400 (5/01–10/31); 2,000 (11/01–4/30)
040201	Bayou Manchac	400 (5/01–10/31); 2,000 (11/01–4/30)
040302	Amite River	400 (5/01–10/31); 2,000 (11/01–4/30)
040304	Grays Creek	400 (5/01–10/31); 2,000 (11/01–4/30)
040305	Colyell Creek	400 (5/01–10/31); 2,000 (11/01–4/30)
040503	Natalbany River	400 (5/01–10/31); 2,000 (11/01–4/30)
040504	Yellow Water River	400 (5/01–10/31); 2,000 (11/01–4/30)
040505	Ponchatoula Creek and Ponchatoula River	400 (5/01–10/31); 2,000 (11/01–4/30)
040603	Selsers Creek	400 (5/01–10/31); 2,000 (11/01–4/30)
040703	Big Creek	400 (5/01–10/31); 2,000 (11/01–4/30)
040909	W-14 Main Diversion Canal	400 (5/01–10/31); 2,000 (11/01–4/30)
040910	Salt Bayou	400 (5/01–10/31); 2,000 (11/01–4/30)
041302	Drainage Canals, Jefferson and Orleans Parishes	400 (5/01–10/31); 2,000 (11/01–4/30)
041401	New Orleans East leveed waterbodies	400 (5/01–10/31); 2,000 (11/01–4/30)

Source: LDEQ 2011

[a] Criteria for primary and secondary contact recreation: Primary contact recreation – No more than 25 percent of the total samples collected on a monthly basis shall exceed a fecal coliform bacteria density of 400 colonies/100 mL. This shall apply only during the defined recreational period of 05/01 through 10/31. Secondary contact recreation – For all other periods, a fecal coliform bacteria density of 2,000 colonies/100 mL for secondary contact recreation applies.

Primary contact recreation includes any recreational or other water contact use involving full-body exposure with water and considerable probability of ingestion of water (for example, swimming and water skiing). Secondary contact recreation involves activities such as fishing, wading, or boating during which water contact is accidental or incidental, with minimal chance of ingesting appreciable amounts of water (LDEQ 2010a).

Designated uses of water for fish and wildlife propagation include aquatic habitat, food, resting, reproduction, cover, or travel corridors for any indigenous wildlife and aquatic life species associated with the aquatic environment. Fish and wildlife propagation use also includes maintaining water quality at a level that prevents damage to native wildlife and aquatic species associated with the aquatic environment, and prevents contamination of aquatic life consumed by humans (LDEQ 2010a).

The Comite River in subsegment 040102 has a designated use as an outstanding and natural resource. Outstanding and natural resource waterbodies are identified for preservation, protection, reclamation, or enhancement based on certain highly valued characteristics including wilderness, aesthetic, or ecological. Some of these selected waterbodies may also be designated under the Louisiana Natural and Scenic Rivers System or by the Office of Environmental Compliance as significant ecological systems (LDEQ 2010a).

Table 2-6 presents the relevant numeric criteria for each subsegment of concern. These numeric criteria were used in conjunction with the assessment methodology presented in LDEQ's 305(b) report (LDEQ 2011) to list impaired subsegments. The LDEQ assessment methodology specifies that the primary contact recreation and

secondary contact recreation uses must be fully supported, with no more than 25 percent of the values exceeding the criteria for fecal coliform bacteria.

The fecal coliform bacteria criteria for primary contact recreation are applied to the 15 subsegments within the Lake Pontchartrain Basin addressed in this report. The criterion for primary contact recreation specifies that fecal coliform bacteria density must not exceed 400 colonies/100 mL (2,000 colonies/100 mL in winter months).

The Louisiana water quality standards also include an antidegradation policy (*Louisiana Administrative Code* [LAC] Title 33, Part IX, Section 1109.A), which states that state waters exhibiting high water quality should be maintained at that high level of water quality. If that is not possible, water quality of a level that supports the designated uses of the waterbody should be maintained. The designated uses of a waterbody may be changed to allow a lower level of water quality only through a use attainability study.

2.5 Identification of Sources

2.5.1 Point Sources

LDEQ stores permit information using internal databases. LDEQ generated a list of point source discharges within the subsegment by using the TEMPO database. Information on point source discharges to the listed subsegments was obtained from the Integrated Compliance Information System - National Pollutant Discharge Elimination System (ICIS-NPDES) and Louisiana's Electronic Document Management System (EDMS). Data were pulled from ICIS for the list of permits generated by LDEQ and data were confirmed through EDMS. Each facility was evaluated on the basis of its discharges and permit limits to determine whether the facility should be used in developing the TMDLs. Because the number of permits is so large, these are listed in Appendix B. Figure 2-8 shows locations of permitted dischargers in the 15 selected subsegments of the Lake Pontchartrain Basin that are addressed in this report.

The suspected sources of impairment identified in Table 1-1 were based on information included in Louisiana's draft 2010 section 303(d) list. Subsegments 040102, 040103, 040201 list sanitary sewer overflows (collection system failures) as potential point sources for impairment. The suspected sources of impairment for subsegments 040909, 041302, and 041401 are municipal separate storm systems (MS4) and sanitary sewer overflows. Specific point sources were not identified for the other impaired subsegments. These TMDLs contain a Future Growth (FG) component that can be used for any point sources not identified or that are in the planning state.

Overflows in sanitary sewer lines or major upsets at wastewater treatment plants can be related to poor maintenance in collection system interceptor lines (infiltration and inflow or line clogging), equipment failures at lift stations, or inadequate pretreatment programs (LDEQ 2010a). Municipal point sources include pollution introduced from end-of-pipe discharges from publicly owned treatment works.

LDEQ acknowledges the possibility of many unpermitted point sources (e.g., privately owned treatment units for subdivisions, private homes, or small businesses) in the Lake Pontchartrain Basin, including the Ponchatoula Creek watershed. LDEQ plans to locate unpermitted facilities and update permitted facility information in the Lake Pontchartrain Basin. Unpermitted facilities will be required to apply for the appropriate permits. The Lake Pontchartrain Basin Foundation (LPBF) has worked with LDEQ and the Louisiana Department of Health and Hospitals to identify and address undocumented and unpermitted wastewater treatment plant (Andrea Bourgeois-Calvin (LPBF), personal communication, January 9, 2012; for more details, see Table K-1 in Appendix K).

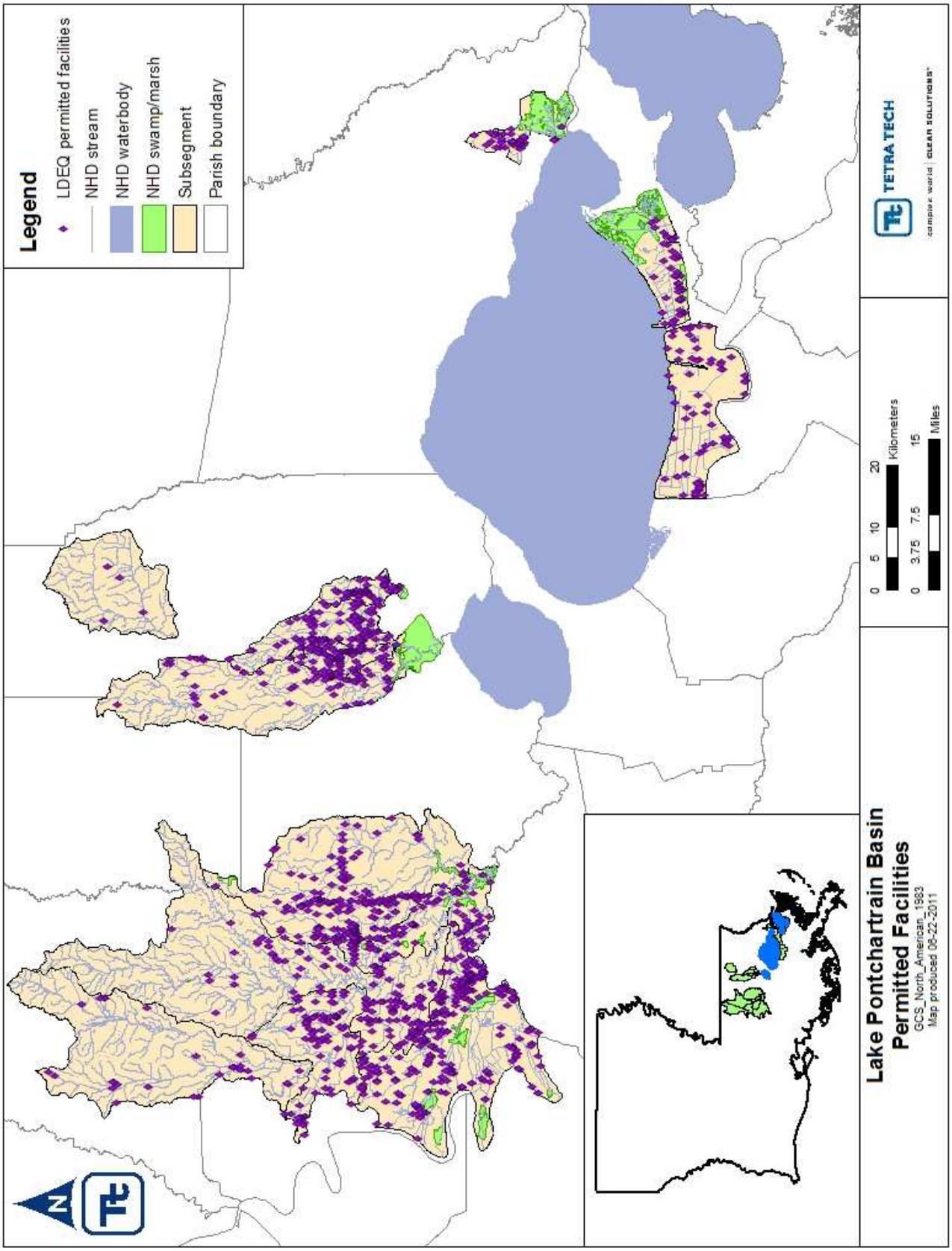

Figure 2-8. Location of LDEQ permitted facilities in the Lake Pontchartrain Basin.

Phase I and II stormwater systems are additional possible point source contributors within the Lake Pontchartrain Basin. Stormwater discharges are generated by runoff from urban land and impervious areas such as paved streets, parking lots, and rooftops during precipitation events. These discharges often contain high concentrations of pollutants that can eventually enter nearby waterbodies. Most stormwater discharges are considered point sources and require coverage by a NPDES permit.

Under the NPDES stormwater program, operators of large, medium, and regulated small MS4s must obtain authorization to discharge pollutants. The Stormwater Phase I Rule (55 *Federal Register* 47990, November 16, 1990) requires all operators of medium and large MS4s to obtain a NPDES permit and develop a stormwater management program. Medium and large MS4s are defined by the size of the population within the MS4 area, not including the population served by combined sewer systems. A medium MS4 has a population between 100,000 and 249,999. A large MS4 has a population of 250,000 or more. The Stormwater Phase II Rule (64 *Federal Register* 68722, December 8, 1999) applies to operators of regulated small MS4s with a population less than 100,000 not already covered by Phase I; however, the Phase II Rule is more flexible and allows greater variability of regulated entities than does the Phase I Rule. Regulated, small MS4s include those within boundaries of "urbanized areas" as defined by the Bureau of Census and those designated by the NPDES permitting authority.

The NPDES permitting authority may designate a small MS4 under any of the following circumstances: the MS4's discharges do or can negatively impact water quality; population exceeds 10,000; population density is at least 1,000 people per square mile; contribution of pollutant loadings to a physically interconnected MS4 is evident.

In the Lake Pontchartrain Basin, several entities are regulated as MS4s. Table 2-7 presents information for MS4 discharges to impaired subsegments within the Lake Pontchartrain Basin: NPDES permits beginning with *LAS* represent Phase I MS4s, and permit numbers beginning with *LAR* represent Phase II MS4s.

Table 2-7. MS4 information for the Lake Pontchartrain River Basin

Subsegment	NPDES permit number	Agency Interest (AI) number	Authority	Subsegment name	Subsegment area (acres)
040102	LAS000101	90427	City of Baton Rouge	Comite River	113,796
	LAS000101	113707	LADOTD District 61		
	LAS000101	113711	City of Baker		
	LAS000101		City of Central		
040103	LAS000101	90427	City of Baton Rouge	Comite River	48,908
	LAS000101	113707	LADOTD District 61		
	LAS000101	113711	City of Baker		
	LAS000101		City of Central		
040201	LAS000101	90427	City of Baton Rouge	Bayou Manchac	110,391
	LAS000101	113707	LADOTD District 61		
	LAS000101	113708	LSU		
	LAR041034	115005	Ascension Parish Government		
040302	LAR040002	108276	Livingston Parish – Gravity Drainage Districts 1, 2, & 5	Amite River	189,225
	LAR041034	115006	Ascension Parish Government		
	LAS000101	90427	City of Baton Rouge		
	LAS000101	113707	LADOTD District 61		
040304	LAR040002	108276	Livingston Parish – Gravity Drainage Districts 1, 2, & 5	Grays Creek	21,027
	LAR041020	108502	City of Denham Springs		
040305	LAR040002	108276	Livingston Parish – Gravity Drainage Districts 1, 2, & 5	Colyell Creek	119,675
	LAR041004	107846	City of Walker		
040503	LAR041030	104053	City of Hammond	Natalbany River	90,787

Subsegment	NPDES permit number	Agency Interest (AI) number	Authority	Subsegment name	Subsegment area (acres)
040504	LAR041030	104053	City of Hammond	Yellow Water River	11,047
040505	LAR041030	104053	City of Hammond	Ponchatoula Creek and Ponchatoula River	36,246
040603	LAR041030	104053	City of Hammond	Selsers Creek	10,376
040909	LAR041015	108410	City of Slidell	W-14 Main Diversion Canal	7,419
	LAR041024	108405	St Tammany Parish		
040910	LAR041024	108405	St Tammany Parish	Salt Bayou	9,869
041302	LAS000201	95365	Jefferson Parish	Drainage Canals, Jefferson and Orleans Parishes	55,947
	LAS000201	127008	City of Harahan		
	LAS000201	127009	City of Kenner		
	LAS000301	90429	City of New Orleans		
	LAS000301	95365	Jefferson Parish		
	LAS000301	124806	Orleans Levee District		
	LAS000301	124808	LADOTD District 02		
	LAS000301	124809	Port of Orleans		
	LAS000301	124810	Sewerage & Water Board of New Orleans		
041401	LAS000301	90429	New Orleans City of	New Orleans East leveed waterbodies	34,906
	LAS000301	124806	Orleans Levee District		
	LAS000301	124808	LADOTD District 02		
	LAS000301	124810	Sewerage & Water Board of New Orleans		
Statewide	LAR043001	108424	LADOTD	Not applicable	Not applicable

2.5.2 Nonpoint Sources

Louisiana's section 303(d) list identifies the suspected causes of the fecal coliform bacteria impairment in the selected subsegments within the Lake Pontchartrain Basin as: *on-site treatment systems (septic systems and similar decentralized systems), dairies, and unknown sources* (LDEQ 2010a).

On-site treatment systems are specifically mentioned as nonpoint sources in subsegments 040103, 040201, 040302, 040304, 040305, 040503, 040504, 040505, 040909, and 040910. Problems from on-site treatment systems (septic systems and similar decentralized systems) include poor installation or maintenance (LDEQ 2010a).

Dairy farm land outside of the milk parlor area is the suspected source of impairment for subsegment 040703. The most common problem is improper maintenance of waste lagoons; however, additional areas on the farm that may contribute to water quality issues include holding or feeding areas, stabilization lagoons, and pastures for dairy cows (Bourgeois-Calvin 2008, LDEQ 2010a). The suspected cause of impairment in subsegment 040603 is identified as *unknown sources*, which indicates that various sources might be present, but not enough data are available to identify them.

3. Characterization of Existing Water Quality

Water quality data were obtained from LDEQ's routine ambient water quality monitoring program. Sixteen LDEQ water quality stations have provided fecal coliform bacteria data relevant to the subsegments addressed in this report. Each subsegment has at least one water quality station in it. Additional water quality data provided by the LPBF were collected during a study beginning in 2005 (Bourgeois-Calvin 2008). The study focused on the Tangipahoa and Natalbany watersheds in Tangipahoa Parish. Eleven LPBF water quality stations are in subsegments 040503, 040504, 040505, and 040703. Figure 3-1 shows the locations of the water quality stations within Lake Pontchartrain Basin. Summaries of the fecal coliform bacteria data are in Tables B-1 and B-2 in Appendix C. Appendix D presents the raw water quality data.

3.1 Comparison of Observed Data to Criteria

Louisiana's 2010 section 303(d) list identifies 15 subsegments for fecal coliform bacteria impairments within the Lake Pontchartrain Basin (LDEQ 2010a); these 15 subsegments are addressed in this TMDL study. Most of the subsegments have one data set, and subsegment 040302 has two. Tables C-1 and C-2 in Appendix C summarize the observations at each water quality station by subsegment, including the number of observations; the minimum, maximum, average, and median observations; the number of exceedances of the criterion; and the percentage of observations exceeding the criterion at each station.

The subsegment with the most fecal coliform bacteria observations, from LDEQ and the LPBF study, is subsegment 040503 with 464 observations between 1991 and 2010. The lowest number of observations at a station is 23 in subsegment 040910.

Exceedances of the summer primary contact recreation criterion (400/100 mL) from May 1 through October 31 were observed in all 15 subsegments, with the highest percentage of exceedances (100 percent) in subsegment 040703 (Table B-1). All but two of the subsegments (040304 and 040305) also have exceedances of the winter criterion (2,000/100 mL), which is applied from November 1 through April 30. The highest percentage of winter exceedances (57 percent) is in subsegment 040504 (Table B-1).

3.2 Trends and Patterns in Observed Data

The fecal coliform bacteria data were plotted over time for each of the impaired subsegments (see Appendix E). No distinct seasonal trends or patterns are evident in the water quality data. Fecal coliform bacteria data were not compared to flow because a majority of these subsegments are in tidal areas for which no representative flow data are available.

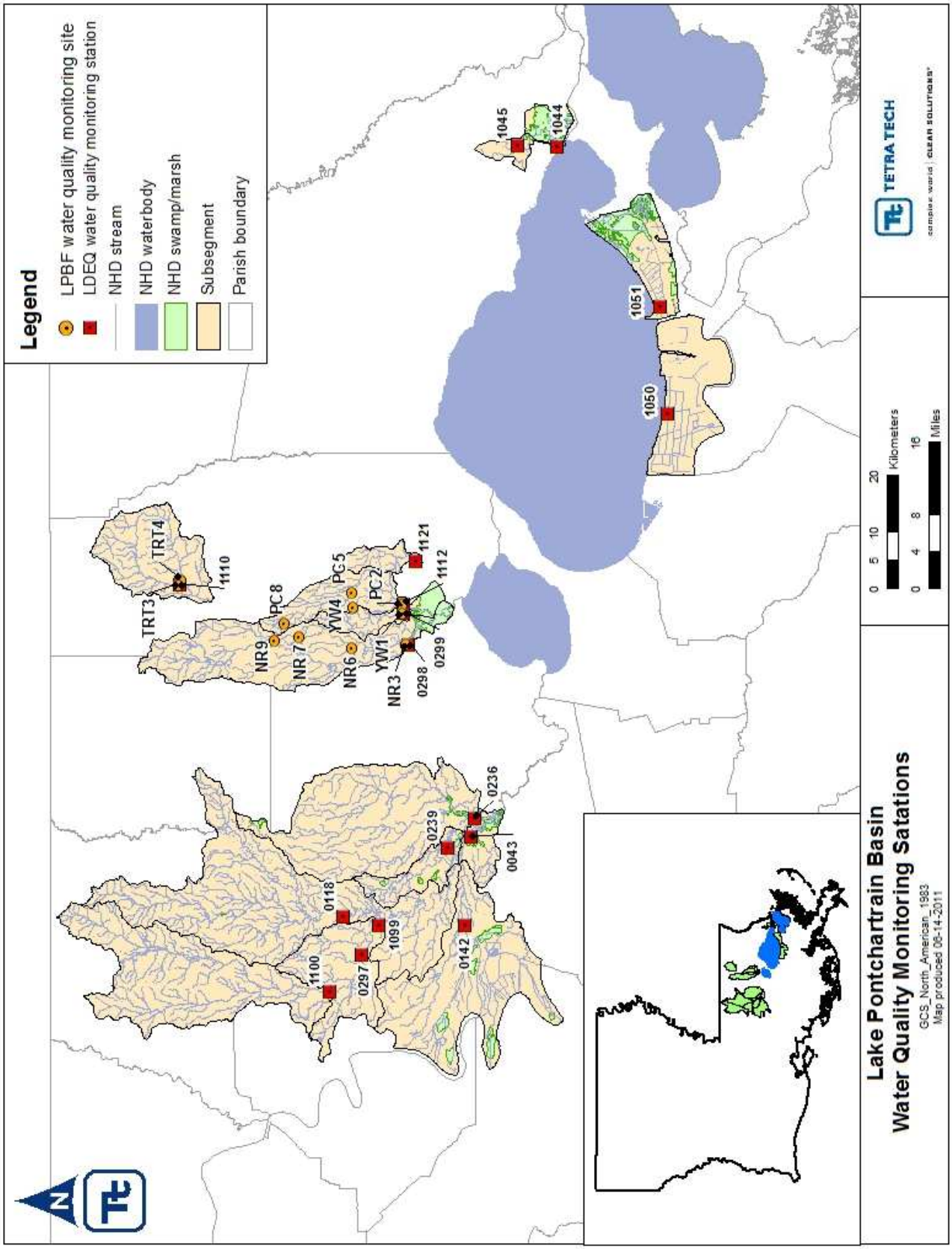

Figure 3-1. Location of water quality sampling stations in the Lake Pontchartrain Basin.

4. TMDL Development

A TMDL is the total amount of a pollutant that can be assimilated by the receiving waterbody while still achieving water quality standards. In TMDL development, allowable loadings from all pollutant sources that cumulatively amount to no more than the TMDL must be established and thereby provide the basis for establishing water quality-based controls.

A TMDL for a given pollutant and waterbody is calculated using the sum of individual WLAs for point sources and LAs for nonpoint sources and natural background levels. In addition, the TMDL must include an implicit or explicit margin of safety (MOS) to account for the uncertainty in the relationship between pollutant loads and the quality of the receiving waterbody, and it may include a future growth (FG) component. The components of the TMDL calculation are illustrated using the following equation:

$$TMDL = \sum WLAs + \sum LAs + MOS + FG$$

TMDLs are typically expressed on a mass loading basis (e.g., kilograms per day); however, for bacteria, TMDLs can be expressed in terms of organism counts per day, in accordance with 40 CFR 130.2(l).

4.1 TMDL Analytical Approach

The TMDLs in the Lake Pontchartrain Basin were calculated using both a load reduction approach and load duration curve approach. The load reduction approach was applied to the subsegments influenced by tidal action: 040201, 040302, 040304, 040305, 040503, 040504, 040505, 040603, 040909, 040910, 041302, and 041401. The load duration curve approach was applied to the remaining subsegments: 040102, 040103, and 040703. Each approach is described below.

4.1.1 Load Reduction Approach

Using the load reduction approach, the water quality targets of each subsegment were multiplied by the average daily runoff to determine the TMDL loading. Because the selected subsegments have a designated use of primary contact recreation, seasonal (summer and winter) fecal coliform bacteria TMDLs were developed. TMDL calculation results are included in Appendix F, along with the original water quality data.

Because of flow dynamics in a majority of subsegments within the Lake Pontchartrain Basin, where stream flow could not be used, the monthly water yield was used to obtain TMDL loadings. Monthly water yields for the Southeast, East Central, and South Central Climate Divisions were obtained from the Louisiana Office of State Climatology and used to characterize conditions in subsegments 040201, 040302, 040304, 040305, 040503, 040504, 040505, 040603, 040909, 040910, 041302, and 041401. The monthly water yield was divided by the number of days in the month to obtain runoff intensity. Available data from 1980 to 2003 were averaged to obtain the summer and winter averages for the selected subsegments (Table 4-1).[1] The average yield was multiplied by the area of the subsegment to obtain the flow from the subsegment into the waterbodies. These averages were assigned to each subsegment accordingly. If a subsegment overlapped multiple climate divisions, a combined seasonal water yield average was calculated based on relative proportions of each climate division. Flows from point sources were not incorporated in the water yield. This method produces loading on the basis of expected average flows, and does not rely on expected point source flows to meet water quality criteria. By using the monthly water yield, the calculations estimate the loadings from the land surface that enter into the waterways.

[1] The Louisiana Office of State Climatology did not respond to requests for updated data.

Table 4-1. Average water yields for climate divisions in the Lake Pontchartrain Basin

Climate division	Period	Average monthly water yield (millimeters)	Subsegments represented
East Central	Summer	2.04	040201, 040302, 040304, 040305, 040503, 040504, 040505, 040603, 040909, 040910
	Winter	2.98	
South Central	Summer	2.21	040201
	Winter	2.55	
South East	Summer	2.25	040201, 040302, 041302, 041401
	Winter	2.56	

4.1.2 Load Duration Curve Approach

The second methodology used to determine the TMDL for the impaired subsegments in the remaining Lake Pontchartrain Basin subsegments is the load duration curve. These TMDLs represent a continuum of desired loads over all flow conditions, rather than a fixed, single value, because loading capacity varies as a function of the flow present in the stream. The basic elements of this procedure are documented on the Kansas Department of Health and Environment Web site (KDHE 2003). This method was used to illustrate allowable loading for a wide range of flows. The steps for how this methodology was applied for the TMDLs in this report are summarized as follows:

1. Develop a flow duration curve.
2. Convert the flow duration curve to load duration curves for each impairment.
3. Plot observed loads with load duration curves.
4. Calculate TMDL, WLA, LA, MOS, and FG (see Section 4.2).
5. Calculate percent reductions required to meet water quality standards.

Load duration curves describe contributions of pollutants from surface runoff, subsurface inflow, and point sources—not just surface runoff (overland flow). Load duration curves are valid whether pollutant concentrations tend to be higher at low flows or high flows. When the curve shows higher concentrations at lower flows, this suggests that point sources are the main contributors, rather than nonpoint sources, which predominate when high concentrations accompany high flows. An advantage of the load duration approach is the ability to show allowable loads for a wide range of flow conditions. The load duration curves identify the flow conditions under which the greatest exceedances of water quality criteria occur.

4.1.2.1 Flow Duration Curve

A flow duration curve was developed for subsegments 040102, 040103, and 040703. Only flow data from 1980 and later were used in these calculations. Daily streamflow measurements were sorted in increasing order, and the percentile ranking of each flow was calculated. The daily streamflow measurements were separated into summer (May through October) and winter (November through April) data sets to accommodate the state's seasonal fecal coliform bacteria criteria. The load duration methodology requires use of the same flow period for both developing the flow duration and calculating observed loads from sampling data. For each season, the flows were then plotted against the corresponding percent flow that exceeds a specific flow to create the flow duration curves.

Figure 4-1 is an example of a flow duration curve. The plot shows the flow (e.g., cubic feet per second [cfs]) on the Y-axis. The X-axis shows the percentage of days on which the plotted flow is exceeded. Points at the lower end of the plot (0 through 10 percent) represent high-flow conditions where only 0 through 10 percent of the flow exceeds the plotted point. Conversely, points on the high end of the plot (90 to 100 percent) represent low-flow conditions.

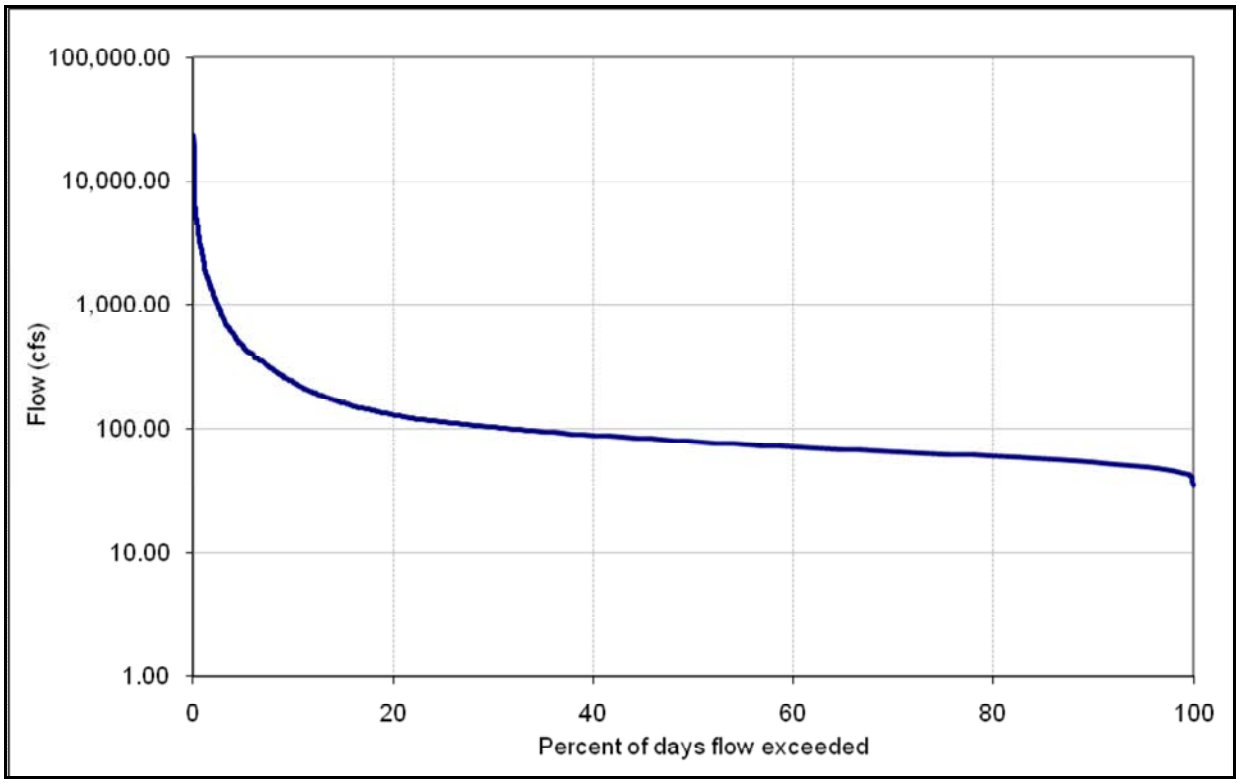

Figure 4-1. Example of a flow duration curve (subsegment 040102, summer flow duration curve for gage 07377500).

Detailed flow information for the TMDL subsegments were available for several of the listed subsegments or nearby subsegments within the Lake Pontchartrain basin. In order to determine flow, data from selected USGS gages from the region were reviewed. The gages were selected according to size (gages with drainage areas greater than 1,000 square miles were not considered), type of data (only gages with daily discharge data were considered), and the period of data (only gages with recent data were considered). Table 4-2 lists the USGS gages that were selected. Data from the selected gages were used to compare the drainage area to average flow for each gage. Figure 4-2 shows the results of those comparisons. The results showed a very good relationship between drainage area and average flow with a correlation coefficient, R^2, of almost 1.0. For the purposes of this TMDL, USGS gages 07377500, 07378000, and 07376500 were chosen to represent flow. Flows from these gages were area weighted to represent the flow from the TMDL subsegments 040102, 040103, and 040703, respectively.

Table 4-2. USGS flow gages used in drainage area and average flow analysis

Station number	Station name	Drainage area (sq. mi.)	Average flow (cfs)
07375800	Tickfaw River at Liverpool, LA	89.70	107.47
07375960	Tickfaw River at Montpelier, LA	220.00	320.55
07376000	Tickfaw River at Holden, LA	247.00	376.06
07376500	Natalbany River at Baptist, LA	79.50	115.24
07377000	Amite River near Darlington, LA	580.00	908.21
07377240	Little Sandy Creek near Greenwell Springs, LA	28.20	56.34
07377500	Comite River near Olive Branch, LA	145.00	233.30
07378000	Comite River near Comite, LA	284.00	480.70
07379960	Dawson Creek at Bluebonnet Blvd near Baton Rouge, LA	15.11	35.59

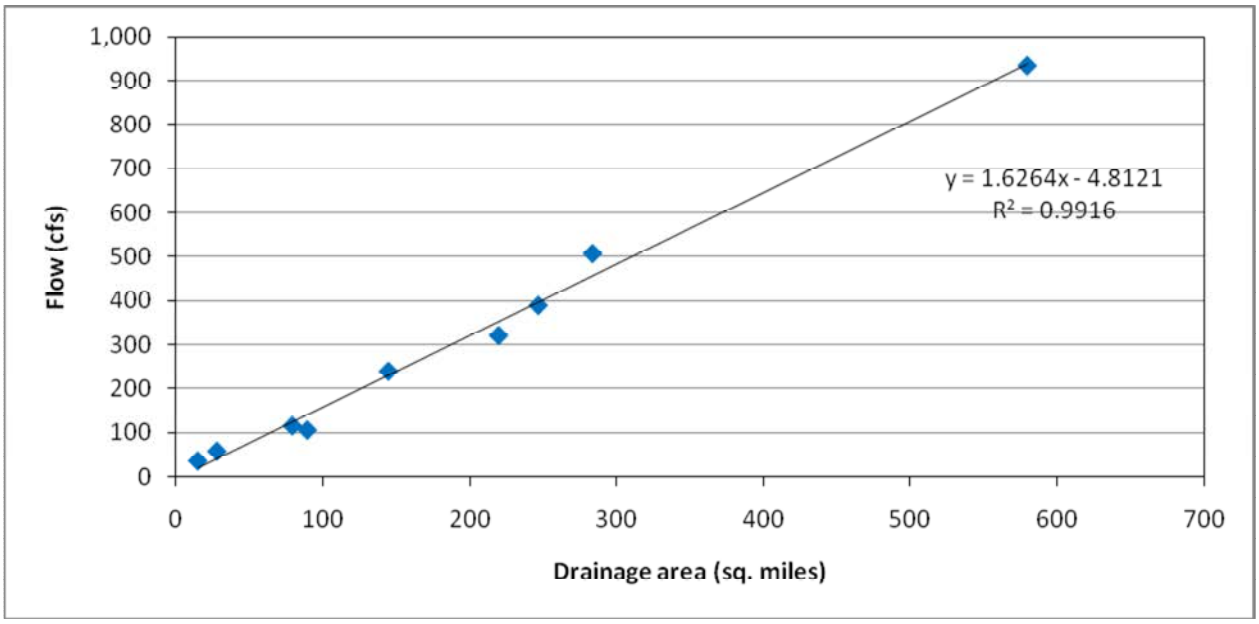

Figure 4-2. Result of USGS station drainage area and average flow analysis.

4.1.2.2 Load Duration Curve

The flows from the flow duration curves were multiplied by the appropriate target concentration (Table 2-6) for each season to compute an allowable load duration curve. Each load duration curve is a plot of organism count per day versus the percent flow exceedance from the flow duration curves.

The load duration curve is beneficial when analyzing monitoring data with their corresponding flow information plotted as a load. This approach allows placement of the monitoring data in relation to their locations in the flow continuum. Assumptions of the probable source or sources of the impairment can then be made from the plotted data. The load duration curve shows the calculation of the TMDL at any flow, rather than at a single critical flow. The official TMDL number is reported as a single number, but the curve is provided to demonstrate the value of the acceptable load at any flow. This allows analyses of load cases in the future for different flow regimes.

4.1.2.3 Observed Loads

For each sampling station and season, observed loads were calculated by multiplying the observed concentration of fecal coliform bacteria by the flow on the sampling day. These observed loads were then plotted versus the percent flow exceedance of the flow on the sampling day and placed on the same plot as the load duration curve. Reductions were applied to the observed loads for each parameter until its water quality criteria and allowable percent exceedance were met to obtain an overall percent reduction for each subsegment. These plots are shown in the appendices of this report as follows:

Appendix G: Load Duration Calculations for TMDLs (CD-ROM)
Appendix H: Load Duration Curve Summaries and Plots for Fecal Coliform Bacteria

These plots provide visual comparisons between observed and allowable loads under different flow conditions. Observed loads that are plotted above the load duration curve represent conditions under which observed water quality concentrations exceed the target concentrations. Observed loads plotted below the load duration curve represent conditions under which observed water quality concentrations are less than target concentrations (i.e., do not exceed water quality standards).

4.2 TMDL, WLA, and LA

The TMDLs for the tidal Lake Pontchartrain Basin subsegments (040201, 040302, 040304, 040305, 040503, 040504, 040505, 040603, 040909, 040910, 041302, and 041401) were calculated using the load reduction approach, and represent local contributions to the subsegment. The water quality criteria and the average water yield were multiplied by the calculated drainage area of each subsegment to estimate the total allowable load.

The TMDLs for the remaining Lake Pontchartrain Basin subsegments (040102, 040103, and 040703) were calculated as the area under the load duration curve. Table 4-3 presents the TMDLs and allocations for the subsegments in this report using the mass balance and load duration curve approaches.

Table 4-3. Summary of fecal coliform bacteria TMDLs, WLAs, LAs, MOS, and FG for the Lake Pontchartrain Basin

Subsegment	Season	TMDL (MPN/day)	WLA (MPN/day)	LA (MPN/day)	Explicit MOS (MPN/day)	FG (MPN/day)	Percent reduction
040102	Summer	1.86E+12	7.52E+10	1.41E+12	1.86E+11	1.86E+11	55.0%
	Winter	2.02E+13	8.06E+11	1.53E+13	2.02E+12	2.02E+12	73.5%
040103	Summer	8.61E+11	4.04E+11	2.85E+11	8.61E+10	8.61E+10	85.0%
	Winter	9.33E+12	4.21E+12	3.25E+12	9.33E+11	9.33E+11	88.8%
040201	Summer	3.92E+12	1.33E+12	1.81E+12	3.92E+11	3.92E+11	76.5%
	Winter	2.48E+13	8.07E+12	1.18E+13	2.48E+12	2.48E+12	97.8%
040302	Summer	6.38E+12	9.61E+11	4.14E+12	6.38E+11	6.38E+11	76.5%
	Winter	4.57E+13	6.77E+12	2.98E+13	4.57E+12	4.57E+12	91.7%
040304	Summer	7.48E+11	1.96E+11	4.02E+11	7.48E+10	7.48E+10	31.0%
	Winter	5.12E+12	1.11E+12	2.99E+12	5.12E+11	5.12E+11	0.0%
040305	Summer	3.99E+12	2.29E+11	2.96E+12	3.99E+11	3.99E+11	20.0%
	Winter	2.89E+13	1.43E+12	2.17E+13	2.89E+12	2.89E+12	0.0%
040503	Summer	3.01E+12	1.86E+11	2.22E+12	3.01E+11	3.01E+11	50.0%
	Winter	2.19E+13	1.30E+12	1.62E+13	2.19E+12	2.19E+12	87.5%
040504	Summer	3.94E+11	2.26E+11	8.97E+10	3.94E+10	3.94E+10	86.7%
	Winter	2.69E+12	1.49E+12	6.66E+11	2.69E+11	2.69E+11	93.3%
040505	Summer	1.20E+12	3.57E+11	6.06E+11	1.20E+11	1.20E+11	92.0%
	Winter	8.74E+12	2.57E+12	4.42E+12	8.74E+11	8.74E+11	87.5%
040603	Summer	3.50E+11	3.39E+10	2.46E+11	3.50E+10	3.50E+10	20.0%
	Winter	2.51E+12	2.04E+11	1.80E+12	2.51E+11	2.51E+11	87.5%
040703	Summer	7.35E+11	6.35E+07	5.88E+11	7.35E+10	7.35E+10	88.0%
	Winter	8.15E+12	6.35E+07	6.52E+12	8.15E+11	8.15E+11	88.8%
040909	Summer	2.97E+11	1.99E+11	3.90E+10	2.97E+10	2.97E+10	95.6%
	Winter	1.84E+12	1.17E+12	2.98E+11	1.84E+11	1.84E+11	60.0%
040910	Summer	3.26E+11	5.23E+08	2.60E+11	3.26E+10	3.26E+10	20.0%
	Winter	2.38E+12	3.02E+09	1.90E+12	2.38E+11	2.38E+11	16.7%
041302	Summer	2.03E+12	1.61E+12	1.63E+10	2.03E+11	2.03E+11	82.6%
	Winter	1.16E+13	9.17E+12	9.28E+10	1.16E+12	1.16E+12	87.5%
041401	Summer	1.27E+12	3.25E+11	6.90E+11	1.27E+11	1.27E+11	97.5%
	Winter	7.23E+12	1.85E+12	3.93E+12	7.23E+11	7.23E+11	87.5%

4.2.1 Wasteload Allocation

The WLA portion of the TMDL equation is the total loading of a pollutant that is assigned to point sources. The point sources in the Lake Pontchartrain Basin include sanitary and industrial wastewater facilities. WLAs are based on the current permit limits and discharge flow levels. Because of the large number of permits, the

individual WLAs for each point source included in these Lake Pontchartrain Basin TMDLs are presented in Appendix I.

WLAs for fecal coliform bacteria were calculated using monthly average permit limits, when applicable. If a permit does not have a monthly average permit limit, the weekly average permit limit was used. If neither the weekly nor monthly average fecal coliform bacteria limits were available, the daily maximum limit was used. The preferred facility flow was the facility design or expected flow. If neither was available, the average (expected or observed) flows were used to calculate the WLAs. The permit maximum flow was used if the permitted or average flow was not available. The permit maximum flow was usually the maximum flow covered by the specific type of general permit. For example, the Louisiana Pollution Discharge Elimination System (LPDES) Class II Sanitary General Permit covers facilities with flow rates up to 25,000 gallons per day. The permit maximum flow sometimes was significantly greater than the expected flow, and therefore the permit maximum was used only when other flows were not available.

The equation for WLA calculation is

Flow (gallon/day) × concentration (MPN/100 mL) × 3,785.412 mL/gallon = load (MPN/day).

LPDES permitted discharges without fecal coliform effluent limitations have been determined to not be sources of fecal coliform and will not receive allocations. If at some future time, LDEQ determines that any of the discharges may contain fecal coliform, wasteload allocations may be provided along with the appropriate permit conditions.

As long as point source discharges of treated wastewater contain parameter levels at or below these permit limits, they should not be a cause of exceedances of the fecal coliform bacteria water quality criteria. Year-round WLAs have been assigned at water quality targets, and no point source has been given a reduction from that level. The decision to provide a WLA to these sources does not reflect any determination by EPA that an effluent limit is needed or required in a NPDES permit. As part of the permitting process, LDEQ will review the WLAs and permit applications to determine if a permit limit is appropriate on a case-by-case basis.

In recent permits, LDEQ has provided limits for total residual chlorine (TRC) as a surrogate parameter for fecal coliform for certain sanitary waste discharges covered by general permits. In addition, LDEQ considers these facilities in compliance with TRC limits if they properly operate and maintain a marine sanitation device (MSD) that complies with pollution control standards and regulations under Section 312 of the Clean Water Act. LDEQ requires that the MSD be tested yearly as part of the permit. Although the derived WLAs are for fecal coliform bacteria, meeting the WLAs might not be necessary if alternative remediation and future monitoring prove that fecal coliform bacteria concentrations are being controlled without reducing these parameters.

EPA's stormwater permitting regulations require municipalities to obtain permit coverage for all stormwater discharges from MS4s. For each MS4 in the basin, a gross MS4 load was computed by multiplying the LA by the ratio of the MS4 area in each subsegment to the subsegment area. That estimates the loading that enters the impaired waterbodies from the MS4 areas. Note that those values are estimates that can be refined in the future as more information about the MS4s and land-use-specific loadings becomes available. Note also that the MS4 loads presented reflect only that portion of the MS4 in the subsegment. The computed MS4 load was subtracted from the LA and included as a seasonal WLA component of the TMDL because MS4s are permitted dischargers but function similarly to nonpoint sources (through storm-driven processes). EPA expects that the MS4 WLAs will be achieved through best management practices (BMPs) and adaptive management.

Table 4-4 lists the individual WLAs for the MS4s identified in Section 2.5. For those dischargers, LDEQ is not providing allocations or permit limits, and it is not the intention of this TMDL to assign permit limits. If, at some time in the future, LDEQ determines that any of the discharges might contain those parameters, WLAs may be specified along with the appropriate permit conditions.

Table 4-4. Fecal coliform bacteria WLAs for the MS4s in the Lake Pontchartrain Basin

Subsegment	Urban area (UA)	NPDES number	MS4 area (acres)	Season	MS4 WLA (#/day)
040102	City of Baton Rouge	LAS000101	1,559	Summer	2.04E+10
				Winter	2.21E+11
	City of Baker	LAS000101	3,118	Summer	4.08E+10
				Winter	4.42E+11
	City of Central	LAS000101	1,000	Summer	1.31E+10
				Winter	1.42E+11
040103	City of Baton Rouge	LAS000101	15,500	Summer	2.06E+11
				Winter	2.35E+12
	City of Baker	LAS000101	2,000	Summer	2.66E+10
				Winter	3.04E+11
	City of Central	LAS000101	10,000	Summer	1.33E+11
				Winter	1.52E+12
040201	City of Baton Rouge	LAS000101	40,529	Summer	1.11E+12
				Winter	7.25E+12
	LSU	LAS000101	650	Summer	1.78E+10
				Winter	1.16E+11
	Ascension Parish Government	LAR041034	3,355	Summer	9.21E+10
				Winter	6.00E+11
040302	Livingston Parish - Gravity Drainage Districts 1, 2 & 5	LAR040002	10,921	Summer	2.93E+11
				Winter	2.11E+12
	Ascension Parish Government	LAR041034	4,368	Summer	1.17E+11
				Winter	8.43E+11
	City of Baton Rouge	LAS000101	19,657	Summer	5.28E+11
				Winter	3.79E+12
040304	Livingston Parish - Gravity Drainage Districts 1, 2 & 5	LAR040002	1,500	Summer	3.89E+10
				Winter	2.88E+11
	City of Denham Springs	LAR041020	4,000	Summer	1.04E+11
				Winter	7.69E+11
040305	Livingston Parish - Gravity Drainage Districts 1, 2 & 5	LAR040002	3,511	Summer	9.26E+10
				Winter	6.77E+11
	City of Walker	LAR041004	3,712	Summer	9.79E+10
				Winter	7.15E+11
040503	City of Hammond	LAR041030	6,703	Summer	1.77E+11
				Winter	1.29E+12
040504	City of Hammond	LAR041030	7,583	Summer	1.96E+11
				Winter	1.46E+12
040505	City of Hammond	LAR041030	13,300	Summer	3.51E+11
				Winter	2.56E+12
040603	City of Hammond	LAR041030	1,024	Summer	2.69E+10
				Winter	1.97E+11
040909	City of Slidell	LAR041015	5,735	Summer	1.44E+11
				Winter	1.10E+12
	St Tammany Parish	LAR041024	125	Summer	3.13E+09
				Winter	2.39E+10
040910	St Tammany Parish	LAR041024	15	Summer	3.96E+08
				Winter	2.89E+09

Subsegment	Urban area (UA)	NPDES number	MS4 area (acres)	Season	MS4 WLA (#/day)
041302	Jefferson Parish	LAS000201	10,393[a]	Summer	1.63E+12
				Winter	9.27E+12
	City of Harahan	LAS000201	1,266[a]	Summer	3.68E+10
				Winter	2.10E+11
	City of Kenner	LAS000201	9,681[a]	Summer	2.81E+11
				Winter	1.60E+12
	City of New Orleans	LAS000301	23,013	Summer	6.69E+11
				Winter	3.81E+12
	Jefferson Parish	LAS000301	10,394[a]	Summer	1.63E+12
				Winter	9.27E+12
	Port of Orleans	LAS000301	640	Summer	1.86E+10
				Winter	1.06E+11
041401	New Orleans City of	LAS000301	11,189	Summer	3.25E+11
				Winter	1.85E+12

[a] Data provided by Jefferson Parish

4.2.2 Load Allocation

The LA is the portion of the TMDL assigned to natural background loadings, as well as nonpoint sources such as septic tank leakage, wildlife, and agricultural practices. The LA was calculated for this TMDL by subtracting the WLA (including the MS4 loading), MOS, and FG from the total TMDL. The final LA was calculated after the MS4 was determined. The permitting authority may reallocate LA to WLA if the area covered by the MS4 permits increases more than the allocation provided for in the FG allocation. LAs were not allocated to separate nonpoint sources because of a lack of available source characterization data. The LAs are listed in Table 4-3.

4.3 Seasonality and Critical Conditions

The federal regulations at 40 CFR 130.7 require that TMDLs include seasonal variations and take into account critical conditions for streamflow, loading, and water quality parameters. For this TMDL, fecal coliform bacteria loadings for subsegments with primary contact recreation and secondary contact recreation as the designated use were determined for winter and summer on the basis of seasonal water quality criteria, thus accounting for seasonality. In addition, the sampling results for all pollutants were plotted over time and reviewed for any seasonal patterns (see Section 3.2).

The water quality criteria for fecal coliform bacteria include values that must not be exceeded more than 25 percent of the time (primary and secondary contact recreation) on the basis of sampling data obtained throughout the year, including during critical and noncritical conditions.

4.4 Margin of Safety

Both section 303(d) of the Clean Water Act and the regulations at 40 CFR 130.7 require that TMDLs include an MOS to account for uncertainty in available data or in the actual effect that controls will have on the loading reductions and receiving water quality. The MOS can be incorporated in two ways (USEPA 1991). One way is to implicitly incorporate it by using conservative model assumptions to develop allocations. The other way to incorporate the MOS is to explicitly specify a portion of the TMDL as the MOS and use the remainder for allocations. For this analysis, the MOS is explicit: 10 percent of each targeted TMDL was reserved as the MOS to account for any uncertainty in the TMDL. Using 10 percent of the TMDL load provides an additional level of protection to the designated uses of the subsegments of concern.

4.5 Future Growth

While the MOS is an allocation for scientific uncertainty, FG is an allocation for growth. Ten percent of the load was allocated for FG in the area covered by the TMDL. This includes future urban development, point sources, MS4 areas, agricultural areas, and other typical nonpoint source contributing areas. The FG could also be used for unaccounted or unknown sources not included in the TMDL.

5. Future Watershed Activities

This section discusses TMDL implementation strategies, environmental monitoring activities, and stormwater permitting requirements and presumptive best management practices approach for the TMDL conducted for the selected subsegments in the Lake Pontchartrain Basin.

5.1 TMDL Implementation Strategies

Current TMDL requirements do not require implementation plans to be included in TMDL reports. Louisiana is responsible for developing and implementing the TMDL implementation plans. Section 303(d) of the Clean Water Act and the implementing regulations at 40 CFR 130.7 state that EPA has no authority to approve or disapprove TMDL implementation plans.

WLAs will be implemented through LPDES permit procedures. LDEQ was delegated to manage the NPDES program in August 1996, and LDEQ is responsible for all permits covered by the delegation package. As part of that designation, a Memorandum of Agreement (MOA) was established between LDEQ and EPA. The designation and memorandum were revised in April 2004. In accordance with Section 1.C of the NPDES MOA between LDEQ and EPA (Revision 1, April 28, 2004), EPA has the responsibility of providing continued technical and other assistance, including interpreting and implementing federal regulations, policies, and guidelines on permitting and enforcement matters. The MOA further states that LDEQ has primary responsibilities for implementing the LPDES program in Louisiana, including applicable sections of the federal Clean Water Act, applicable state legal authority, the applicable requirements of 40 CFR Parts 122–125, and any other applicable federal regulations establishing LPDES program priorities with consideration of EPA Region 6 and national NPDES goals and objectives. For details on the designation and agreement, see the EPA Region 6 website at http://www.epa.gov/region6/water/npdes/docs/louisiana-moa.pdf.[2] LDEQ's position is that, if any unresolved LDEQ comments to these TMDLs become the basis for an EPA Region 6 objection of an LDEQ-drafted permit or permittee objection/appeal of an LDEQ drafted permit, LDEQ may relinquish permitting authority to EPA Region 6.

LAs will be addressed through the LDEQ *Nonpoint Source Management Plan* (LDEQ 2000), which states that TMDLs are being developed through a close relationship between LDEQ and EPA Region 6. It further states that, "[m]anagement strategies outlined within this document (both statewide and watershed) will be implemented in each of the watersheds where water quality problems have been attributed to nonpoint sources of pollution." Objective 3 of the watershed management strategies (on page ii) is to, "utilize pollutant load reductions of the TMDL to develop nonpoint source pollution reduction strategies for each of the watersheds...that have water quality problems identified." In addition, Objective 7 provides a tracking process for evaluating progress in reducing loadings of fecal coliform bacteria.

The plan includes a discussion of a number of nonpoint source activities and presents BMPs that can be used to achieve the nonpoint source load reductions for fecal coliform bacteria established in the TMDLs. The plan broadly discusses programs to address agriculture, forestry, home sewerage systems, hydromodification, urban runoff, construction, and resource extraction. Accompanying each BMP is an evaluation of the BMP's effectiveness, ranked as high, medium, or low. Additional evaluations should be conducted to determine the most likely source of impairment within this watershed, and to identify localized hot spots to be targeted for effective BMP implementation. These and other BMPs can be implemented at a scale adequate to achieve the load reductions established in the TMDL.

[2] Accessed March 9, 2012.

5.2 Water Quality Monitoring Activities

LDEQ uses funds provided under section 106 of the Clean Water Act and under the authority of the Louisiana Environmental Quality Act to run a program for monitoring the quality of Louisiana's surface waters. The LDEQ Surveillance Section collects surface water samples at various locations using appropriate sampling methods and procedures to ensure the quality of the data collected. The objectives of the surface water monitoring program are to determine the quality of the state's surface waters, to develop a long-term database for water quality trend analysis, and to monitor the effectiveness of pollution controls. The data obtained through the surface water monitoring program are used to develop the state's biennial section 305(b) report (*Water Quality Inventory*) and section 303(d) list of impaired waters (*2010 Integrated Report*). This information is also used to establish priorities for LDEQ's nonpoint source program.

LDEQ has implemented a rotating approach to surface water quality monitoring. Through the rotating approach, the entire state is sampled on a 4-year cycle. Long-term trend monitoring sites at various locations on the larger rivers and Lake Pontchartrain are sampled throughout the 4-year cycle. Sampling is conducted monthly during a water year (October through September) to yield approximately 12 samples per site during each year the site is monitored. Sampling locations are selected where they are considered representative of the waterbody. Under the current monitoring schedule, approximately one-half of the state's waters are newly assessed for section 305(b) and section 303(d) listing purposes for each biennial cycle. Monitoring allows LDEQ to determine whether any improvement in water quality occurred after the TMDLs had been implemented. LDEQ evaluates the monitoring results to generate the Integrated Report submitted by April 1 on even-numbered years. More information can be found in *Louisiana's Water Quality Assessment Method and Integrated Report Rationale: 2010 Water Quality Integrated Report* (LDEQ 2010a). Monitoring will allow LDEQ to determine whether there has been any improvement in water quality following TMDL implementation. As the monitoring results are evaluated at the end of each year, waterbodies might be added to or removed from the section 303(d) list of impaired waterbodies.

Two watershed coordinators have been hired to work with the Lake Pontchartrain Basin Foundation (LPBF) on stakeholder involvement for watershed plans. LDEQ's nonpoint source staff is also working with the LPBF to implement these plans, and will be assigned additional watersheds to work on through the planning and implementation process. In order to address some of the known problems that exist within this basin, LDEQ has been implementing programs that address fecal coliform, DO, and mercury, which are the primary water quality problems that have been identified in these waterbodies. LPBF has implemented many programs to restore water quality, and will be an important partner for LDEQ as TMDLs are implemented within the basin. Because much of the basin is included within the Coastal Zone Boundary, Louisiana Department of Natural Resources – Coastal Management Division will be working with LDEQ and LPBF on implementation of management measures required through the Coastal Nonpoint Source Pollution Control Program (LDEQ 2010c).

5.3 Stormwater Permitting Requirements and Presumptive Best Management Practices Approach

5.3.1 Background

The NPDES permitting program for stormwater discharges was established under the Clean Water Act as the result of a 1987 amendment. The Act specifies the level of control to be incorporated into the NPDES stormwater permitting program depending on the source (industrial versus municipal stormwater). These programs contain specific requirements for the regulated communities/facilities to establish a comprehensive stormwater management program (SWMP) or stormwater pollution prevention plan (SWPPP) to implement any requirements of the TMDL allocation (see 40 CFR Part 130).

Stormwater discharges are highly variable both in terms of flow and pollutant concentration, and the relationships between discharges and water quality can be complex. For municipal stormwater discharges in particular, the use of system-wide permits and a variety of jurisdiction-wide BMPs, including educational and programmatic BMPs,

does not easily lend itself to the existing methodologies for deriving numeric water quality-based effluent limitations. These methodologies were designed primarily for process wastewater discharges, which occur at predictable rates with predictable pollutant loadings under low-flow conditions in receiving waters. EPA has recognized such problems and developed permitting guidance for stormwater permits (USEPA 1996).

Because of the nature of stormwater discharges, and the typical lack of information on which to base numeric water quality-based effluent limitations (expressed as concentration and mass), EPA recommends an interim permitting approach for NPDES stormwater permits that is based on BMPs. EPA permitting guidance states that, "[t]he interim permitting approach uses BMPs in first-round storm water permits, and expanded or better-tailored BMPs in subsequent permits, where necessary, to provide for the attainment of water quality standards" (USEPA 1996).

A monitoring component is also included in the recommended BMP approach. According to EPA permitting guidance, "each storm water permit should include a coordinated and cost-effective monitoring program to gather necessary information to determine the extent to which the permit provides for attainment of applicable water quality standards and to determine the appropriate conditions or limitations for subsequent permits" (USEPA 1996). This approach was further elaborated in a guidance memo issued in 2002. "The policy outlined in this memorandum affirms the appropriateness of an iterative, adaptive management BMP approach, whereby permits include effluent limits (e.g., a combination of structural and nonstructural BMPs) that address stormwater discharges, implement mechanisms to evaluate the performance of such controls, and make adjustments (i.e., more stringent controls or specific BMPs) as necessary to protect water quality. … If it is determined that a BMP approach (including an iterative BMP approach) is appropriate to meet the storm water component of the TMDL, EPA recommends that the TMDL reflect this" (Wayland and Hanlon 2002). This BMP-based approach to stormwater sources in TMDLs is also recognized and described in the most recent EPA guidance (USEPA 2008).

This TMDL adopts the EPA-recommended approach and relies on appropriate BMPs for implementation. No numeric effluent limitations are required or anticipated for municipal stormwater discharge permits.

5.3.2 Specific SWMP/SWPPP Requirements

As discussed in the Louisiana Small MS4 NPDES permit, if a TMDL assigns an individual WLA specifically to a MS4's stormwater discharge, LDEQ's permit specifies specifies that permittees should revise the SWMP to incorporate the WLA as a measurable goal as well as appropriate BMPs and activities.

Typical activities that the MS4 would conduct to be consistent with the WLA include the following:

- Developing a program to identify possible sources of the pollutant of concern
- Developing a schedule for implementation of additional controls and/or BMPs, if necessary, on the basis of source identification or monitoring results, to ensure compliance with applicable TMDLs
- Monitoring to evaluate program compliance, the appropriateness of identified BMPs, and progress toward achieving identified measurable goals

6. Public Participation

Federal regulations require EPA to notify the public and seek comments concerning the TMDLs it prepares. These TMDLs were developed under contract to EPA, and EPA held a public review period seeking comments, information, and data from the public and any other interested parties. The notice for the public review period was published in the *Federal Register* on November 14, 2011. The review period closed on January 13, 2012, after being extended from December 29, 2011 on December 12, 2011.

Comments were received from LPBF, Jefferson Parish, the Sewerage and Water Board of New Orleans, and St. Tammany Parish. EPA reviewed the comments and referred to them while revising and finalizing this TMDL document, as necessary. Full comment text is included in Appendix J. Responses to the comments are in Appendix K.

EPA will submit the final TMDL to LDEQ for implementation and incorporation into LDEQ's water quality management plan.

7. References

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