TMDLS FOR TURBIDITY, SULFATE, AND TDS FOR SUBSEGMENTS 101503, 101505, 101601, AND 101602 IN THE RED RIVER BASIN, LOUISIANA

REVISED DRAFT
July 7, 2006

TMDLS FOR TURBIDITY, SULFATE, AND TDS
FOR SUBSEGMENTS 101503, 101505, 101601, AND 101602
IN THE RED RIVER BASIN, LOUISIANA

Prepared for

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EXECUTIVE SUMMARY

Section 303(d) of the Federal Clean Water Act requires states to identify water bodies that are not meeting water quality standards, and to develop total maximum daily pollutant loads for those water bodies. A total maximum daily load (TMDL) is the amount of pollutant that a water body can assimilate without exceeding the established water quality standard for that pollutant. Through a TMDL, pollutant loads can be distributed to allocated to point sources and nonpoint sources discharging to the water body. This report presents TMDLs that have been developed for turbidity for Old Saline Bayou (subsegment 101503), Bayou Cocodrie (subsegment 101601), and Cocodrie Lake (subsegment 101602); and turbidity, sulfate, and total dissolved solids (TDS) for Larto Lake (subsegment 101505).

All of these subgements are located in the Red River basin in eastern central Louisiana. Old Saline Bayou (subsegment 101503) is located between Saline Lake and the Red River, north of Marksville, Louisiana. The watershed of this subsegment is 24 mi^2 and is primarily cropland. Larto Lake (subsegment 101505) is located just east of the Dewey W. Mills Wildlife Management Area, near the Black River. The watershed for this subsegment is 33 mi^2, primarily in cropland, and with significant wetlands. Bayou Cocodrie (subsegment 101601) is located southwest of Ferriday, Louisiana, between the Black and Mississippi Rivers. The watershed of this subsegment is 99 mi^2, predominantly in cropland. Cocodrie Lake (subsegment 101602), is located between Bayou Cocodrie and the Black River. The watershed for this subsegment is 122 mi^2, with the majority of the land used for cropland.

These water bodies were included on the Louisiana Department of Environmental Quality (LDEQ) final 2004 303(d) list as not supporting their fish and wildlife propagation and, for Bayou Cocodrie, outstanding natural resource waters designated uses, and were ranked as priority #1 for TMDL development. Natural conditions were identified as suspected causes of impairment for three of the subsegments. Crop production was identified as the suspected cause of impairment for Bayou Cocodrie.

LDEQ historical water quality data at five monitoring locations associated with the subsegments were analyzed for long term trends, seasonal patterns, relationships between concentration and stream flow, and relationships between turbidity and TSS. No historical trends, seasonal patterns, nor relationships with flow were apparent in these data.

Because turbidity cannot be expressed as a mass load, the turbidity TMDLs were expressed using TSS as a surrogate for turbidity. A regression between TSS and turbidity was developed for each of the water quality stations. Target TSS concentrations for the subsegments were calculated using the resulting regression equations and numeric criteria for turbidity in the Louisiana water quality standards.

All six TMDLs (four turbidity, one sulfate, and one TDS) were developed using the load duration curve methodology. This method illustrates allowable loading at a wide range of stream flow conditions. The steps for applying this methodology for the TMDLs in this report 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 components; and
5. Calculating percent reductions.

For the turbidity TMDLs, an implicit margin of safety (MOS) was incorporated through the use of conservative assumptions. The primary conservative assumption was to treat TSS as a conservative parameter that does not settle out of the water column. For the sulfate and TDS TMDLs, an explicit MOS was established as 10% of the TMDL. For all the TMDLs, 10% of the TMDL was set aside for future growth (FG).

Because point sources were considered to have a negligible effect on existing violations of water quality standard, all of the load reductions were assigned to nonpoint sources. The wasteload allocation (WLA) for point sources, the load allocation (LA) for nonpoint sources, and the nonpoint source percent reduction needed for each TMDL are summarized in Tables ES.1 and ES.2.

Table ES.1 Summary of four TMDLs for turbidity.

Subsegment	Stream Name	Parameter Causing Impairment	Loads (tons/day of TSS)					Percent Reduction Needed
			WLA	LA	MOS	FG	TMDL	
101503	Old Saline Bayou	Turbidity	0	2.09	impl	0.23	2.32	81%
101505	Larto Lake	Turbidity	0	3.06	impl	0.34	3.40	71%
101601	Bayou Cocodrie	Turbidity	0	10.06	impl	1.12	11.18	87%
101602	Cocodrie Lake	Turbidity	0	13.29	impl	1.48	14.77	82%

Table ES.2 Summary of TMDLs for sulfate and TDS.

Subsegment	Stream Name	Parameter Causing Impairment	Loads (tons/day of sulfate)					Percent Reduction Needed
			WLA	LA	MOS	FG	TMDL	
101505	Larto Lake	Sulfate	0	0.91	0.11	0.11	1.13	20%
101505	Larto Lake	TDS	0	14.94	1.87	1.87	18.68	59%

Hurricane Katrina made landfall on Monday, August 29, 2005 as a category 4 hurricane. The storm brought heavy winds and rain to southeast Louisiana, breaching several levees and flooding up to 80% of New Orleans and large areas of coastal Louisiana. Much of the area that was flooded in Hurricane Katrina was re-flooded by storm surge from Hurricane Rita. Both Hurricanes Katrina and Rita have caused a significant amount of change in sedimentation and water quality in south Louisiana. Many wastewater treatment facilities were temporarily or permanently damaged. Some wastewater treatment facilities will rebuild while others will relocate. The hurricanes expedited the loss of coastal land and modified the hydrology of some of the coastal waterbodies. Several federal and state agencies including United States Environmental Protection Agency (US EPA) and LDEQ are engaged in collecting environmental data and assessing the recovery of the Gulf of Mexico waters. The proposed TMDLs were developed based on the pre-hurricane conditions. Therefore, the post-hurricane conditions and other factors may delay the implementation of the proposed TMDLs or render the proposed TMDLs obsolete or may require modifications of the TMDLs.

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1.0 INTRODUCTION

This report presents total maximum daily loads (TMDLs) for turbidity for subsegments 101503 (Old Saline Bayou), 101601 (Bayou Cocodrie), and 101602 (Cocodrie Lake) in the Red River basin in eastern central Louisiana; and TMDLs for turbidity, sulfate, and TDS for subsegment 101505 (Larto Lake) also in the Red River basin in eastern Louisiana. These subsegments were included on the Louisiana Department of Environmental Quality (LDEQ) final 2004 303(d) list as not supporting their designated uses of fish and wildlife propagation and, for subsegment 101601, outstanding natural resource waters. The sources of contamination and causes of impairment from the LDEQ 303(d) list are shown in Table 1.1. The TMDLs in this report were developed in accordance with Section 303(d) of the Federal Clean Water Act and the United States Environmental Protection Agency's (US EPA) regulations in 40 CFR 130.7.

The purpose of a TMDL is to determine the pollutant loading that a waterbody can assimilate without exceeding the water quality standard for that pollutant, and to establish the load reduction that is necessary to meet the water quality standard in that waterbody. The TMDL is the sum of the wasteload allocation (WLA), load allocation (LA), future growth (FG), and a margin of safety (MOS). The WLA is the load allocated to point sources of the pollutant of concern, and the LA is the load allocated to nonpoint sources, including natural background. The MOS is a percentage of the TMDL that takes into account any lack of knowledge concerning the relationship between pollutant loadings and water quality, and the FG takes into account any future growth (FG) in loads to the waterbody.

Table 1.1. Subsegments and parameters for impairments addressed in this report.

Subsegment Number	Subsegment Name	Source of Information[1]	Impaired Use[2]	Suspected Causes of Impairment							Suspected Sources of Impairment	TMDL Priority (1 = highest)
				Chloride	Sulfate	TDS	Sediment/ Siltation	TSS	Turbidity	Fecal Coliforms		
101503	Old Saline Bayou	LDEQ 303(d)	FWP						X		Natural conditions-water quality standard use attainability analyses needed	1
101505	Larto Lake	LDEQ 303(d)	FWP		X	X			X		Natural conditions-water quality standard use attainability analyses needed	1
101601	Bayou Cocodrie	LDEQ 303(d)	FWP, ONR						X		Irrigated and non-irrigated crop production	1
101602	Cocodrie Lake	LDEQ 303(d)	FWP						X		Natural conditions-water quality standard use attainability analyses needed	1

Notes:
1. Source of information is the final 2004 LDEQ 303(d) list
2. FWP=Fish and Wildlife Propagation, ONR=Outstanding Natural Resource Waters

2.0 BACKGROUND INFORMATION

2.1 General Information

The study area for this project consists of subsegments 101503 (Old Saline Bayou), 101505 (Larto Lake), 101601 (Bayou Cocodrie), and 101602 (Cocodrie Lake) in the Red River basin in eastern central Louisiana (Figure A.1 in Appendix A). General information about these subsegments is presented in Table 2.1. The Old Saline Bayou subsegment is bounded on the north by Saline Bayou, on the west by Saline Lake, on the south and east by Red River - Alexandria (Louisiana Hwy 165) to Old River Control Structure Diversion Channel, and on the east by Larto Lake. Larto Lake is bounded on the north by subsegment 081604, on the west by Saline - Larto Lake to Saline Lake and Old Saline Bayou, on the south by Red River - Alexandria (Louisiana Hwy 165) to Old River Control Structure Diversion Channel, and on the east by subsegment 080302. The Cocodrie Lake subsegment is bounded on the North by Bayou Cocodrie - Lake Concordia to Hwy 15 (LDEQ) and Tensas River (LDEQ); on the West by the Black River; and on the South and the East by Bayou Cocodrie subsegment. Bayou Cocodrie is bounded on the north by subsegment 101607 and Bayou Cocodrie - Lake Concordia to Hwy 15 (LDEQ); on the west by Cocodrie Lake subsegment; on the south by Bayou Cocodrie - Wild Cow Bayou to Red River; and on the east by the Mississippi River.

Table 2.1. Background information for subsegments included in this report.

Subsegment	Water Body	Parish	USGS HUC*	Drainage Area
101503	Old Saline Bayou	Catahoula/Avyelles	08040301	24 mi^2
101505	Larto Lake	Catahoula	08040301	33 mi^2
101601	Bayou Cocodrie	Concordia	08040306	99 mi^2
101602	Cocodrie Lake	Concordia	08040305, 08040306	122 mi^2

*www.nationalatlas.gov

2.2 Topography

These subsegments are located in the Lower Mississippi Riverine Forest Province. This Bailey ecoregion province consists of flat to gently sloping broad floodplain and low terraces made up of alluvium and loess. Most of the area is flat, with an average southward slope of less than 8 in/mi (127 mm/km). The only noticeable slopes are sharp terrace scarps and natural levees that rise sharply to several meters above adjacent bottom lands or stream channels (Bailey ecoregions on www.nationalatlas.gov). This area is mostly a broad, flat alluvial plain with river terraces, swales, and levees providing the main elements of relief (Omernik ecoregions on www.nationalatlas.gov).

2.3 Soils

Soil textures for the study were compiled from the STATSGO database, which is maintained by the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS). Table 2.2 summarizes soil textures for each of the subsegments in the study area. Soils in the study area are primarily clays.

Table 2.2. Subsegment soil textures.

Texture Name	101602	101601	101505	101503
Clay	44%	65%	82%	74%
Loam	14%	4%	0%	0%
Silty clay	26%	18%	12%	14%
Silty clay loam	11%	5%	1%	2%
Silt loam	2%	4%	1%	8%
Other texture	3%	4%	4%	2%
Total	100%	100%	100%	100%

2.4 Land Use

Land use data for the study area were compiled from the United States Geological Survey (USGS) 1992 National Land Cover Dataset (USGS 2000). Although these data were based on satellite imagery from the early 1990's, more recent land use data for this area are not available at this time. The spatial distribution of these land uses is shown on Figure A.2 (located in

Appendix A) and land use percentages are shown in Table 2.3. These data indicate that approximately 70% of the study area is cropland. Subsegment 101601 includes part of the Bayou Cocodrie National Wildlife Refuge, and subsegment 101505 includes some of the Dewey W. Mills Wildlife Management Area.

Table 2.3. Land use percentages for subsegments in study area.

Land Use	Percent Coverage			
	101503	**101505**	**101601**	**101602**
Water	6.4%	15.6%	1.5%	5.9%
Urban/Transportation	0.1%	0.2%	0.1%	0.3%
Barren	0.0%	0.0%	0.0%	0.1%
Forest	0.5%	1.8%	1.7%	3.7%
Shrubland/Grassland	0.0%	0.0%	0.0%	0.0%
Pasture/Hay	0.2%	0.7%	2.5%	2.6%
Row Crops	83.1%	53.9%	73.6%	66.4%
Small Grains	0.2%	1.5%	1.0%	2.4%
Urban/Recreational Grasses	0.0%	0.0%	0.1%	0.0%
Wetlands	9.4%	26.4%	19.6%	18.6%
Total	100%	100%	100%	100%

2.5 Description of Hydrology

Average annual precipitation in subsegments 101601 and 101602 is 55 to 65 inches. Average annual precipitation in subsegments 101503 and 101505 is 65 inches (www.nationalatlas.gov). Average monthly precipitation for Ferriday, Louisiana, located just north of the study area, and Marksville, Louisiana, located just south of the study area, are shown in Figures 2.1 and 2.2. At both of these locations, precipitation is lowest in the late summer, and highest during the winter.

There is no current USGS flow gaging station located in any of the subsegments included in the study area for this report. The nearest currently operating USGS flow gaging station is located on nearby Bayou des Glaises Diversion Channel, approximately 14 miles south of the study area (07383500). Flows for Old Saline Bayou, Larto Lake, Bayou Cocodrie, and Cocodrie Lake were estimated from Bayou des Glaises Diversion Channel flows per unit of watershed area.

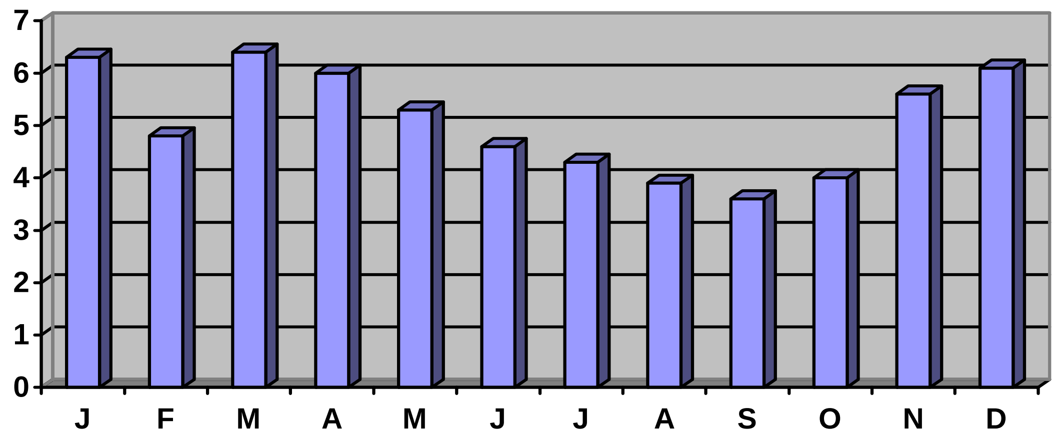

Figure 2.1 Average monthly precipitation (inches) at Ferriday, Louisiana (http://www.city-data.com/city/Ferriday-Louisiana.html).

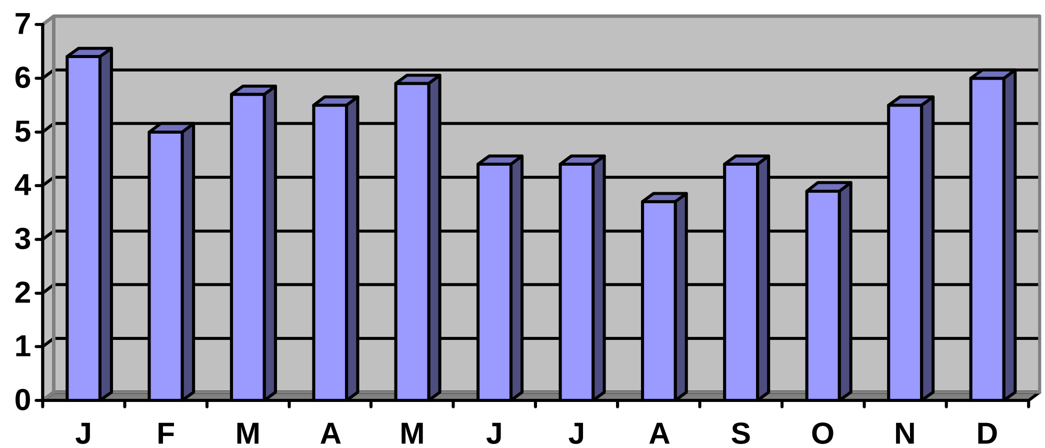

Figure 2.2 Average monthly precipitation (inches) at Marksville, Louisiana (http://www.city-data.com/city/Marksville-Louisiana.html).

2.6 Irrigation

Old Saline Bayou (subsegment 101503) is used for irrigation water. The bayou has been cut off from Saline Lake inflows, so irrigation return water is the only source of inflow to Old Saline Bayou (Personal communication, B. Paul, Kisatchie Regional Office of LDEQ, July 2005).

2.7 Channel Network

The channel network of Old Saline Bayou is significantly altered. Levees cut off the bayou from Saline Lake and Saline Bayou to the north, as well as the Red River to the south. The outlet for Old Saline Bayou is Cow Pen Slough, which empties into Bayou Larto downstream of Larto Lake. Recent monitoring by LDEQ indicates that outflows from Old Saline Bayou are rare (Personal communication, B. Paul, Kisatchie Regional Office of LDEQ, August 2005).

2.8 Water Quality Standards

Water quality standard for Louisiana are included in the Title 33 Environmental Regulatory Code (LDEQ 2005b). Designated uses for the Old Saline Bayou, Larto Lake, Bayou Cocodrie, and Cocodrie Lake are primary and secondary contact recreation, and fish and wildlife propagation. In addition, Bayou Cocodrie is also designated for the uses of agriculture and outstanding natural resource waters. Relevant numeric criteria for Larto Lake are 10 mg/L for sulfate and 165 mg/L fo rTDS.

The Title 33 Environmental Regulatory Code sets a turbidity criterion of 25 NTU for freshwater lakes and outstanding natural resource waters. Therefore, a value of 25 NTU will be used as the turbidity criterion for subsegments 101601 (Bayou Cocodrie), 101602 (Cocodrie Lake), and 101505 (Larto Lake).

Title 33 does not include turbidity criteria for freshwater creeks and bayous that are not designated as scenic or outstanding natural resource waters. Old Saline Bayou is connected to Larto Bayou in subsegment 101505, for which a turbidity criterion of 25 NTU has been set in Title 33. LDEQ assesses the turbidity of subsegments without turbidity criteria, that are just upstream of waterbodies for which criteria exist, using the criterion of the downstream subsegment. The justification for this is that a downstream receiving water body could not be expected to meet a lower criterion than the upstream water body that flows into it. Therefore, the value of 25 NTU will be used as the turbidity criterion for subsegment 101503.

2.9 Nonpoint Sources

The 303(d) listings for subsegments 101503, 101505, and 101602 indicate that the impairments for these subsegments are due to natural conditions (Table 1.1). Bob Paul, of

Kisatchie Regional Office of LDEQ, suggests that agricultural runoff could be a source of turbidity in subsegment 101503 (Old Saline Bayou), and that runoff from abandoned gravel pits may be a source of turbidity in subsegment 101602 (Cocodrie Lake) (personal communication, July 2005). The 303(d) listing for subsegment 101601 (Bayou Cocodrie) indicates crop production as a suspected source of the turbidity impairment for this subsegment (Table 1.1).

2.10 Point Sources

A list of point source discharges in the study area was generated by LDEQ using their TEMPO and PTS databases. Based on this list, there is only one permitted point source located in subsegment 101601, and there are no permitted point source discharges in subsegments 101503, 101505, or 101602. Information for the discharge in the study area was obtained by FTN Associates, Ltd. (FTN) from LDEQ's Electronic Document Management System (EDMS) and is shown in Table 2.4. Because this permitted discharge does not have permit limits for turbidity or TSS, it was assumed to not have a source of turbidity and was not included in the turbidity TMDL.

Table 2.4. Point sources in subsegment 101601.

File Number	Facility Name	Location	Outfall	Sampled/ Estimated/ Design Flows	Flow Units	Rec. Water	TSS Permit Limits	Included in Turbidity TMDL?
LAG540488	Taylor's Trailer Park	Vidalia, 4 m SW on Airport Rd.	001	9000	gpd	Cocodrie Bayou	NA	N

2.11 Previous Water Quality Studies

There are no known previous water quality studies for subsegments 101503, 101505, 101601, or 101602.

3.0 EXISTING WATER QUALITY FOR TURBIDITY AND TSS

3.1 General Description of Data

Turbidity and TSS data have been collected by LDEQ at water quality stations located in three of the subsegments that are impaired for turbidity within the study area. These stations are 1226 (Larto Lake), 1225 (Larto Bayou), 1228 (Bayou Cocodrie), and 1229 (Cocodrie Lake). There is no LDEQ water quality station in subsegment 101503 (Old Saline Bayou). LDEQ uses water quality data from station 371, in the Saline Bayou subsegment 101504, to assess the condition of Old Saline Bayou, so these data will be used for the Old Saline Bayou TMDL. Locations of these sampling sites are shown on Figure A.1 (located in Appendix A). Table 3.1 shows summaries of turbidity data, including percentages of values above the turbidity criterion of 25 NTU. Table 3.2 shows summaries of TSS data for the same water quality stations. TSS data are included in this summary because TSS is needed as a surrogate parameter for expressing the turbidity TMDLs. Time series plots of data for the entire period at each station are shown on Figures B.1 through B.5 for turbidity and Figures B.6 through B.10 for TSS (Appendix B). These data were obtained from LDEQ.

3.2 Seasonal Patterns

Since there is only one year of data available for these water quality stations, it is questionable whether the apparent patterns are truly seasonal, or just happened to occur during 2002. At all of the water quality stations except the one in Larto Lake, turbidity appeared to be generally higher in the winter than in the summer (Figures B.1, B.3 through B.5, Appendix B). At the water quality stations on Bayou Cocodrie and Cocodrie Lake, TSS was also higher in the winter than in the summer (Figures B.9 and B.10, Appendix B). However, at the water quality stations on Saline Bayou and Larto Bayou, TSS did not have an apparent seasonal pattern (Figures B.6 and B.8, Appendix B). No seasonal pattern was apparent for turbidity or TSS at the Larto Lake water quality station (Figures B.2 and B.7, Appendix B).

Table 3.1. Turbidity data for subsegments 101503, 101505, 101601, and 101602.

	Station 371	Station 1226	Station 1225	Station 1228	Station 1229
Station Description	Saline Bayou east of Alexandria, Louisiana	Larto Lake west of New Era, Louisiana	Larto Bayou west of Book, Louisiana	Bayou Cocodrie south of Monterey, Louisiana	Cocodrie Lake north of Monterey, Louisiana
Subsegment	101503	101505	101505	101601	101602
Period of Record	1/22/02 – 12/17/02	1/22/02 – 12/17/02	1/22/02 – 11/18/02	1/28/02 – 12/16/02	1/28/02 – 12/16/02
No. of Values	12	12	11	12	13
Minimum (NTU)	10.0	7.4	50.0	10.0	14.0
Maximum (NTU)	112.0	216.0	1050.0	240.0	150.0
Median (NTU)	25.0	16.0	185.0	30.0	22.0
No. Values > 25 NTU	6	1	11	9	6
% Values > 25 NTU	50%	8%	100%	75%	46%

Table 3.2. TSS data for subsegments 101503, 101505, 101601, and 101602.

	Station 371	Station 1226	Station 1225	Station 1228	Station 1229
Station Description	Saline Bayou east of Alexandria, Louisiana	Larto Lake west of New Era, Louisiana	Larto Bayou west of Book, Louisiana	Bayou Cocodrie south of Monterey, Louisiana	Cocodrie Lake north of Monterey, Louisiana
Subsegment	101503	101505	101505	101601	101602
Period of Record	1/22/02 – 12/17/02	1/22/02 – 12/17/02	1/22/02 – 11/18/02	1/28/02 – 12/16/02	1/28/02 – 12/16/02
No. of Values	12	12	11	12	13
Minimum (mg/L)	7.0	6.6	20.6	12.0	17.0
Maximum (mg/L)	100.0	73.0	1360.0	168.0	140.0
Median (mg/L)	18.3	18.8	113.0	35.7	28.0

3.3 Relationships of Turbidity and TSS vs. Flow

Plots of turbidity and TSS versus estimated stream flow were also developed to examine any correlation between these water quality parameters and stream flow rates (Figures B.11 through B.20, Appendix B). For the most part, these plots don't show a correlation between turbidity or TSS and stream flow. Data from the water quality stations on Saline Bayou and Bayou Cocodrie however, show slight correlations between flow and turbidity (Figures B.11 and B.14).

3.4 Relationships Between TSS and Turbidity

Plots of TSS versus turbidity for each station (Figures B.21 through B.25, Appendix B) show a noticeable correlation, with higher turbidity levels tending to correspond with higher TSS concentrations. Linear regression was preformed on the natural logarithms of turbidity and TSS for each of the water quality stations. The results of these regressions are summarized in Table 3.3. The regressions were performed using the natural logarithms of the data (rather than the raw data values) because turbidity and TSS usually fit a lognormal distribution better than a normal distribution.

Table 3.3. Summary of results of linear regression of turbidity and TSS.

Sampling Station	Regression Equation	Number of Data	R^2	Significance Level (P value)
371	$Turbidity=1.4942*TSS^{0.9088}$	11	0.583	3.8×10^{-3}
1225	$Turbidity=4.3384*TSS^{0.7571}$	11	0.724	8.9×10^{-4}
1226	$Turbidity=0.9514*TSS^{1.0227}$	12	0.615	2.5×10^{-3}
1228	$Turbidity=0.3867*TSS^{1.2787}$	12	0.926	5.5×10^{-7}
1229	$Turbidity=0.6829*TSS^{1.0865}$	13	0.898	8.9×10^{-7}

The strength of the linear relationship is measured by the coefficient of determination (R^2) calculated during the regression analysis (Zar 1996). The R^2 value is the percentage of the total variation in ln turbidity that is explained or accounted for by the fitted regression (ln TSS). For example, for station 1229, 90% of the variation in TSS is accounted for by turbidity and the remaining 10% of variation in turbidity is unexplained. The unexplained portion is attributed to factors other than TSS. The correlations between TSS and turbidity were somewhat variable, with R^2 values ranging from 0.58 (moderate) to 0.93 (good).

The statistical significance for each regression was evaluated by computing the “P value” for the slope for each regression. The P value is essentially the probability that the slope of the regression line is really zero. Thus, a low P value indicates that a non-zero slope calculated from the regression analysis is statistically significant. For these regressions, the P values were all less than 0.05 (Table 3.3), which is considered statistically significant.

4.0 EXISTING WATER QUALITY FOR TDS AND SULFATE

4.1 General Description of Data

Within the study area, only one subsegment (101505) was impaired for TDS and sulfate. Data for these parameters have been collected by LDEQ at two sites in this subsegment, 1225 (Larto Bayou) and 1226 (Larto Lake). Locations of these sampling sites are shown on Figure A.1 (Appendix A). Tables 4.1 and 4.2 show summaries of these data. Time series plots of data for the entire period of record at each station are shown on Figures C.1 and C.2 for TDS and Figures C.3 and C.4 for sulfate (Appendix C). These data were obtained from LDEQ.

Table 4.1. TDS data available for subsegment 101505.

	Station 1225	**Station 1226**
Station Description	Larto Bayou west of Book, Louisiana	Larto Lake west of New Era, Louisiana
Period of Record	1/22/02 – 11/18/02	1/22/02 – 12/17/02
No. of Values	11	12
Minimum (mg/L)	143.0	40.7
Maximum (mg/L)	401.0	319.0
Median (mg/L)	207.0	63.3
No. Values > 165 mg/L	8	1
% Values > 165 mg/L	73%	8%

Table 4.2. Sulfate data available for subsegment 101505.

	Station 1225	**Station 1226**
Station Description	Larto Bayou west of Book, Louisiana	Larto Lake west of New Era, Louisiana
Period of Record	1/22/02 – 11/18/02	1/22/02 – 12/17/02
No. of Values	11	12
Minimum (mg/L)	3.8	3.7
Maximum (mg/L)	29.1	22.4
Median (mg/L)	16.3	5.7
No. Values > 10 mg/L	8	1
% Values > 10 mg/L	73%	8%

4.2 Seasonal Patterns

No seasonal patterns are apparent in the water quality data plots for subsegment 101505 (Figures C.1 through C.4, Appendix C).

4.3 Relationships Between Concentration and Flow

Plots of TDS and sulfate versus estimated stream flow were also developed to examine any correlation between concentration and flow (Figures C.5 through C.8, Appendix C). The Larto Lake data plots generally show that the highest concentrations occurred during the highest estimated flow. The Bayou Larto sulfate data plot shows that the lowest concentration occurred during the highest estimated flow. No relationship between TDS and flow is apparent for the Bayou Larto data.

5.0 TMDL DEVELOPMENT

5.1 Seasonality and Critical Conditions

US EPA regulations at 40 CFR 130.7 require the determination of TMDLs to take into account critical conditions for stream flow, loading, and water quality parameters. Also, both Section 303(d) of the Clean Water Act and regulations at 40 CFR 130.7 require TMDLs to consider seasonal variations for meeting water quality standard. Therefore, the historical data and analyses discussed in Sections 3.0 and 4.0 were used to evaluate whether there were certain flow conditions or certain periods of the year that could be used to characterize critical conditions.

For turbidity, no significant relationships were found between turbidity or TSS and estimated stream flow. Although turbidity and TSS values appeared to be slightly higher during the winter at some of the water quality stations, there was not enough data to confirm the pattern. For TDS and sulfate, no significant seasonal patterns or relationships with estimated stream flow were found. Based on these analyses, the TMDLs in this report were not developed on a seasonal basis. The methodology used to develop these TMDLs (load duration curve) addresses a wide range of flow conditions.

5.2 Water Quality Targets

Turbidity is an expression of the optical properties in a water sample that cause light to be scattered or absorbed and is caused by suspended matter, such as clay, silt, finely divided organic and inorganic matter; soluble colored organic compounds; and plankton and other microscopic organisms (Standard Methods 1999). Turbidity cannot be expressed as a load as preferred for TMDLs. To achieve a load based value, turbidity is often correlated with a surrogate parameter such as TSS that can be expressed as a load. For the turbidity TMDLs, the relationships between turbidity and TSS presented in Section 3.4 were used to develop target TSS concentrations (i.e., numeric endpoints for the TMDLs). The target TSS concentrations calculated from the turbidity criterion of 25 NTU are presented in Table 5.1. Note that the target for subsegment 101505 is calculated based on the relationship for the Larto Lake water quality station (1226), since Larto Lake is the primary waterbody in subsegment 101505.

Table 5.1. Target TSS concentrations for turbidity TMDLs.

Water Quality Station	Regression Equation	Subsegment	Turbidity Guideline	Target TSS Concentration
371	$Turbidity=1.4942*TSS^{0.9088}$	101503	25 NTU	22 mg/L
1226	$Turbidity=0.9514*TSS^{1.0227}$	101505	25 NTU	24 mg/L
1228	$Turbidity=0.3867*TSS^{1.2787}$	101601	25 NTU	26 mg/L
1229	$Turbidity=0.6829*TSS^{1.0865}$	101602	25 NTU	28 mg/L

The water quality targets for TDS and sulfate were simply the criteria from the standards (Section 2.8). TDS and sulfate can easily be expressed as mass, so there was no need to use surrogate parameters.

5.3 Methodology for TMDL Calculations

The methodology used for all of the TMDLs in the report is the load duration curve. Because loading capacity varies as a function of the flow present in the stream, these TMDLs represent a continuum of desired loads over all flow conditions, rather than fixed at a single value. The basic elements of this procedure are documented on the Kansas Department of Health and Environment (KDHE) web site (2005). This method was used to illustrate allowable loading at a wide range of flows. The steps for how this methodology was applied for the TMDLs in this report can be summarized as follows:

1. Develop a flow duration curve (Section 5.4).
2. Convert the flow duration curve to load duration curves (Section 5.5).
3. Plot observed loads with load duration curves (Section 5.6).
4. Calculate TMDL, MOS, FG, WLA, and LA (Sections 5.7 - 5.9).
5. Calculate percent reductions required to meet assessment criteria (Section 5.10).

5.4 Flow Duration Curve

A flow per unit area duration curve was developed for each subsegment. Daily streamflow measurements from Bayou des Glaises Diversion Channel at Moreauville, Louisiana (USGS Gage Number 07383500) were sorted in increasing order and the percentile ranking of each flow was calculated. The data from the Bayou des Glaises Diversion Channel gage were used because the load duration methodology requires that the same flow data be used for developing the flow duration as for calculating observed loads from sampling data. The Bayou des Glaises Diversion Channel gage was the closest flow gage with data during the years that water quality sampling occurred.

5.5 Load Duration Curves

For each TMDL parameter (TSS, TDS, and sulfate), the flows per unit area from the flow duration curves were multiplied by the appropriate target concentration (from Section 5.2) to make an allowable load per unit area duration curve. Each load duration curve is a plot of tons per day per mi^2 of drainage area versus the percent exceedances from the flow duration curve. The load duration curves are presented in the following appendices:

APPENDIX D:	load duration curve for subsegment 101503 TSS
APPENDIX E:	load duration curve for subsegment 101505 TSS
APPENDIX F:	load duration curve for subsegment 101601 TSS
APPENDIX G:	load duration curve for subsegment 101602 TSS
APPENDIX H:	load duration curve for subsegment 101505 sulfate
APPENDIX I:	load duration curve for subsegment 101505 TDS

The calculations for these load duration curves are shown in Tables D.1, E.1, F.1, G.1, H.1, and I.1.

The load duration curve is beneficial when analyzing monitoring data with its corresponding flow information plotted as a load. This allows the monitoring data to be plotted in relation to its place 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 will allow analysis of load cases in the future for different flow regimes.

5.6 Observed Loads

For each sampling station, observed loads were calculated by multiplying each observed concentration of TSS, TDS, or sulfate by the flow per unit area on the sampling day. These observed loads were then plotted versus the percent exceedances of the flow per unit area on the sampling day and placed on the same plot as the load duration curve. These plots are shown in the appendices of this report as follows:

Figure D.1:	plot of loads for TSS in subsegment 101503
Figure E.1	plots of loads for TSS in subsegment 101505
Figure F.1:	plot of loads for TSS in subsegment 101601
Figure G.1:	plot of loads for TSS in subsegment 101602
Figure H.1:	plot of loads for sulfate in subsegment 101505
Figure I.1:	plot of loads for TDS in subsegment 101505

These plots provide visual comparisons between observed and allowable loads under different flow conditions. Observed loads that are plotted above the load duration curve (identified as “TMDL - FG” curve in the legend in the TSS TMDLs and "TMDL - MOS - FG" curve in the legend in the other TMDLs) represent conditions where observed water quality concentrations exceed the target concentrations. Observed loads below the load duration curve represent conditions where observed water quality concentrations were less than target concentrations (i.e., not violating water quality standard).

5.7 TMDL, MOS, and FG

Each TMDL was calculated as the area under the load duration curve. Because the load duration curves were expressed in mass per unit drainage area, the area under the curve ($lb/day/mi^2$) was multiplied by the subsegment drainage area.

Both Section 303(d) of the Clean Water Act and regulations at 40 CFR 130.7 require TMDLs to include a 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 may be expressed explicitly as unallocated assimilative capacity or implicitly through conservative assumptions used in establishing the TMDL. For the turbidity TMDLs, an implicit MOS was incorporated through the use of conservative assumptions. The primary conservative assumption was calculating the TMDL assuming that TSS is a conservative parameter and does not settle out of the water column. For the TDS and sulfate TMDLs, an explicit MOS was established as 10% of the TMDL. All the TMDLs had an explicit FG of 10% of the TMDL (in addition to the MOS).

5.8 Point Source Loads

The WLA for the point source was set to zero in the subsegment 101601 TMDL because it was not a source of TSS. WLAs for the remaining TMDLs were also set to zero because there were no point sources located in the other subsegments.

5.9 Nonpoint Source Loads

For each of the TMDLs in this report, the LA for nonpoint sources was set equal to the TMDL minus the MOS, FG, and the WLA. For the turbidity TMDLs, the LA was effectively the TMDL minus FG because the WLA was zero and the MOS was implicit. For the sulfate and TDS TMDLs, the LA was effectively the TMDL minus the MOS and FG (because the WLA was zero). Calculations for the TMDLs, MOSs, and LAs are shown in the appendices as follows:

Table D.2:	calculations for TSS for subsegment 101503
Table E.2:	calculations for TSS for subsegment 101505
Table F.2:	calculations for TSS for subsegment 101601
Table G.2:	calculations for TSS for subsegment 101602
Table H.2:	calculations for sulfate for subsegment 101505
Table I.2:	calculations for TDS for subsegment 101505

5.10 Percent Reductions

In addition to calculating allowable loads, estimates were made for percent reductions of nonpoint source loads that would be needed for all of the observed loads to be on or below the load duration curve. The observed loads of TSS, sulfate, and TDS at each sampling station were reduced until none of the loads were above the load duration curve. The results of these percent reduction calculations are shown in Tables 5.2 through 5.4.

Table 5.2. Summary of turbidity TMDLs.

Subsegment	Stream Name	Loads (tons/day of TSS)					Percent Reduction Needed
		WLA	LA	MOS	FG	TMDL	
101503	Old Saline Bayou	0	2.09	impl	0.23	2.32	81%
101505	Larto Lake	0	3.06	impl	0.34	3.40	71%
101601	Bayou Cocodrie	0	10.06	impl	1.12	11.18	87%
101602	Cocodrie Lake	0	13.29	impl	1.48	14.77	82%

Table 5.3. Sulfate TMDL for subsegment 101505.

Subsegment	Stream Name	Loads (tons/day of sulfate)					Percent Reduction Needed
		WLA	LA	MOS	FG	TMDL	
101505	Larto Lake	0	0.91	0.11	0.11	1.13	20%

Table 5.4. TDS TMDL for subsegment 101505.

Subsegment	Stream Name	Loads (tons/day of TDS)					Percent Reduction Needed
		WLA	LA	MOS	FG	TMDL	
101505	Larto Lake	0	14.94	1.87	1.87	18.68	59%

6.0 OTHER RELEVANT INFORMATION

This TMDL has been developed to be consistent with the State antidegradation policy (LAC 33:IX.1109.A).

LDEQ will work with other agencies such as local Soil Conservation Districts to implement nonpoint source best management practices in the watershed through the 319 programs. LDEQ will also continue to monitor the waters to determine whether standards are being attained.

In accordance with Section 106 of the federal Clean Water Act, and under the authority of the Louisiana Environmental Quality Act, the LDEQ has established a comprehensive program for monitoring the quality of the State's surface waters. The LDEQ Surveillance Section collects surface water samples at various locations, utilizing appropriate sampling methods and procedures for ensuring 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 data base for water quality trend analysis, and to monitor the effectiveness of pollution controls. The data obtained through the surface water monitoring program is used to develop the State's biennial 305(b) report (Water Quality Inventory) and the 303(d) list of impaired waters. This information is also utilized in establishing priorities for the LDEQ nonpoint source program.

The LDEQ has implemented a watershed approach to surface water quality monitoring. Through this approach, the entire state is sampled over 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 on a monthly basis to yield approximately 12 samples per site each year the site is monitored. Sampling sites are located where they are considered to be representative of the waterbody. Under the current monitoring schedule, approximately one half of the State's waters are newly assessed for each 305(b) and 303(d) listing biennial cycle, with sampling occurring statewide each year. The 4-year cycle follows an initial 5-year rotation that covered all basins in the state according to the TMDL priorities. This will allow the LDEQ to determine whether there has been any improvement in water quality following implementation of the TMDLs. As the monitoring results are evaluated at the end of each year, waterbodies may be added to or removed from the 303(d) list.

Hurricane Katrina made landfall on Monday, August 29, 2005 as a category 4 hurricane. The storm brought heavy winds and rain to southeast Louisiana, breaching several levees and flooding up to 80% of New Orleans and large areas of coastal Louisiana. Much of the area that was flooded in Hurricane Katrina was re-flooded by storm surge from Hurricane Rita. Both Hurricanes Katrina and Rita have caused a significant amount of change in sedimentation and water quality in south Louisiana. Many wastewater treatment facilities were temporarily or permanently damaged. Some wastewater treatment facilities will rebuild while others will relocate. The hurricanes expedited the loss of coastal land and modified the hydrology of some of the coastal waterbodies. Several federal and state agencies including US EPA and LDEQ are engaged in collecting environmental data and assessing the recovery of the Gulf of Mexico waters. The proposed TMDLs were developed based on the pre-hurricane conditions. Therefore, the post-hurricane conditions and other factors may delay the implementation of the proposed TMDLs or render the proposed TMDLs obsolete or may require modifications of the TMDLs.

7.0 PUBLIC PARTICIPATION

When US EPA establishes a TMDL, federal regulations require US EPA to publicly notice and seek comment concerning the TMDL. These TMDLs were prepared under contract to US EPA. After development of the TMDLs, US EPA will prepare a notice seeking comments, information, and data from the general public and affected public. Any comments, data, or information submitted during the public comment period will be addressed in the final TMDL, which will then be transmitted to LDEQ for implementation and for incorporation into LDEQ's current water quality management plan.

8.0 REFERENCES

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APPENDIX A

Maps

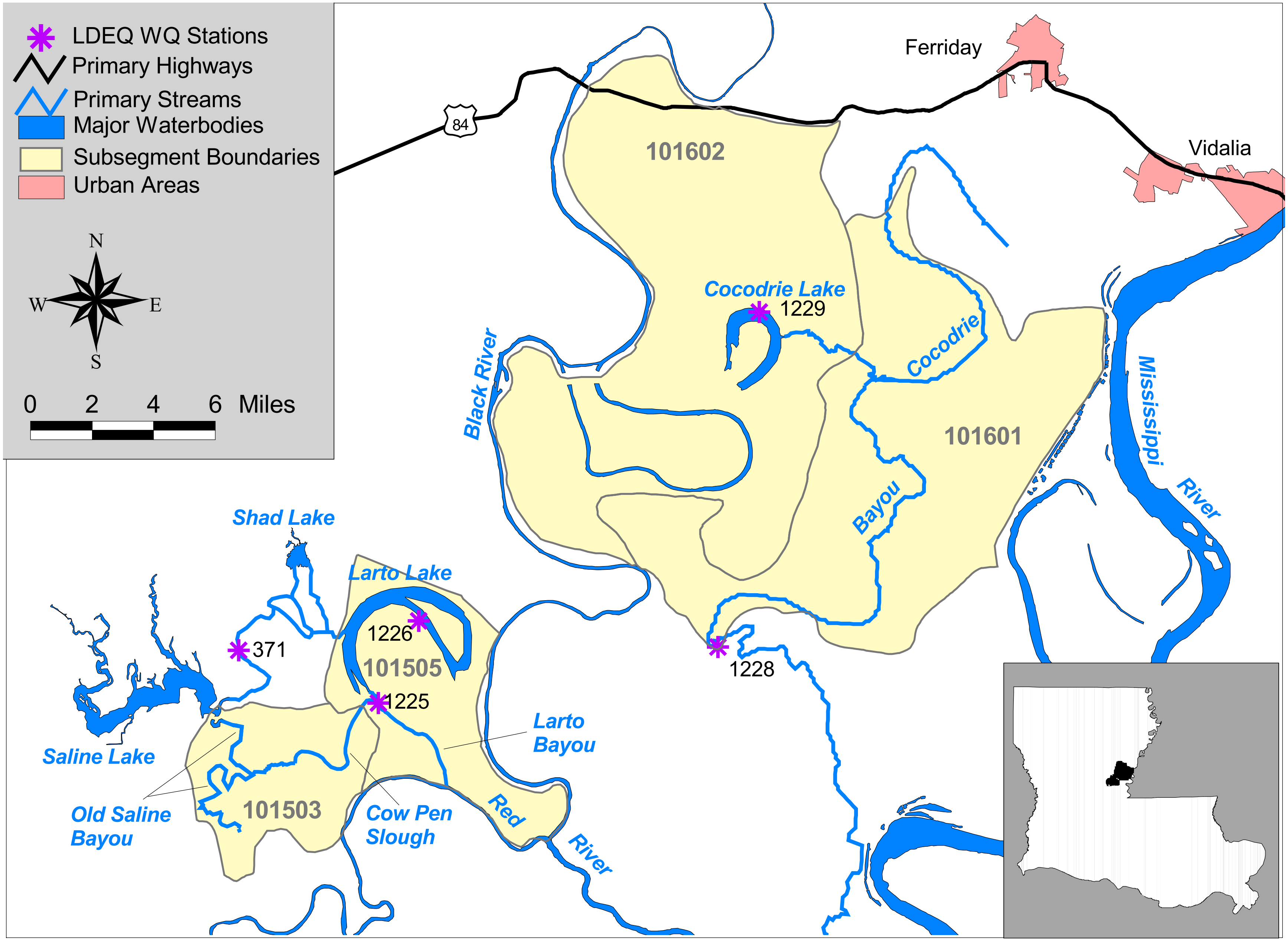


Figure A.1. Watershed map for subsegments 101503, 101505, 101601, and 101602.

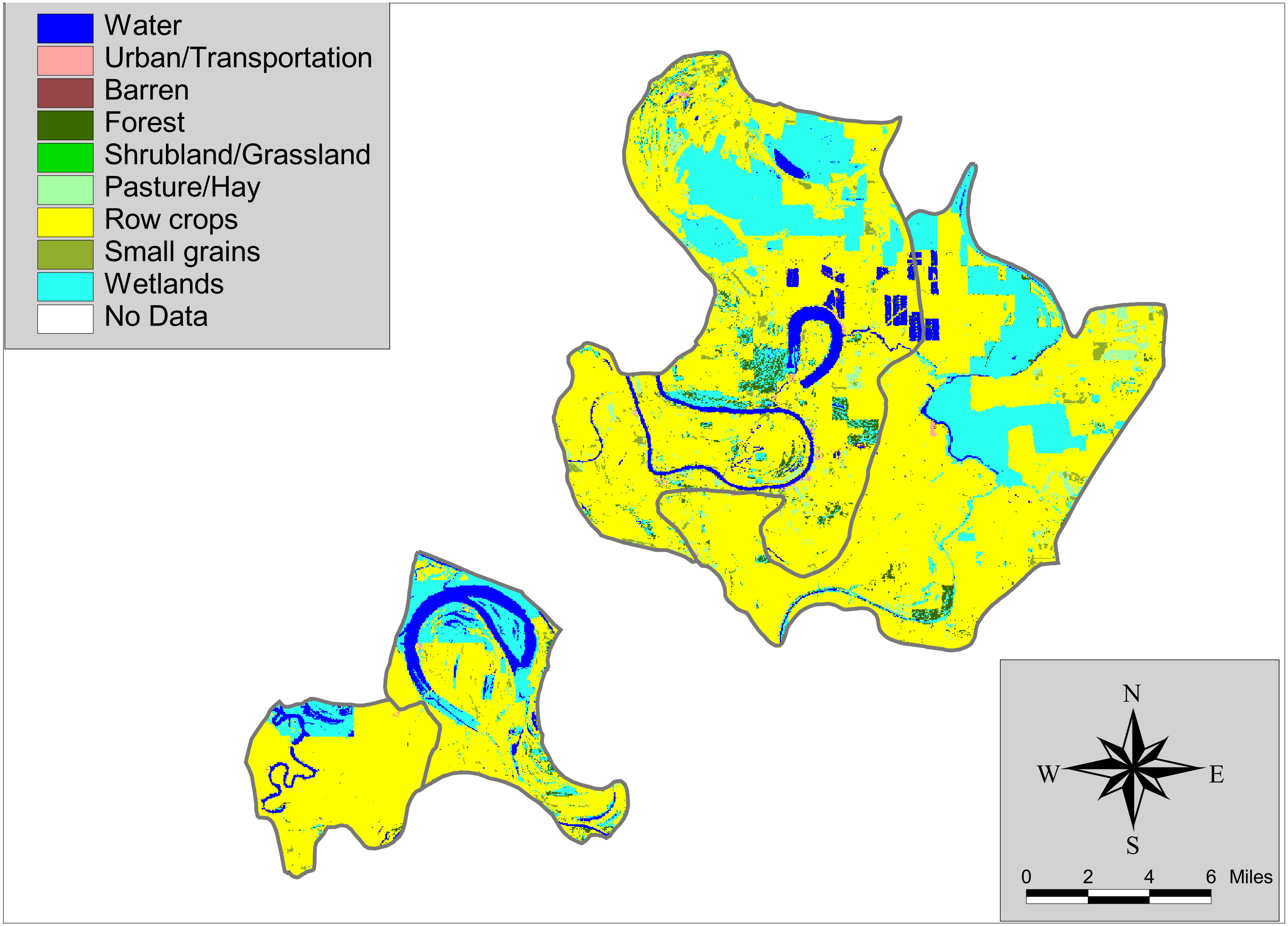


Figure A.2. Land use for subsegments 101503,101505,101601, and 101602.

APPENDIX B

Turbidity and TSS Data

Figure B.1 Turbidity for Saline Bayou east of Alexandria, LA (0371)

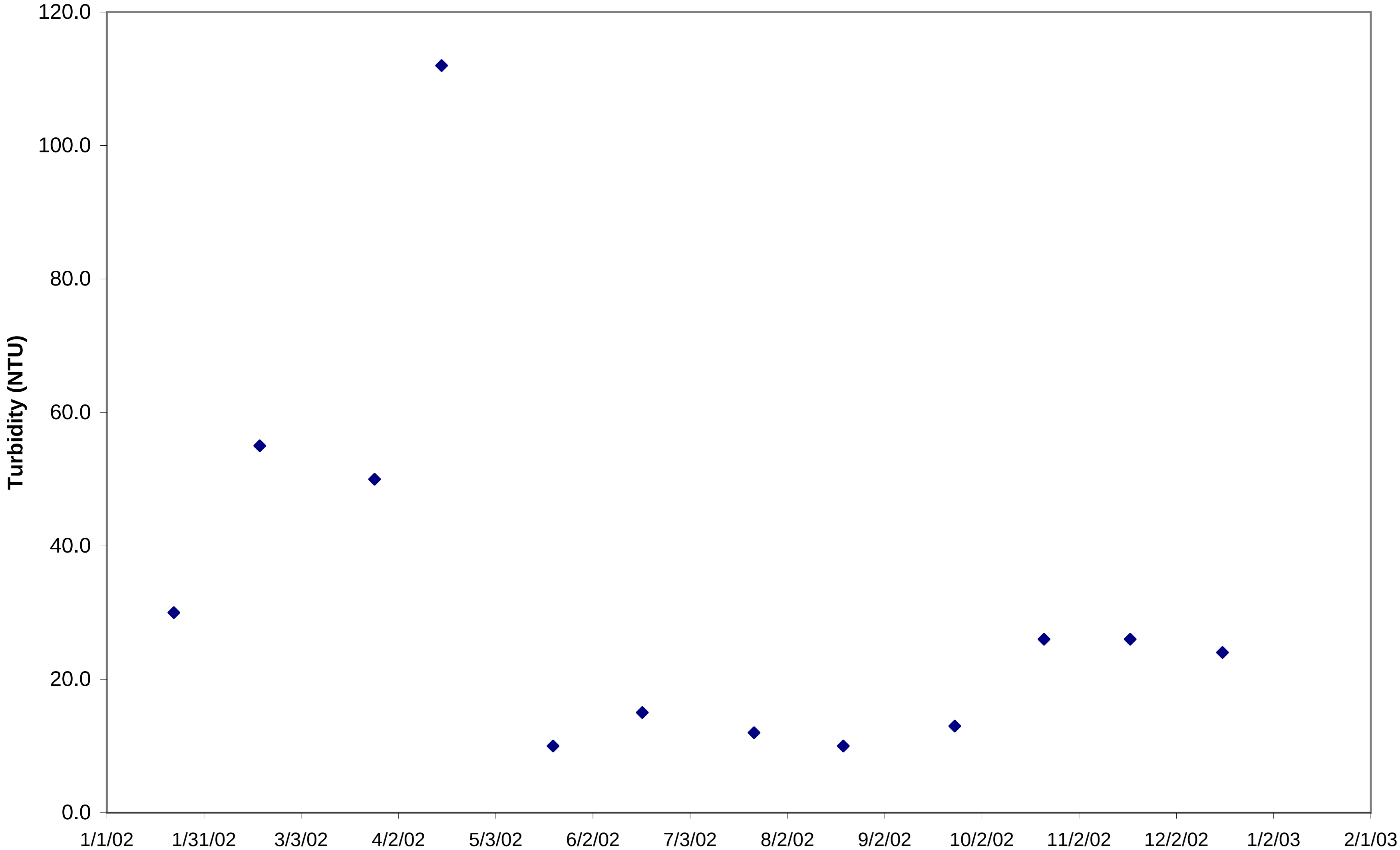


Figure B.2 Observed Turbidity for Larto Lake west of New Era, LA (1226)

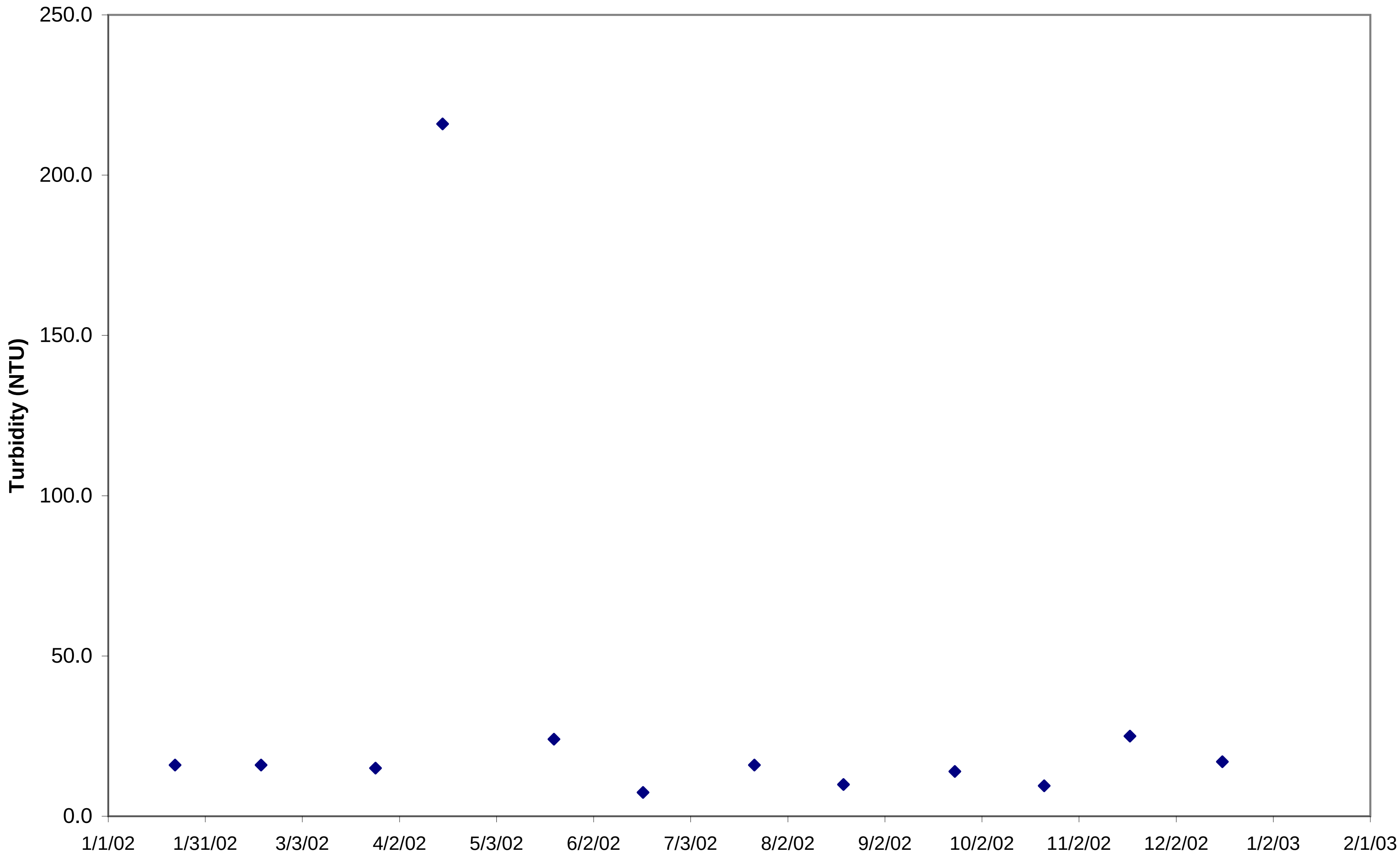


Figure B.3 Observed Turbidity for Larto Bayou west of Book, LA (1225)

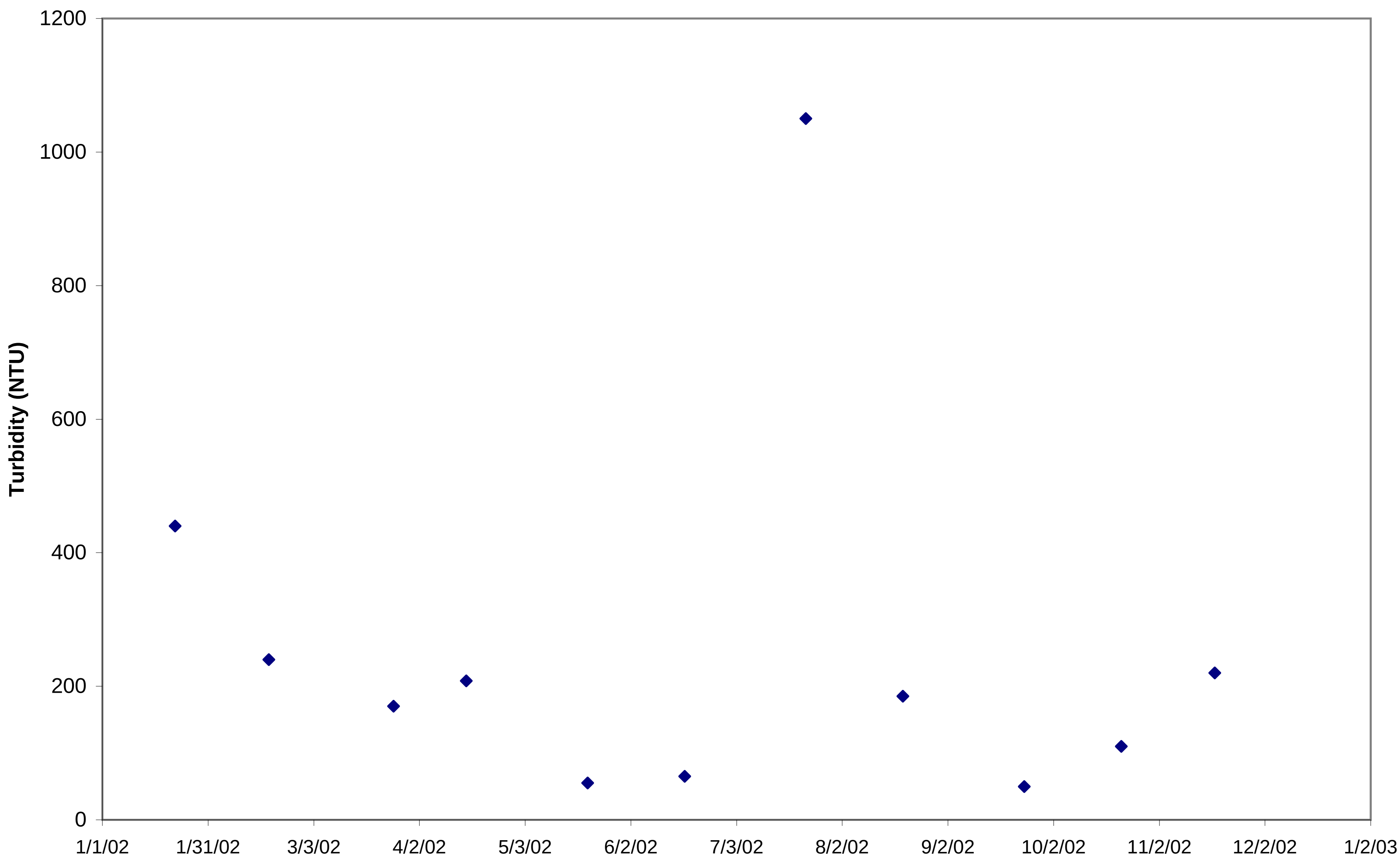


Figure B.4 Observed Turbidity for Bayou Cocodrie south of Monterey, LA (1228)

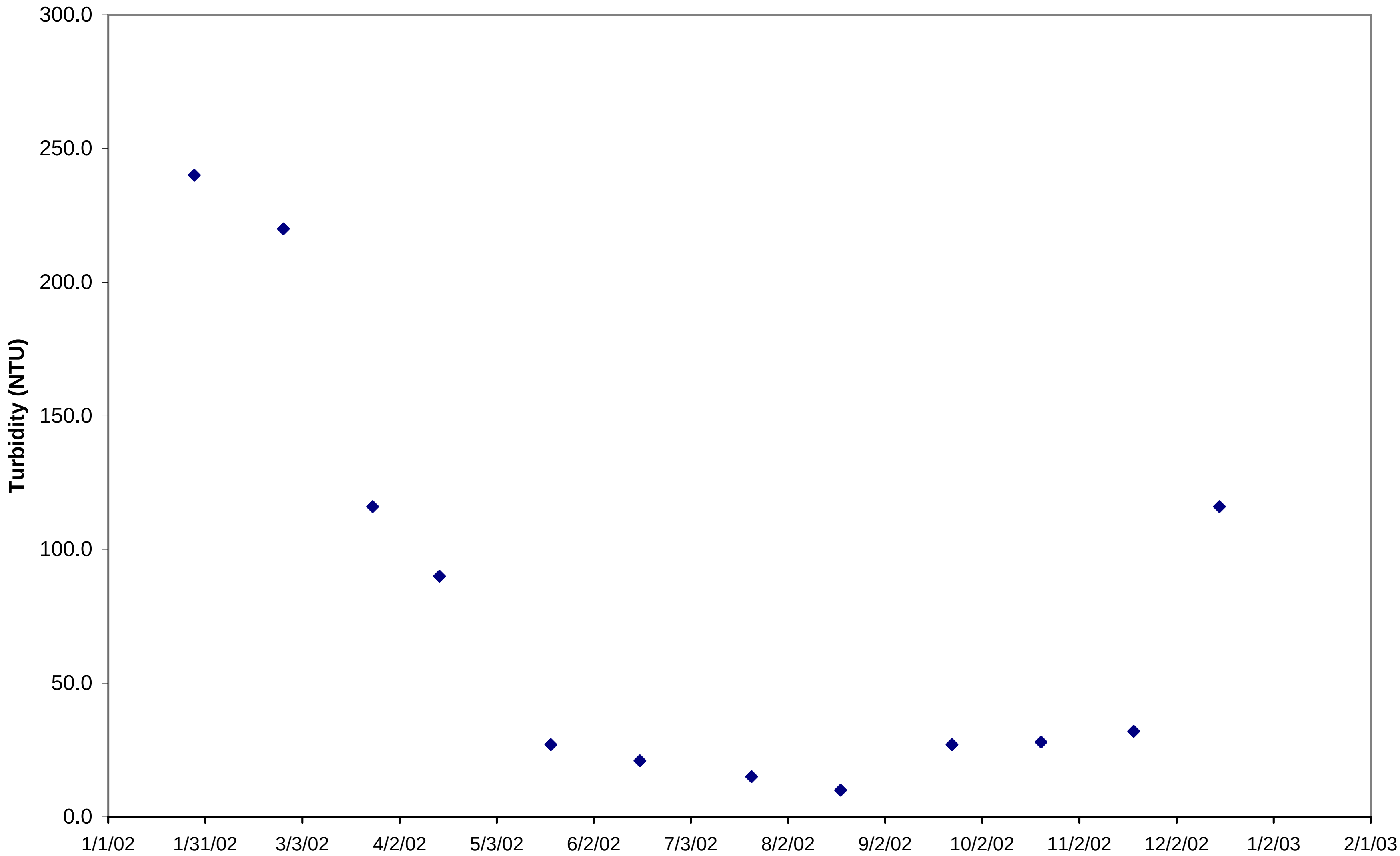


Figure B.5 Observed Turbidity for Cocodrie Lake north of Monterey, LA (1229)

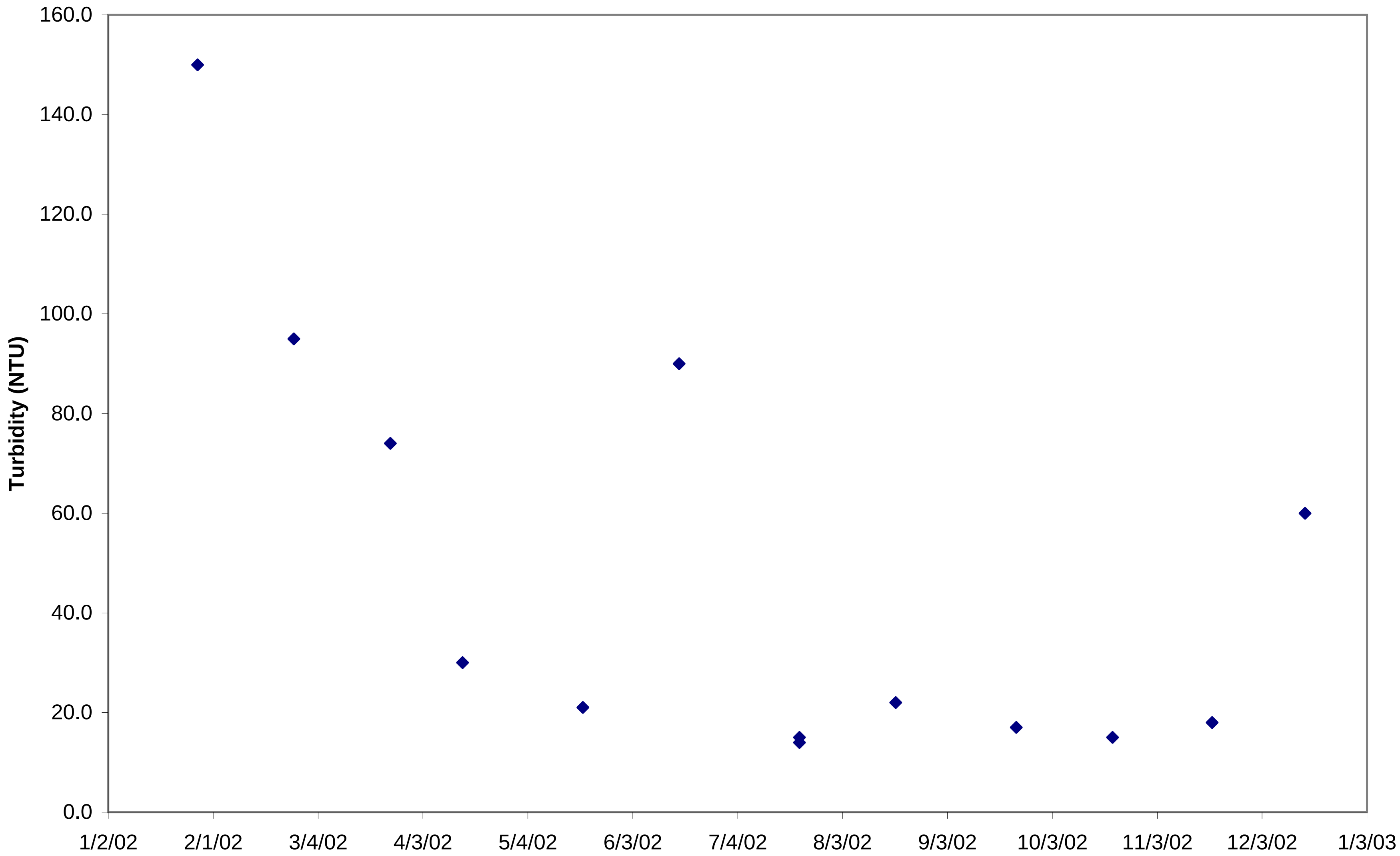


Figure B.6 TSS for Saline Bayou east of Alexandria, LA (0371)

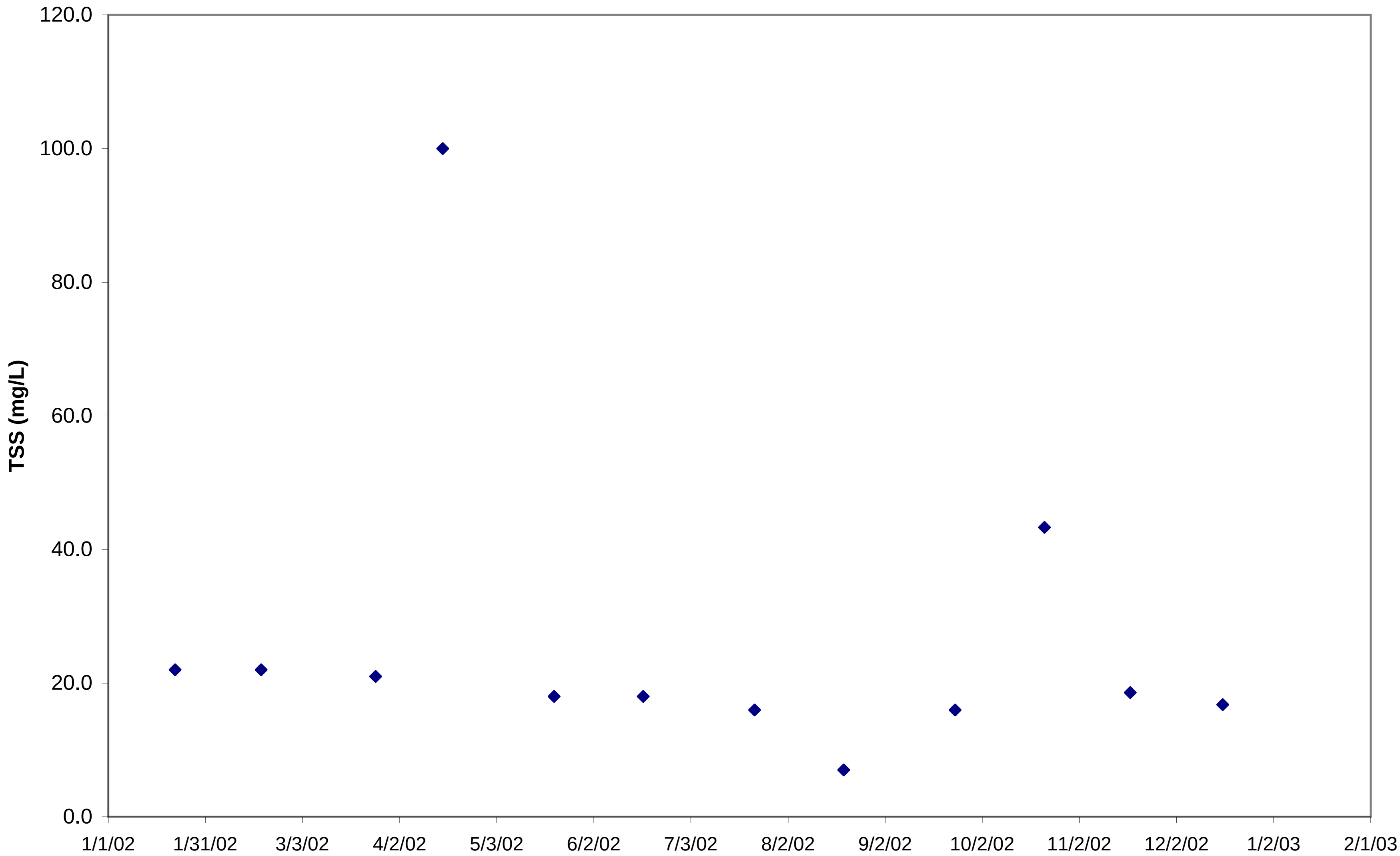


Figure B.7 Observed TSS for Larto Lake west of New Era, LA (1226)

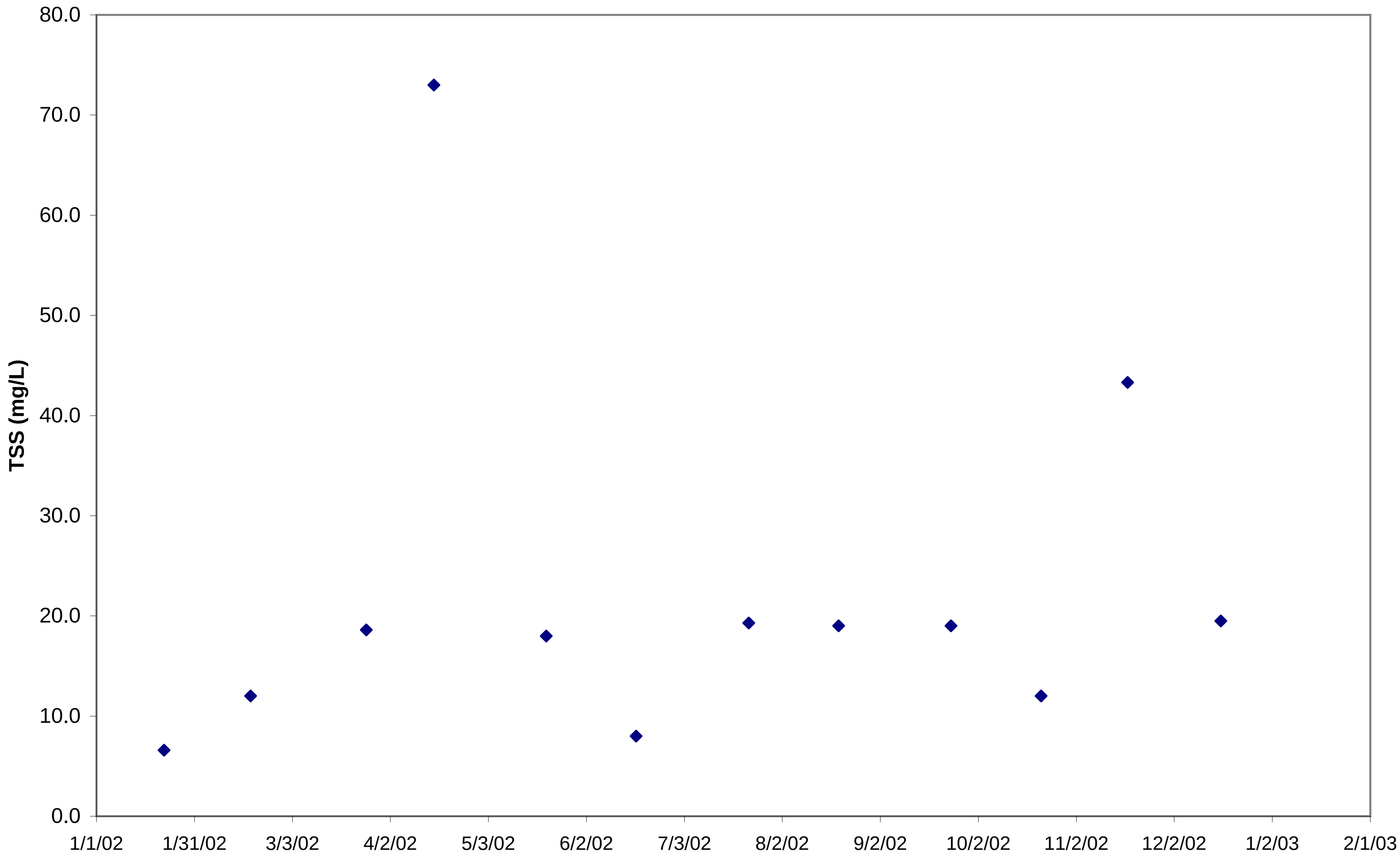


Figure B.8 Observed TSS for Larto Bayou west of Book, LA (1225)

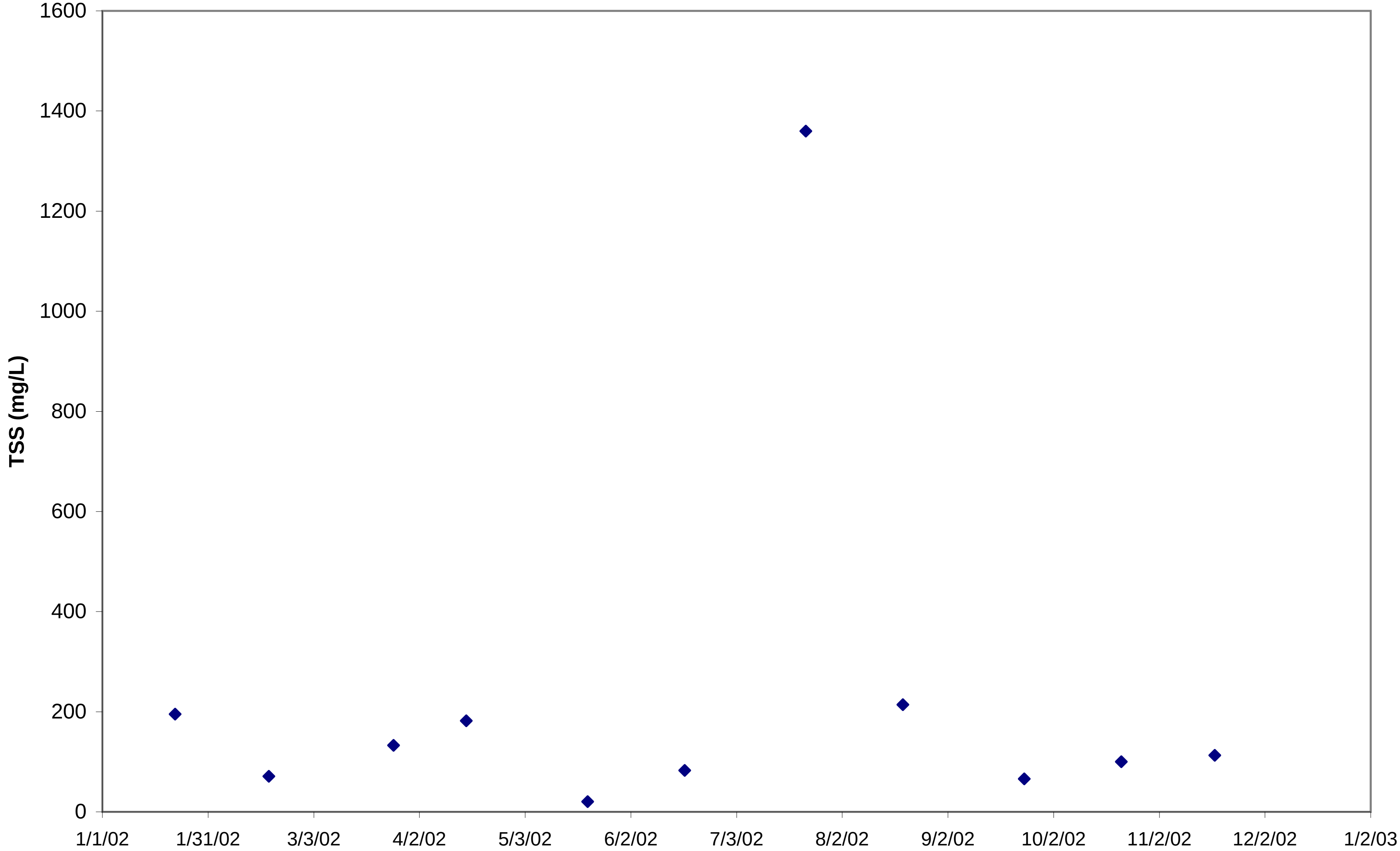


Figure B.9 Observed TSS for Bayou Cocodrie south of Monterey, LA (1228)

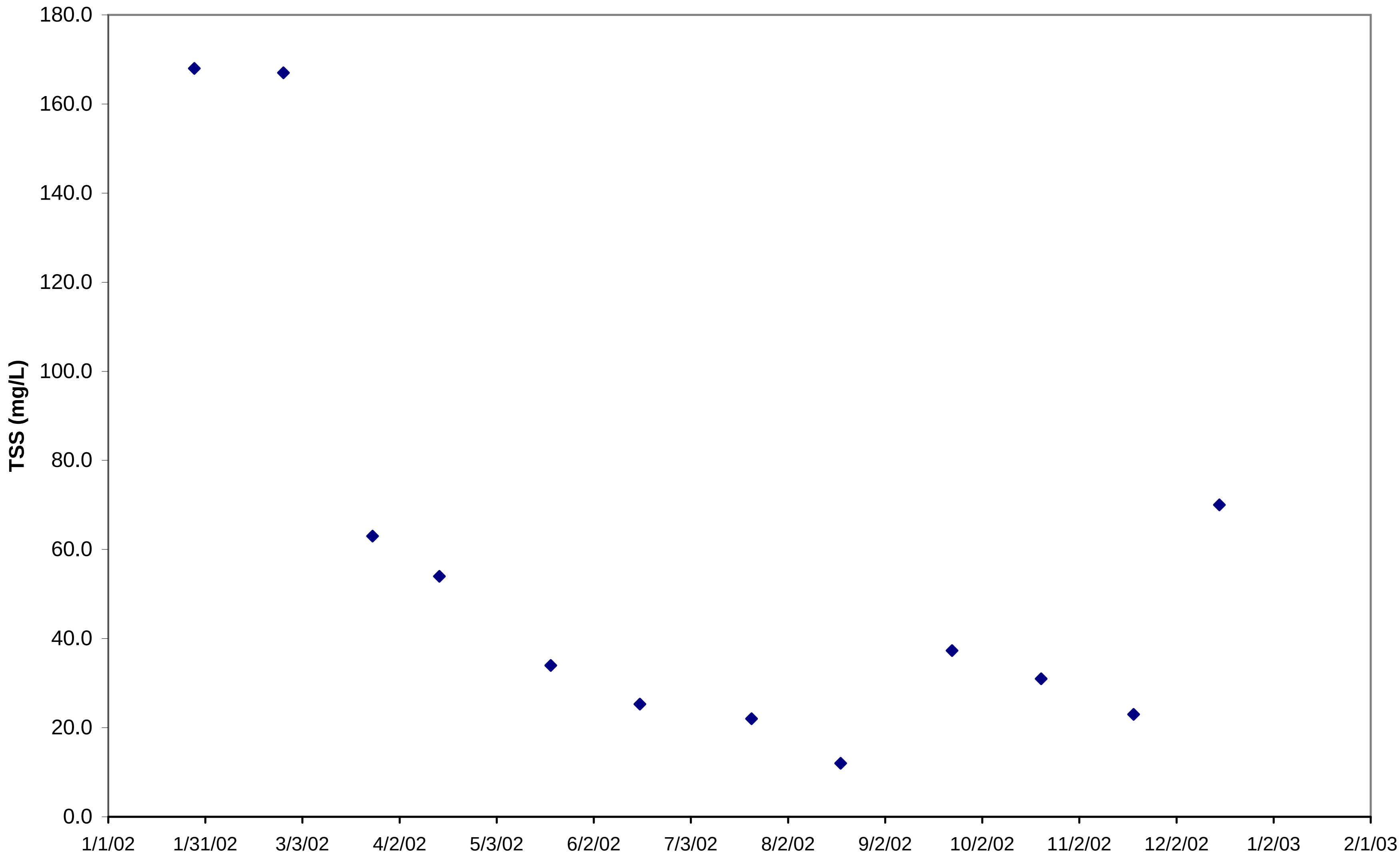


Figure B.10 Observed TSS for Cocodrie Lake north of Monterey, LA (1229)

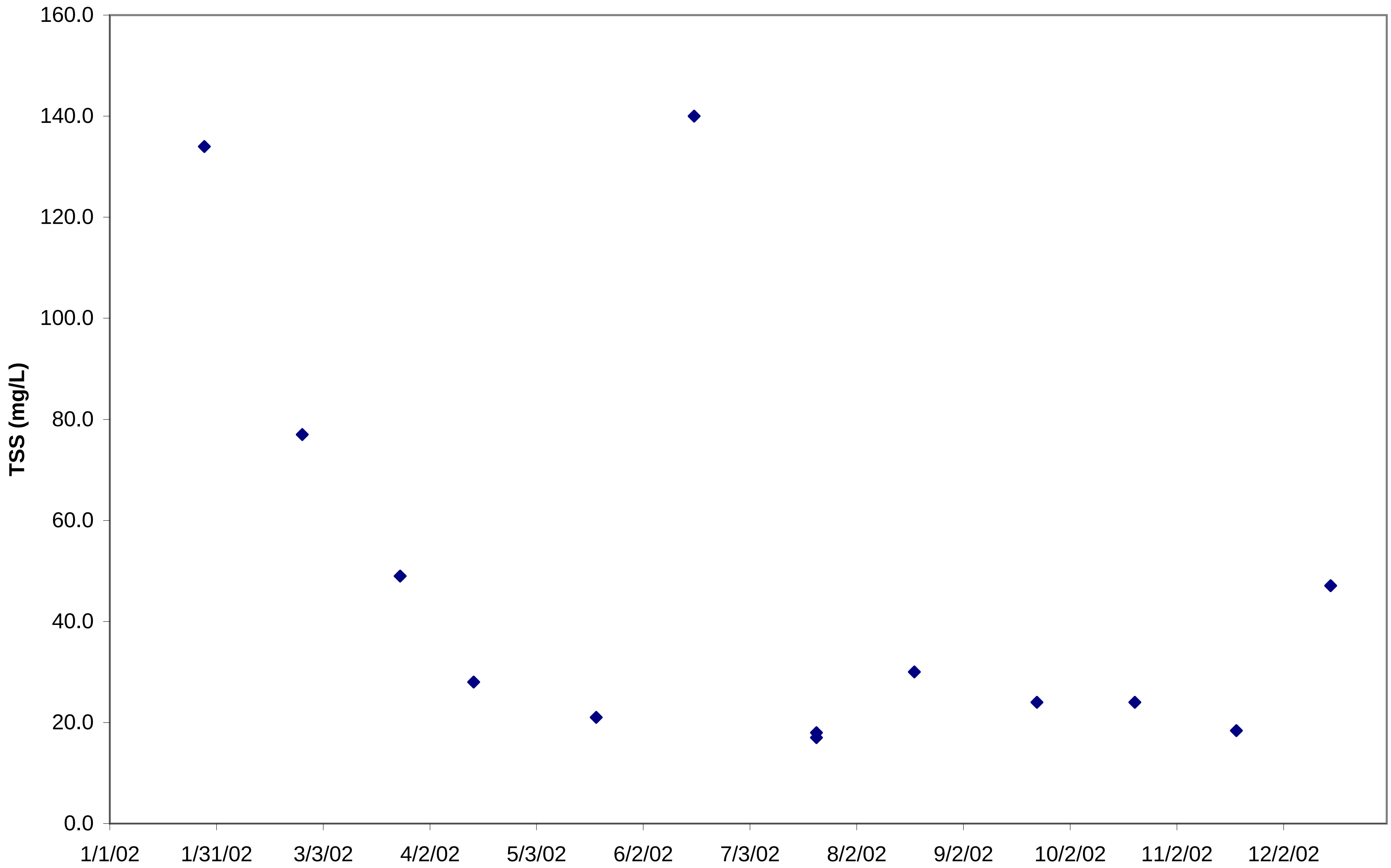


Figure B.11 Flow vs Turbidity for Saline Bayou east of Alexandria, LA (0371)

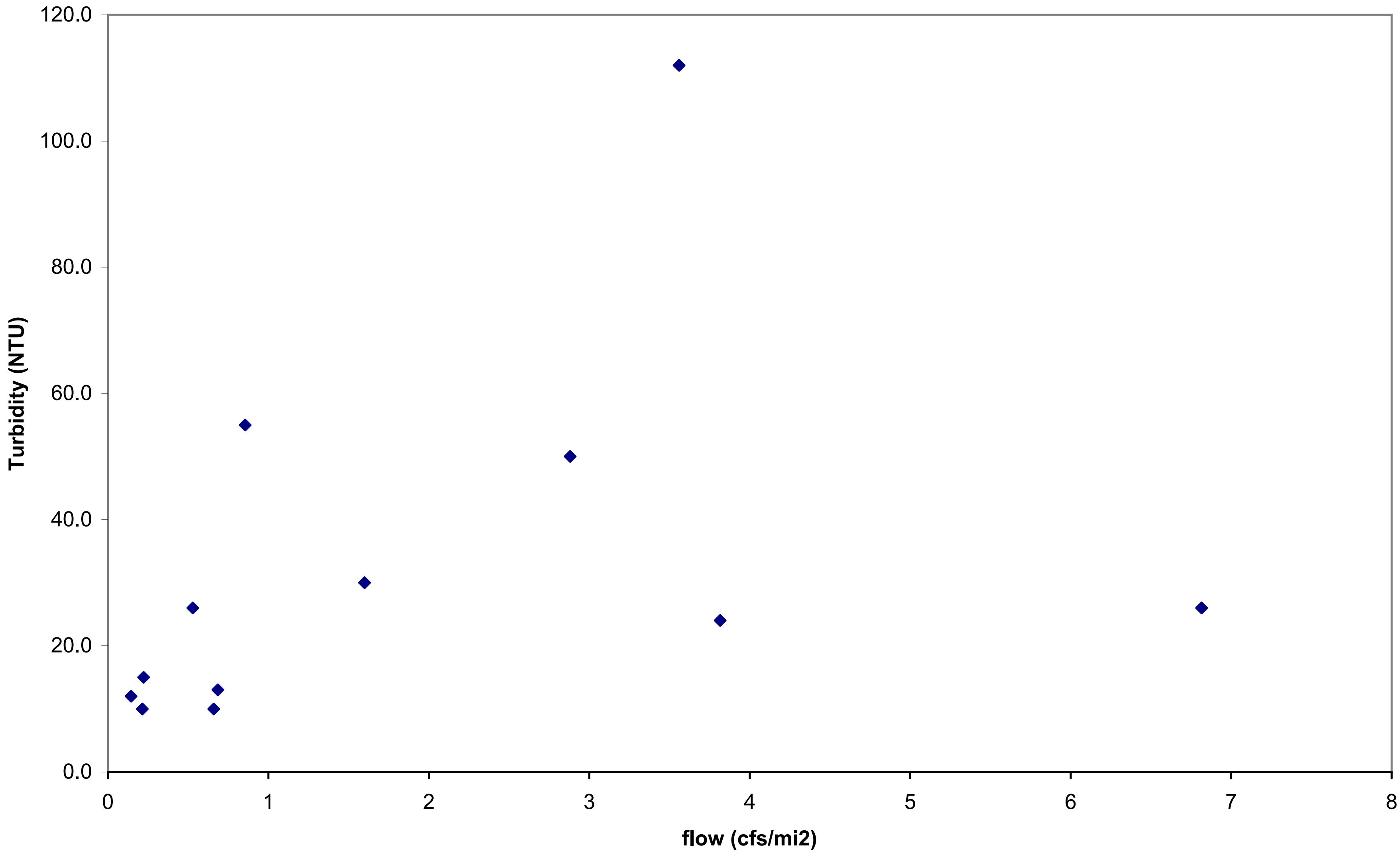


Figure B.12 Flow vs Turbidity for Larto Lake west of New Era, LA (1226)

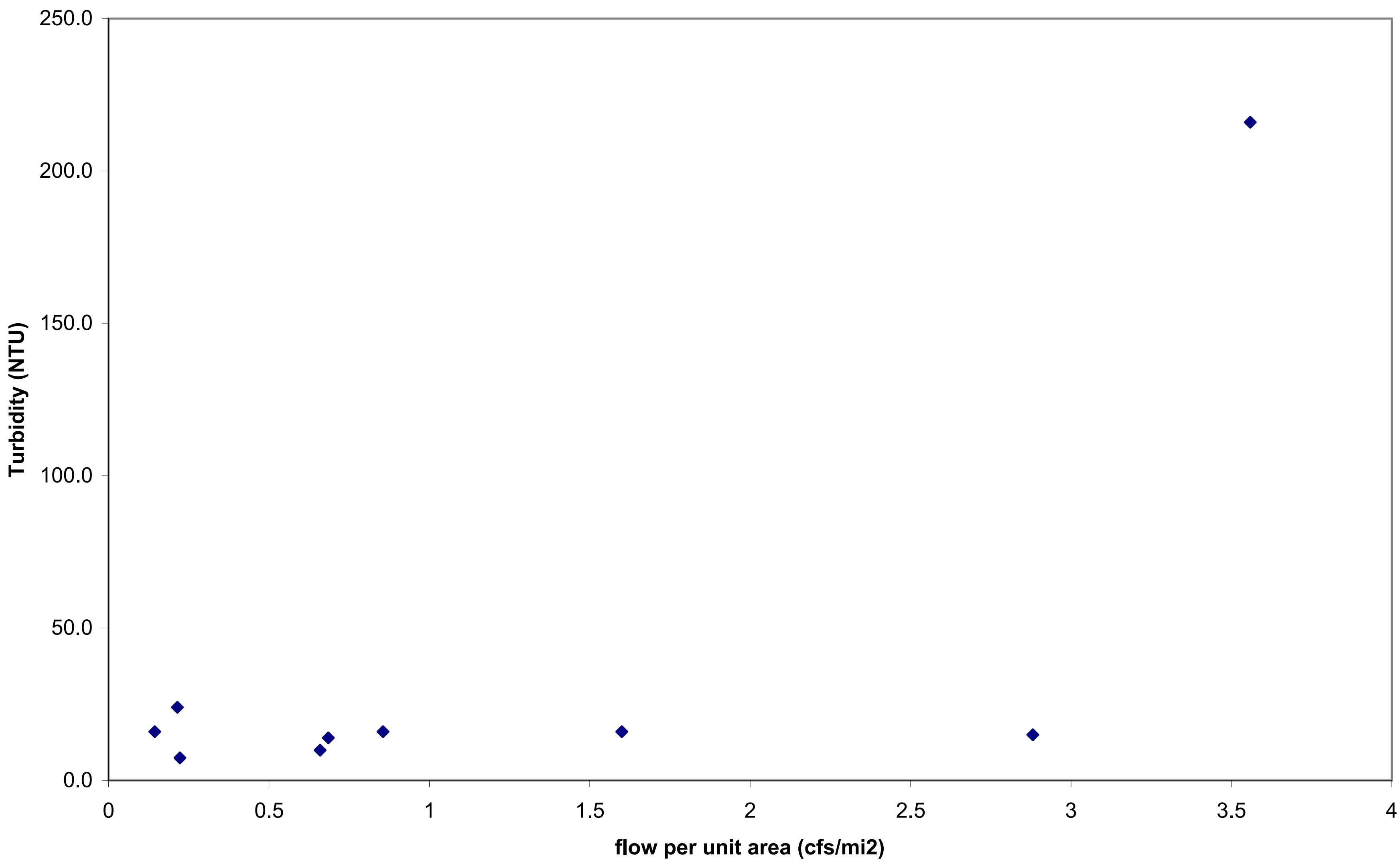


Figure B.13 Flow vs Turbidity for Larto Bayou west of Book, LA (1225)

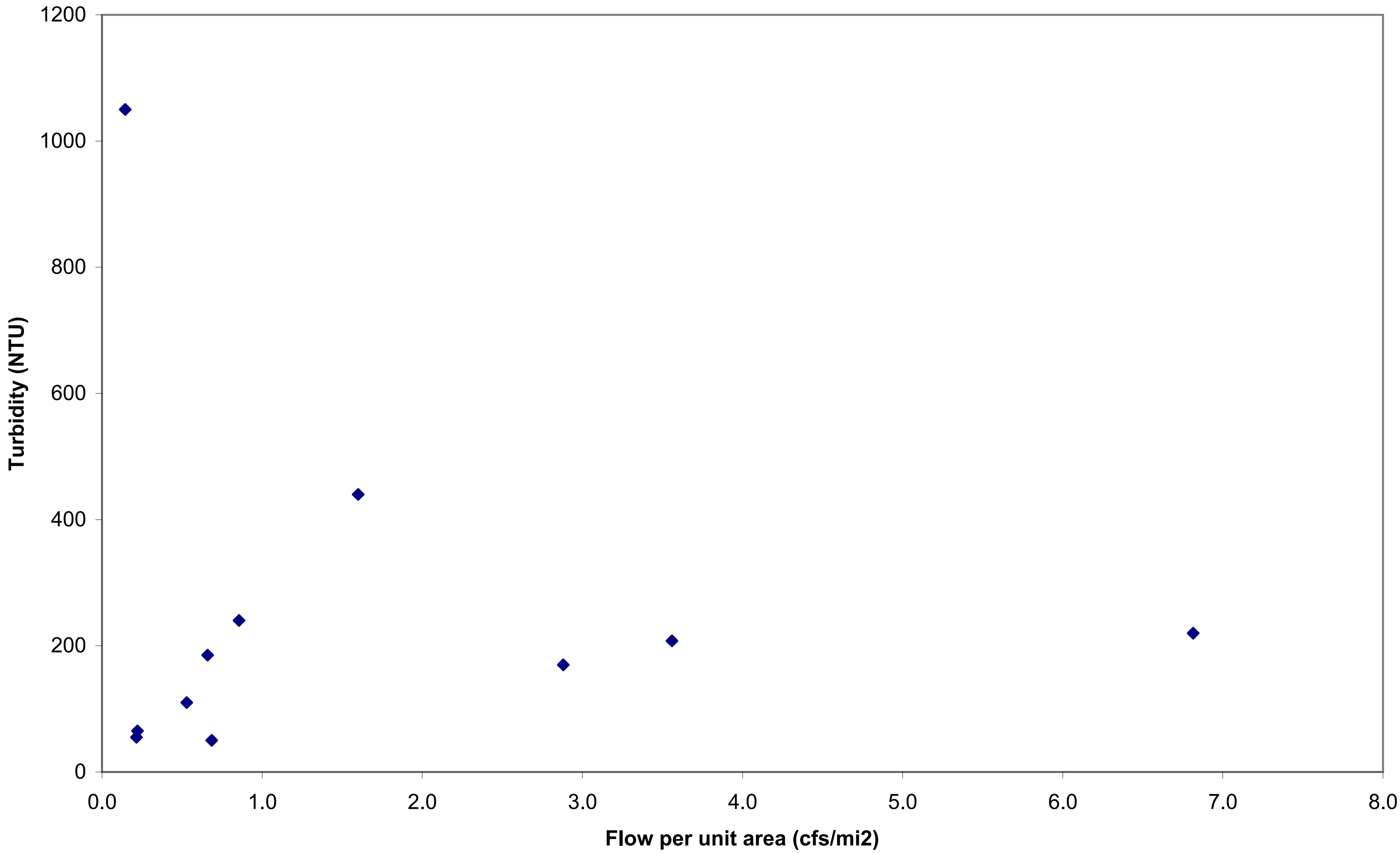


Figure B.14 Flow vs Tubidity Flow for Bayou Cocodrie south of Moterey, LA (1228)

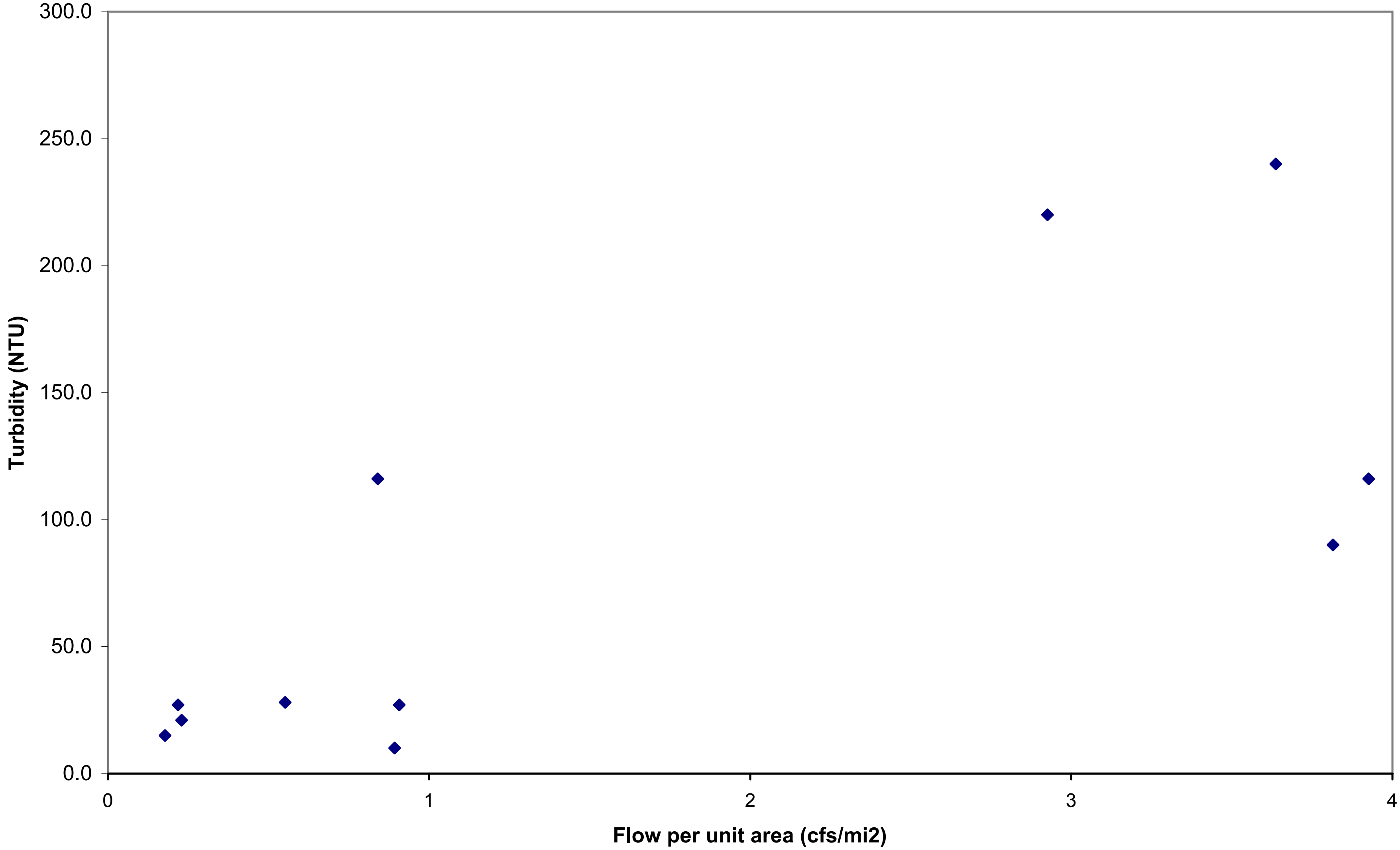


Figure B.15 Flow vs Turbidity for Cocodrie Lake north of Monterey, LA (1229)

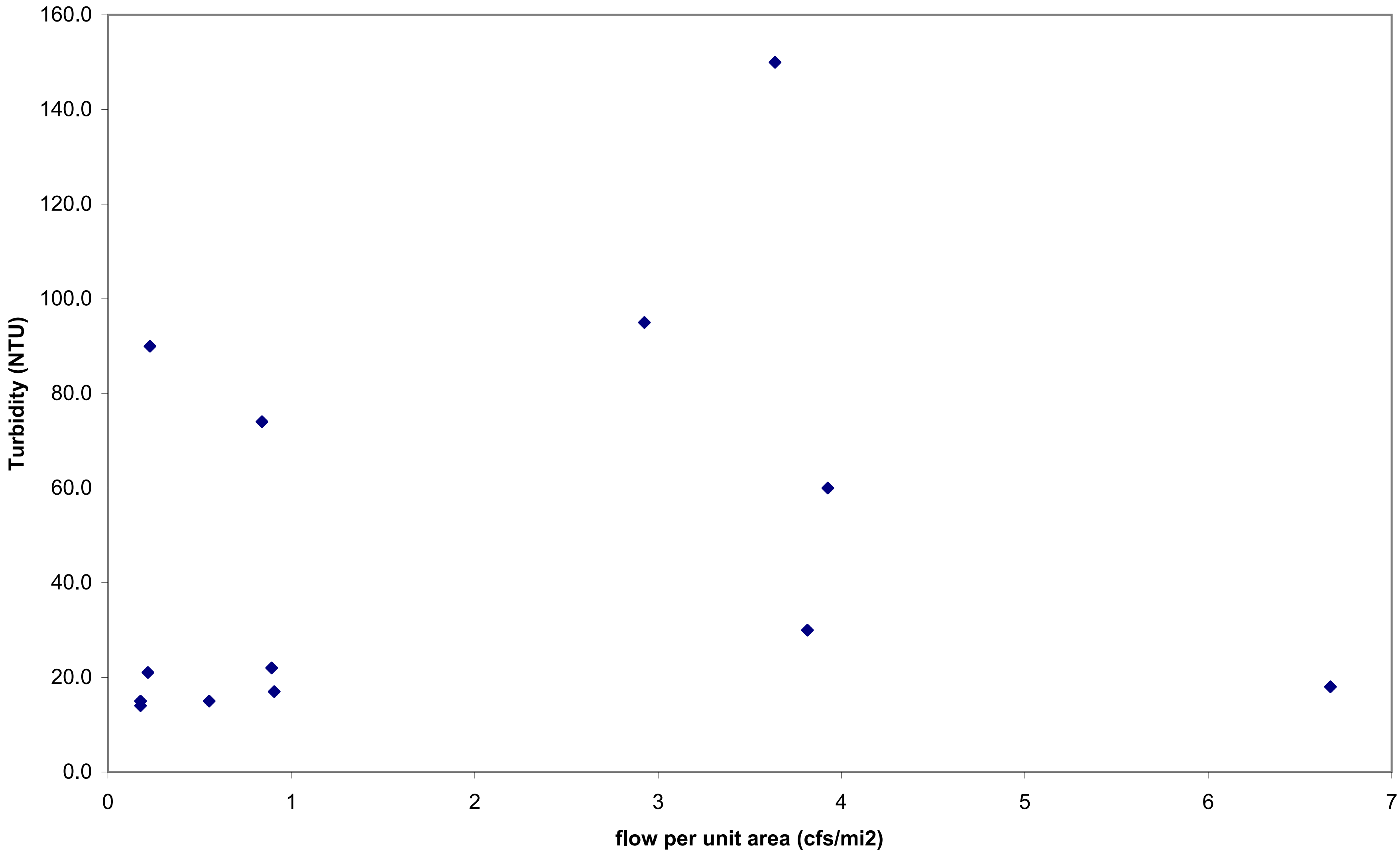


Figure B.16 Flow vs TSS for Saline Bayou east of Alexandria, LA (0371)

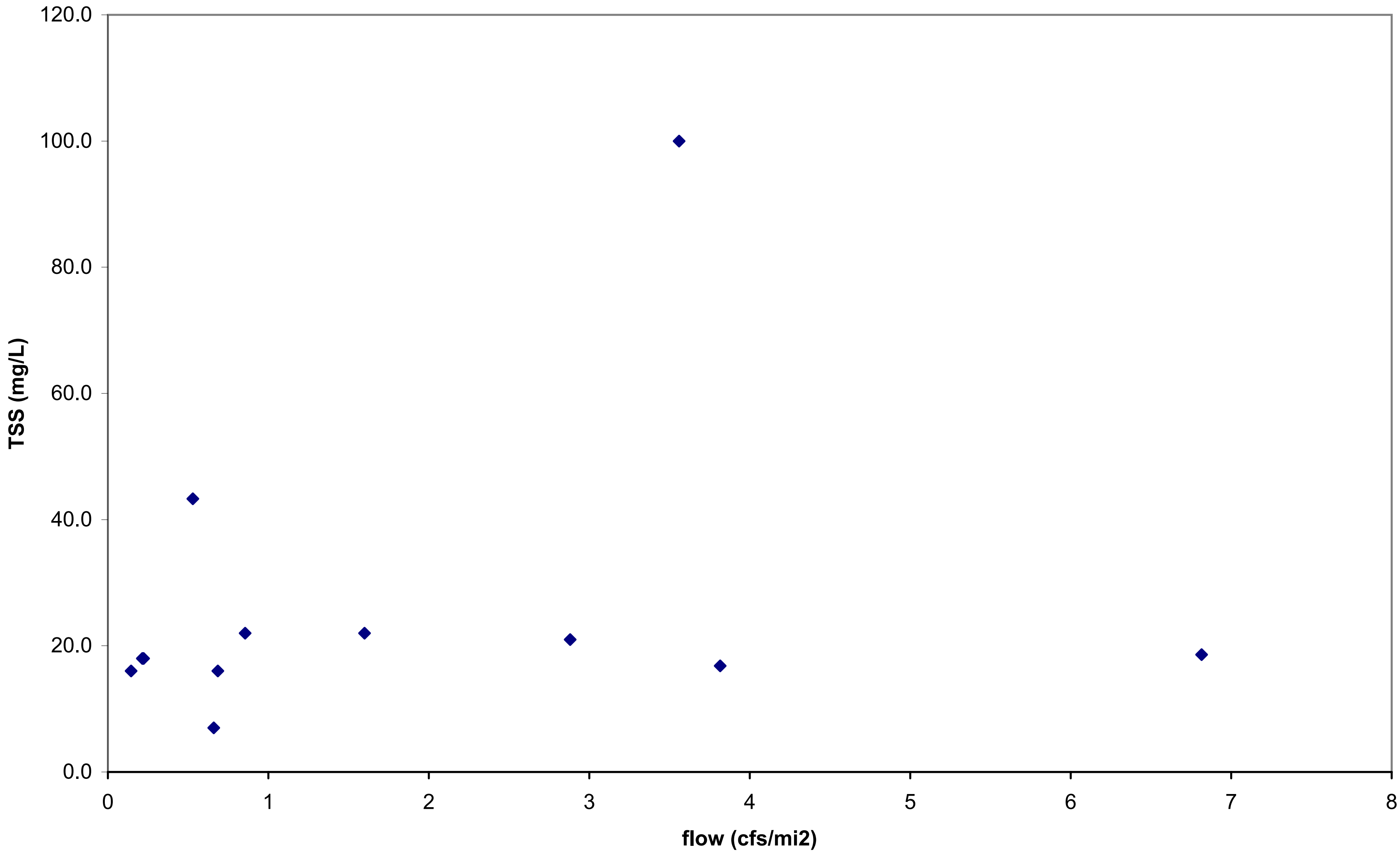


Figure B.17 Flow vs TSS for Larto Lake west of New Era, LA (1226)

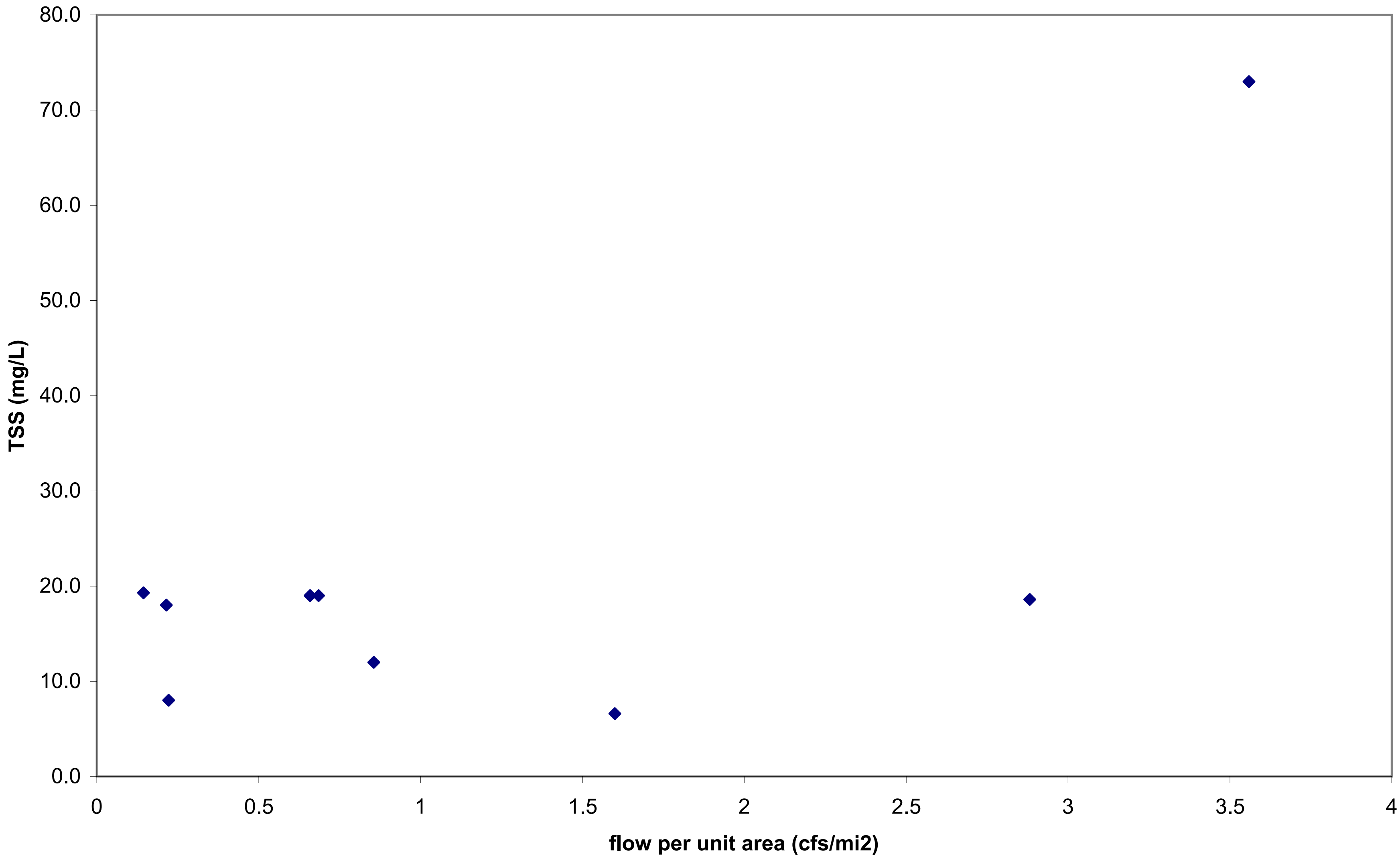


Figure B.18 Flow vs TSS for Larto Bayou west of Book, LA (1225)

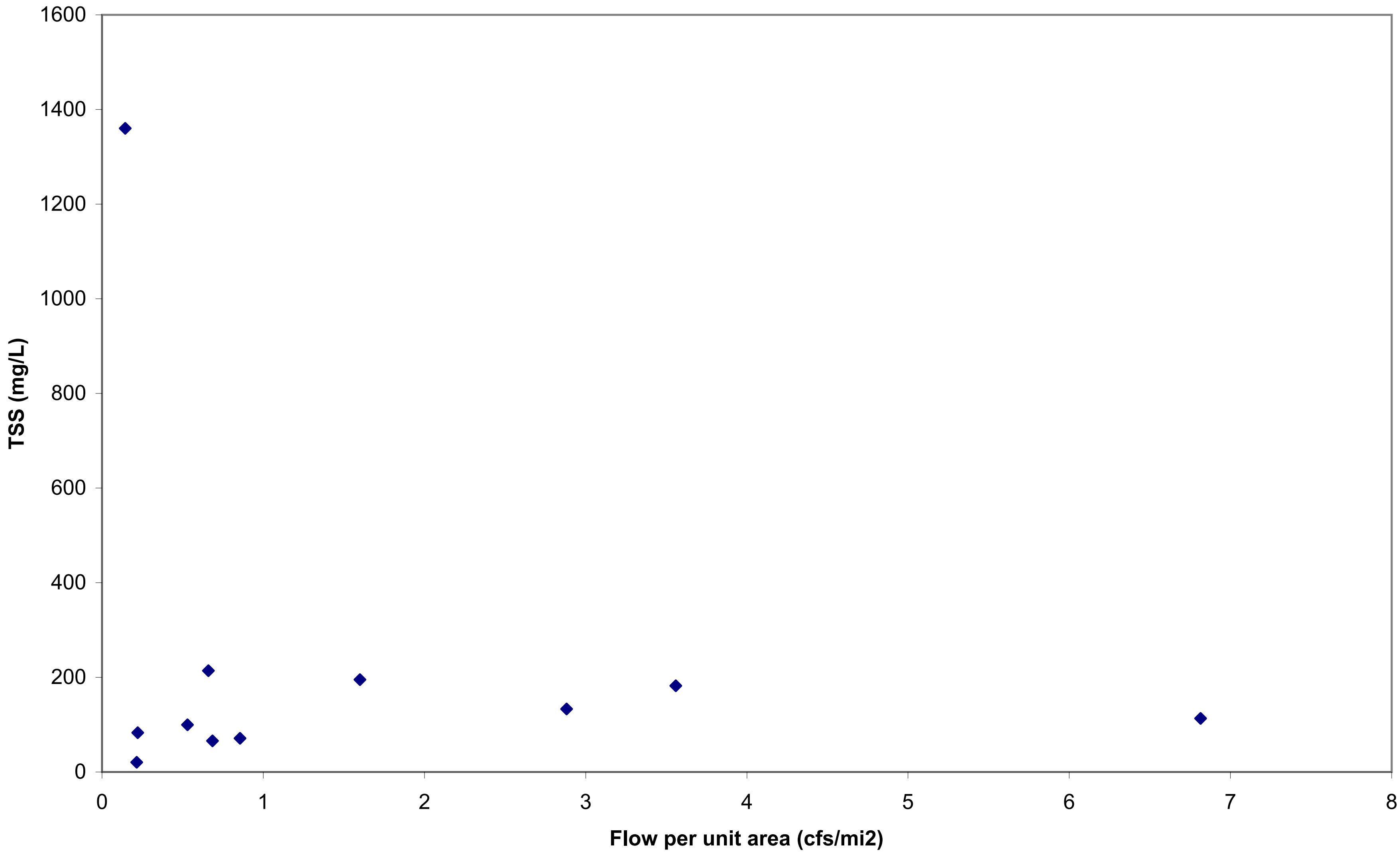


Figure B.19 Flow vs TSS for Bayou Cocdrie south of Monterey, LA (1228)

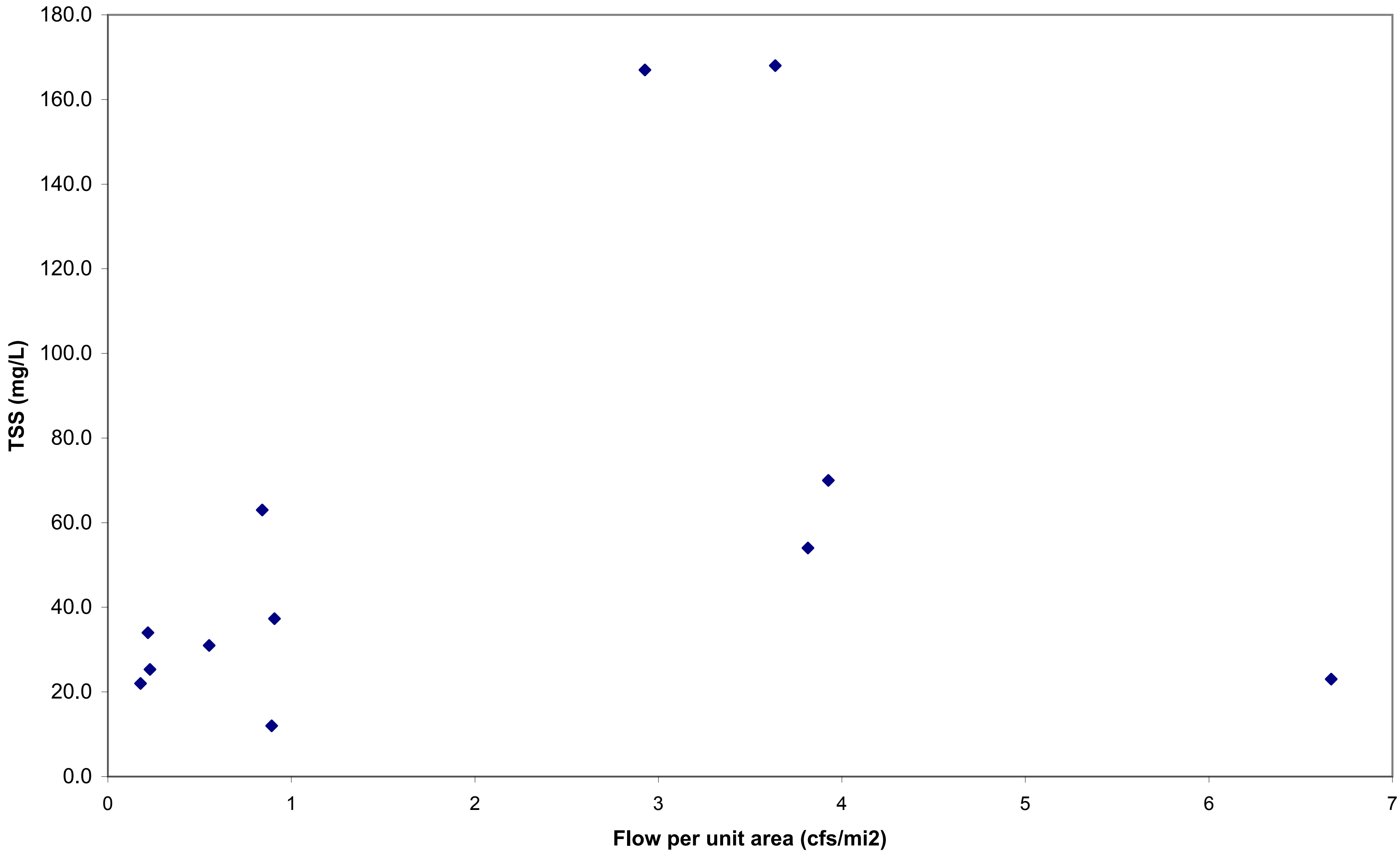


Figure B.20 Flow vs TSS for Cocodrie Lake north of Monterey, LA (1229)

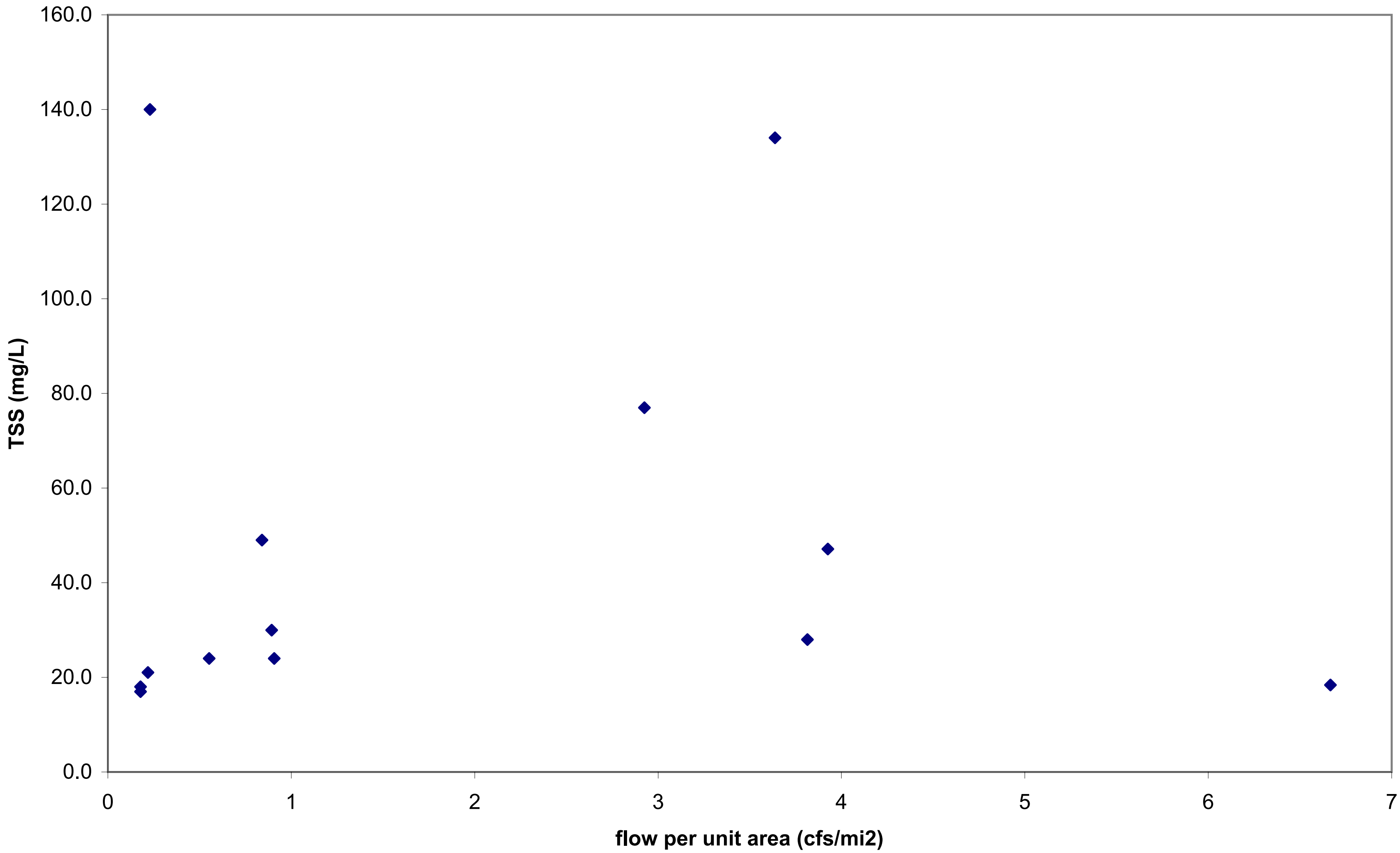


Figure B.21 Turbidity vs. TSS for Saline Bayou east of Alexandria, LA (0371)

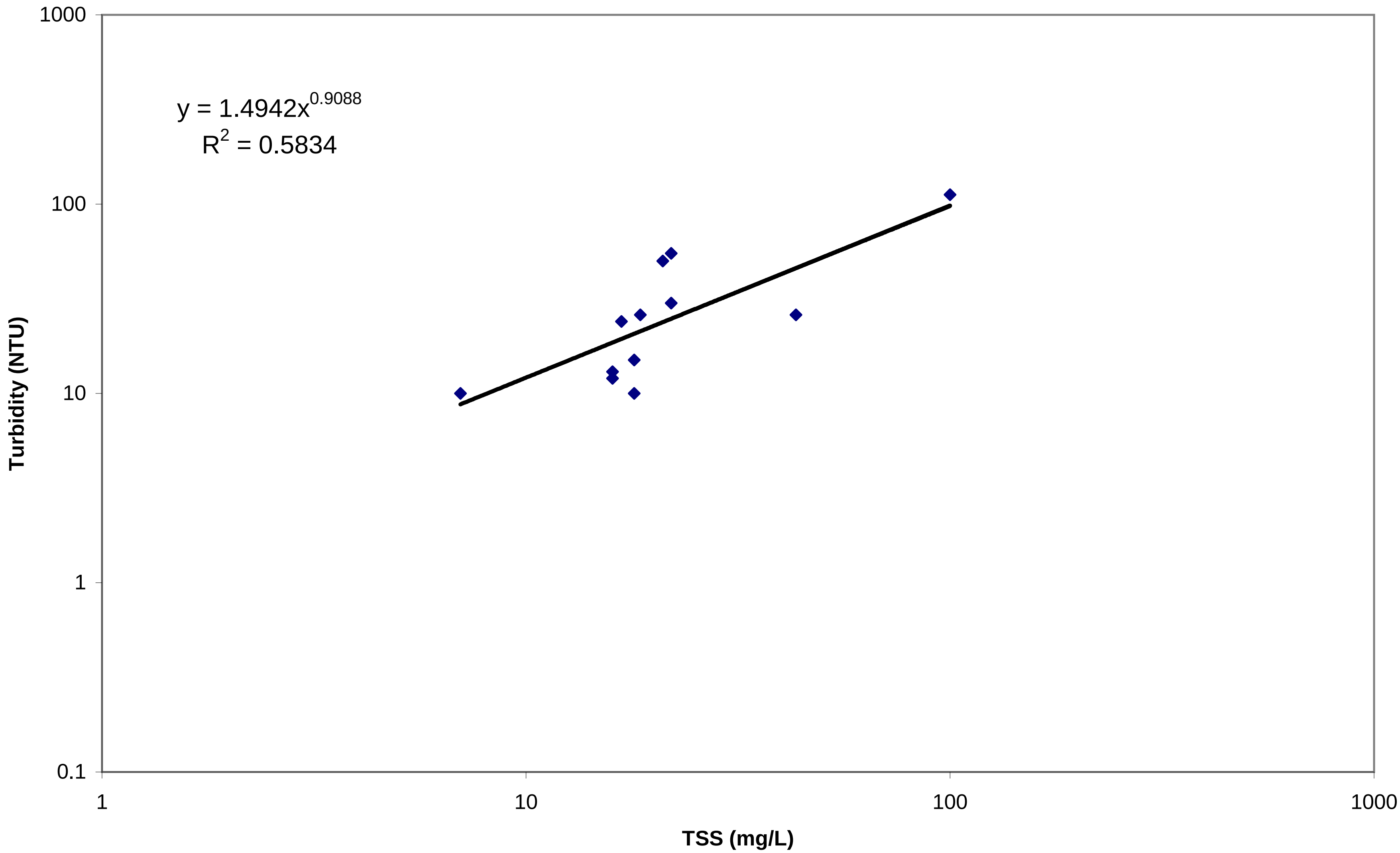


Figure B.22 Turbidity vs. TSS for Lake Larto west of New Era, LA (1226)

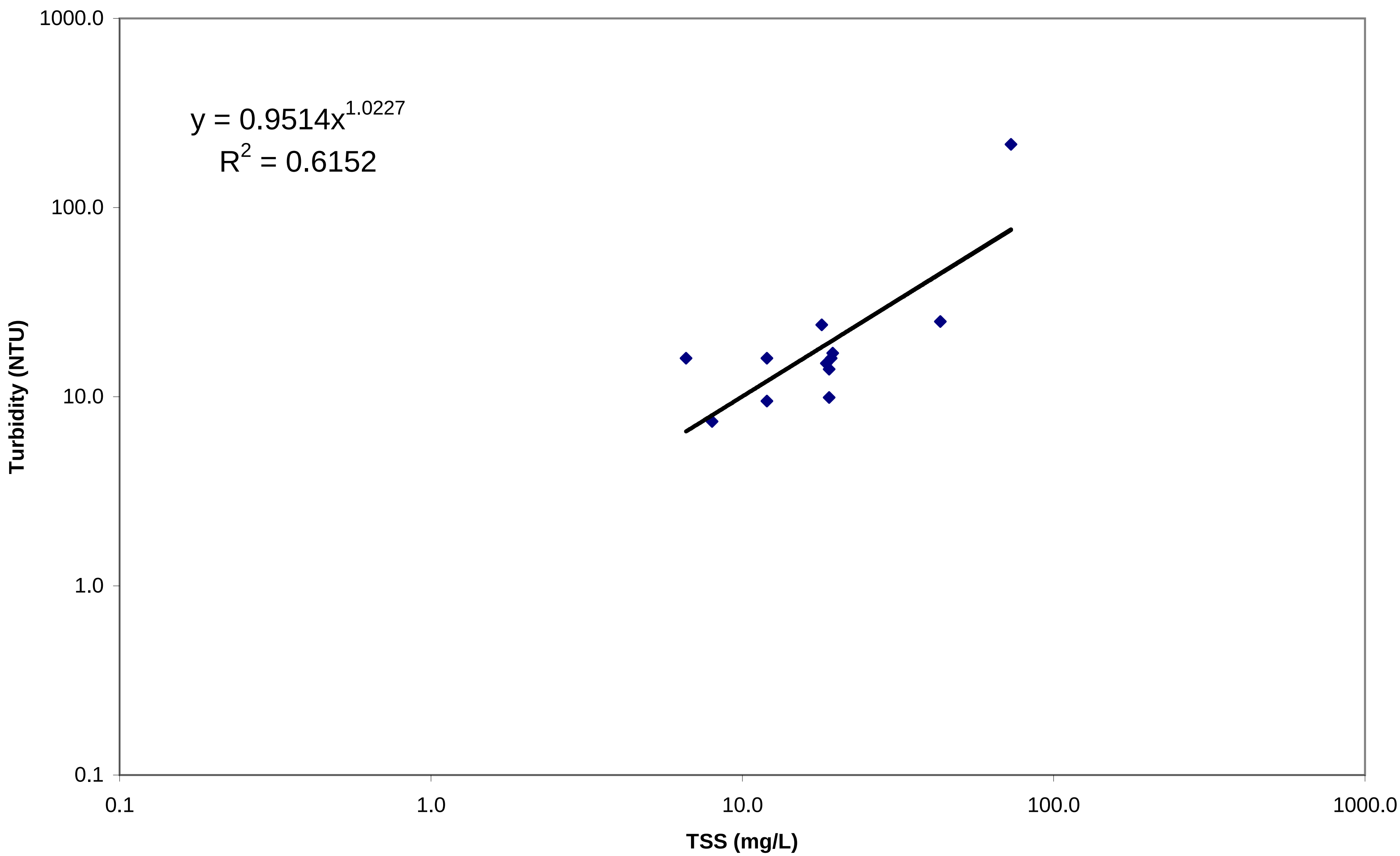


Figure B.23 Turbidity vs. TSS for Larto Bayou west of Book, LA (1225)

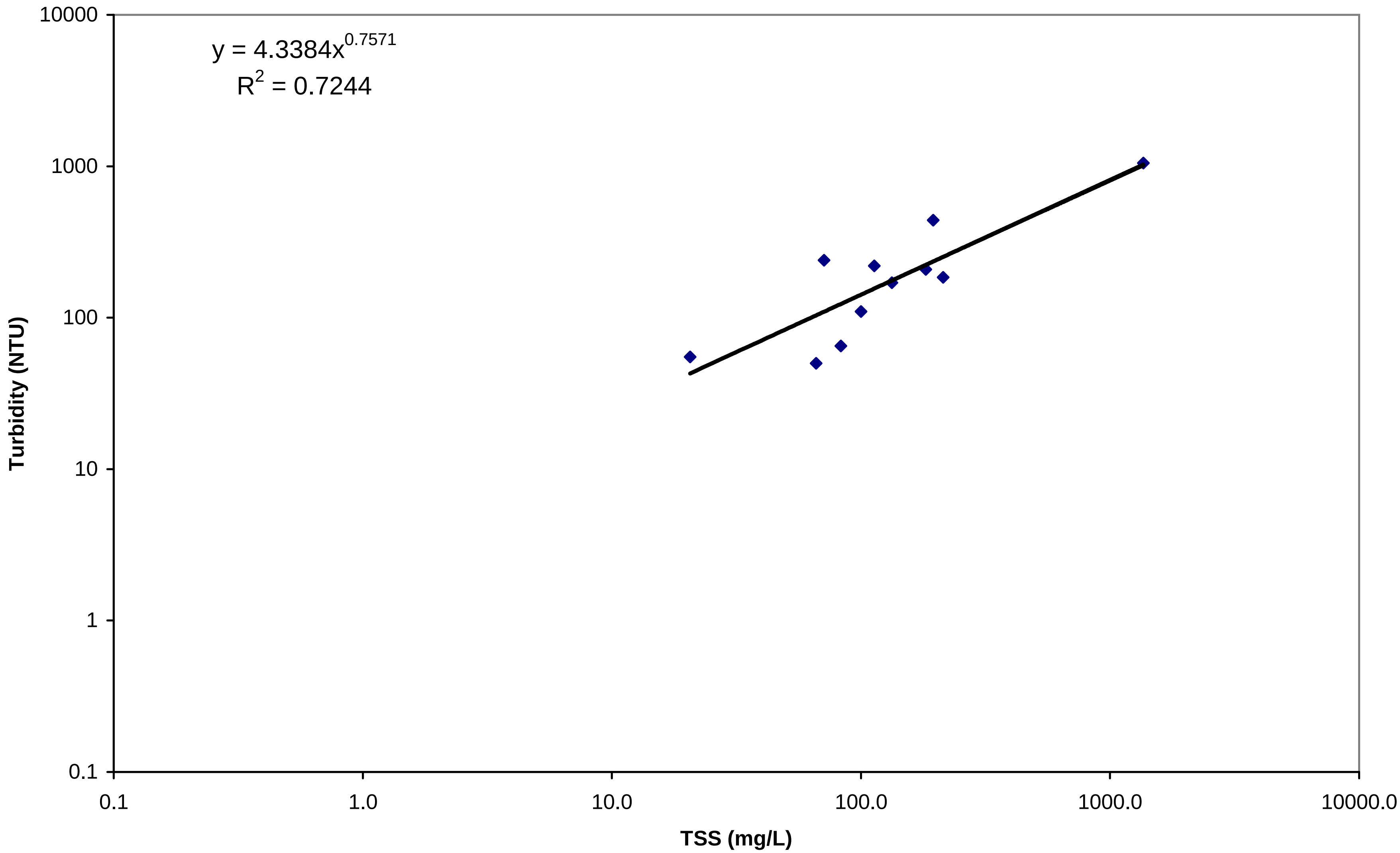


Figure B.24 Turbity vs. TSS for Bayou Cocodrie south of Monterey, LA (1228)

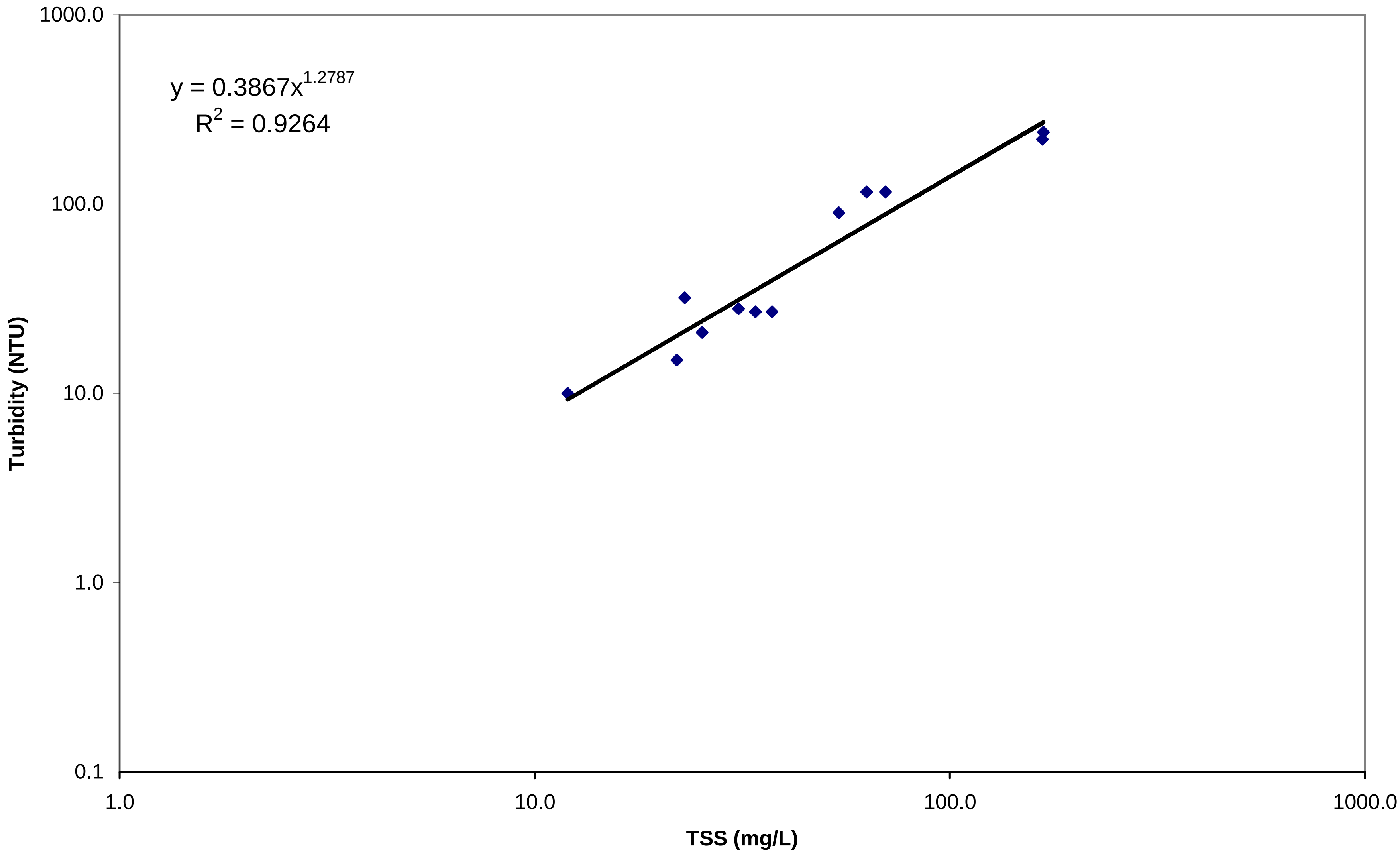
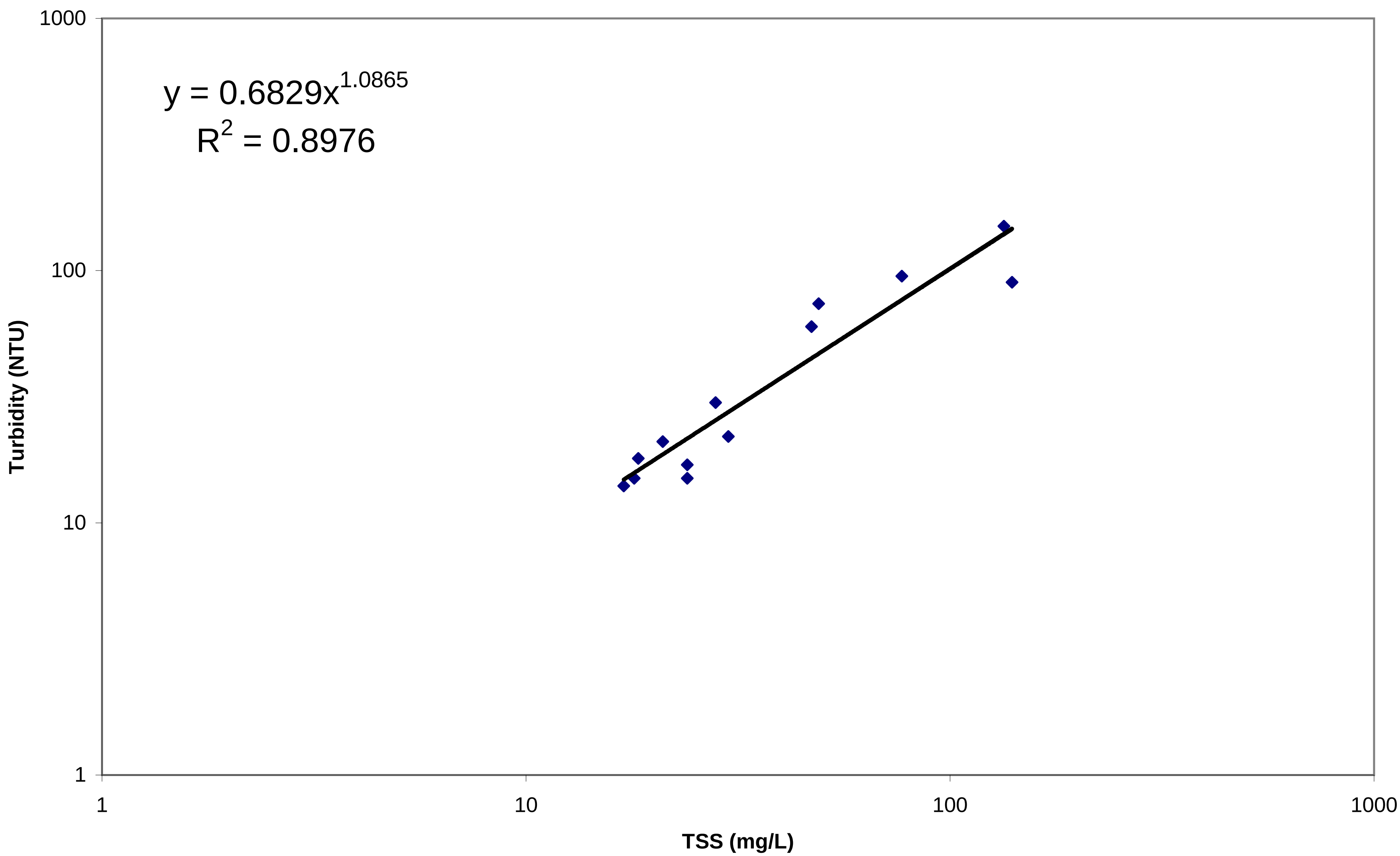


Figure B.25 Turbidity vs. TSS for Lake Cocodrie north of Monterey, LA (1229)



APPENDIX C

TDS and Sulfate Data

Figure C.1 Observed TDS for Larto Bayou west of Book, LA (1225)

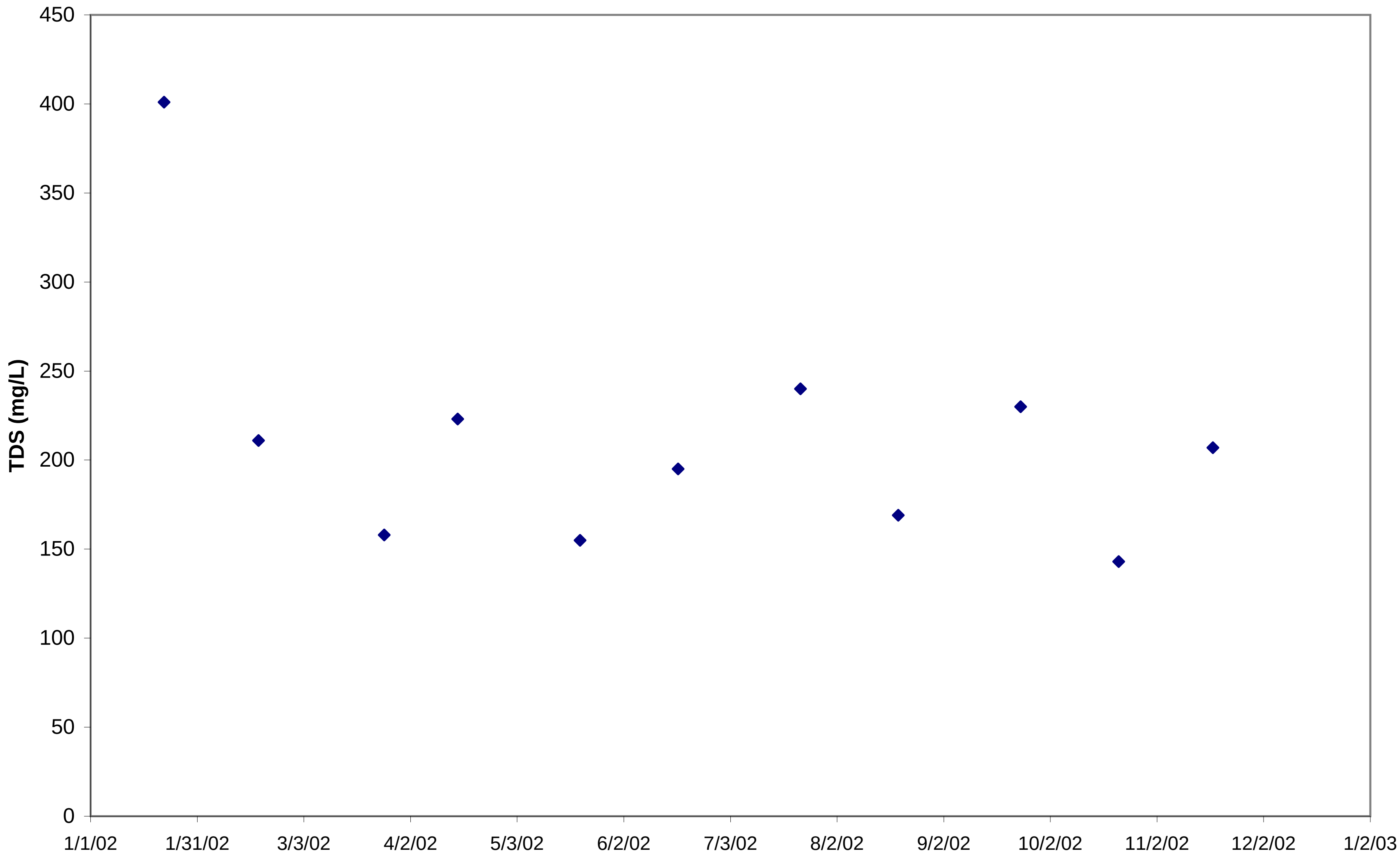


Figure C.2 Observed TDS for Larto Lake west of New Era, LA (1226)

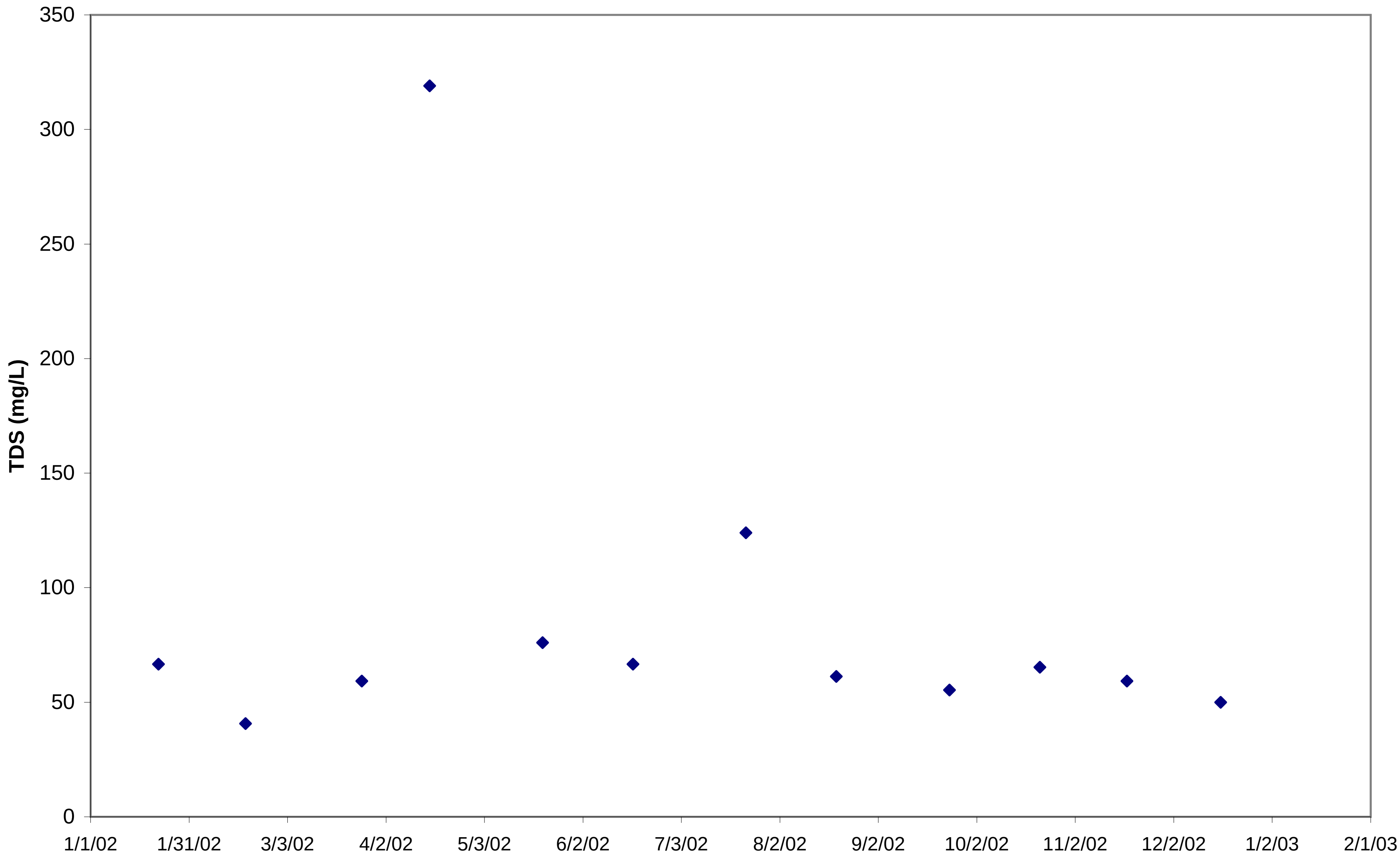


Figure C.3 Observed Sulfates for Larto Bayou west of Blook. LA (1225)

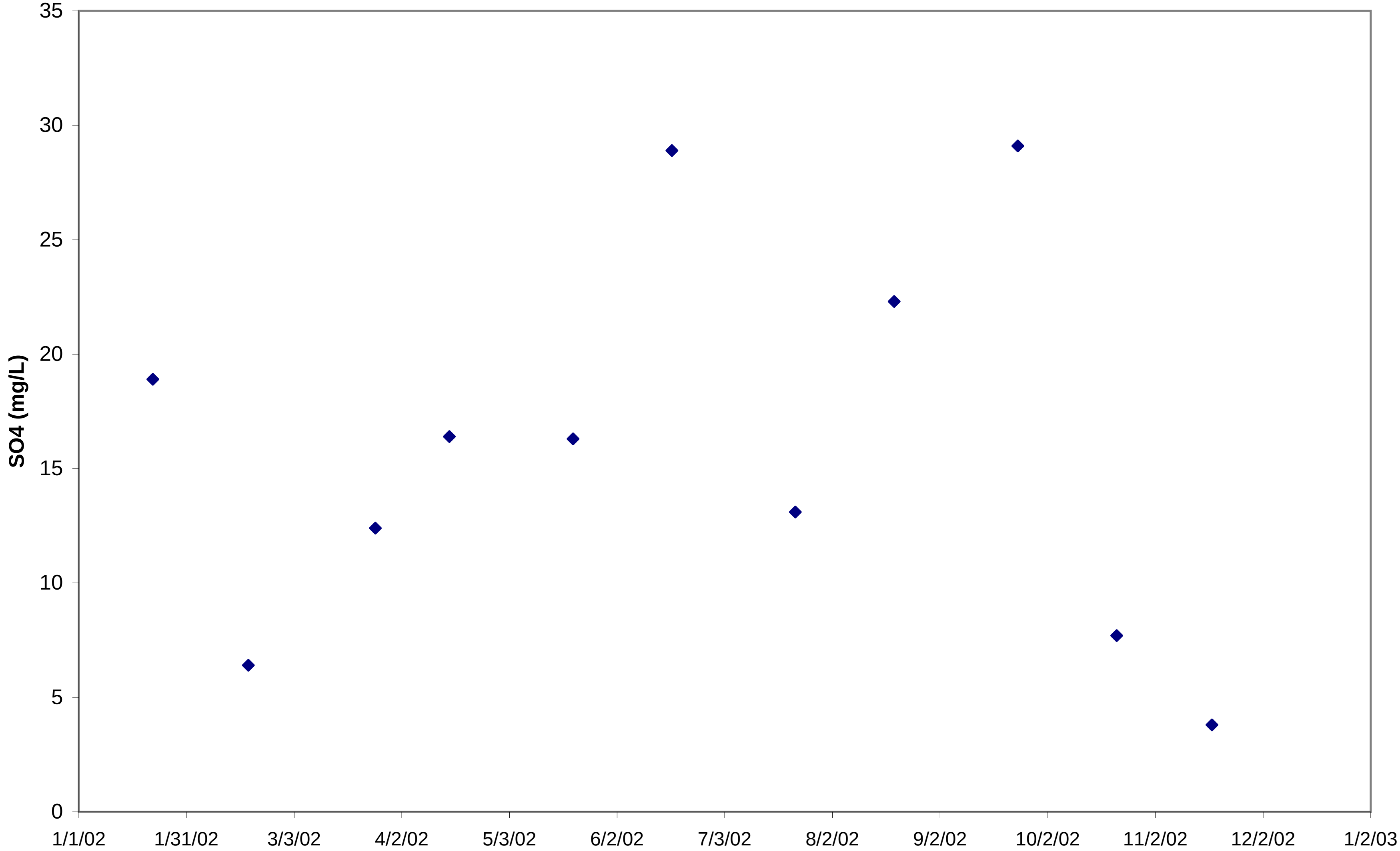


Figure C.4 Observed Sulfates for Larto Lake west of New Era, LA (1226)

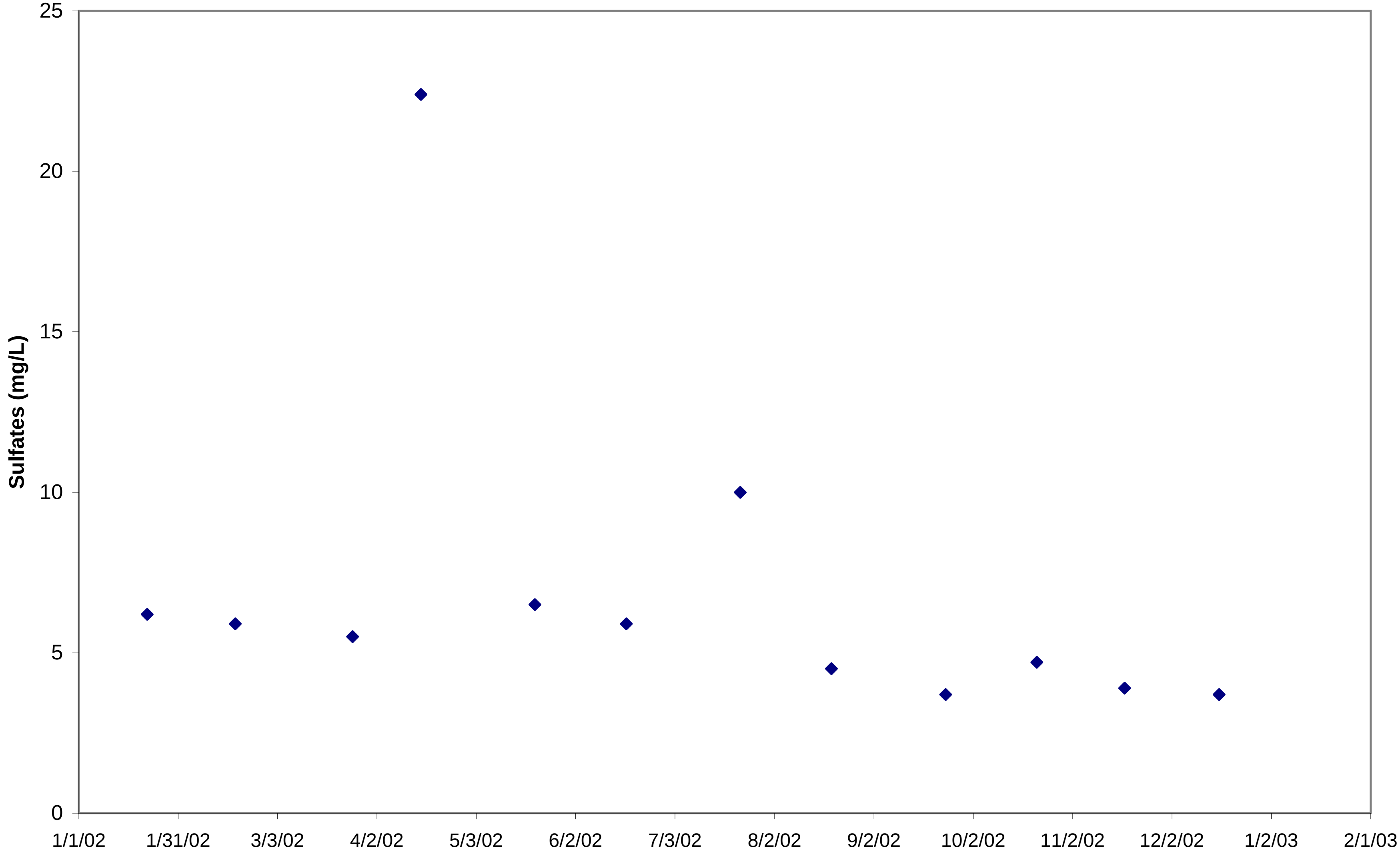


Figure C.5 Flow vs TDS for Larto Bayou west of Book, LA (1225)

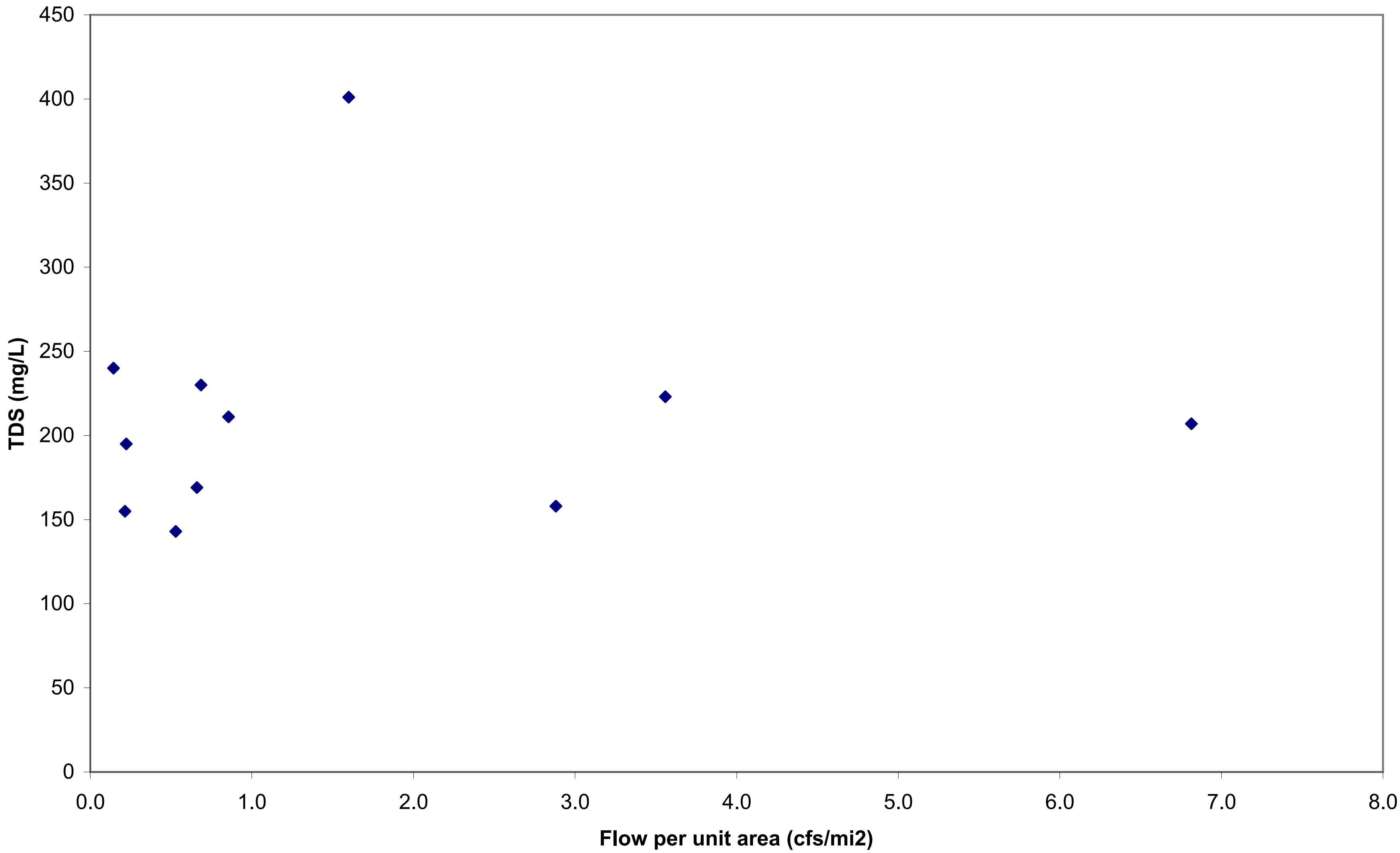
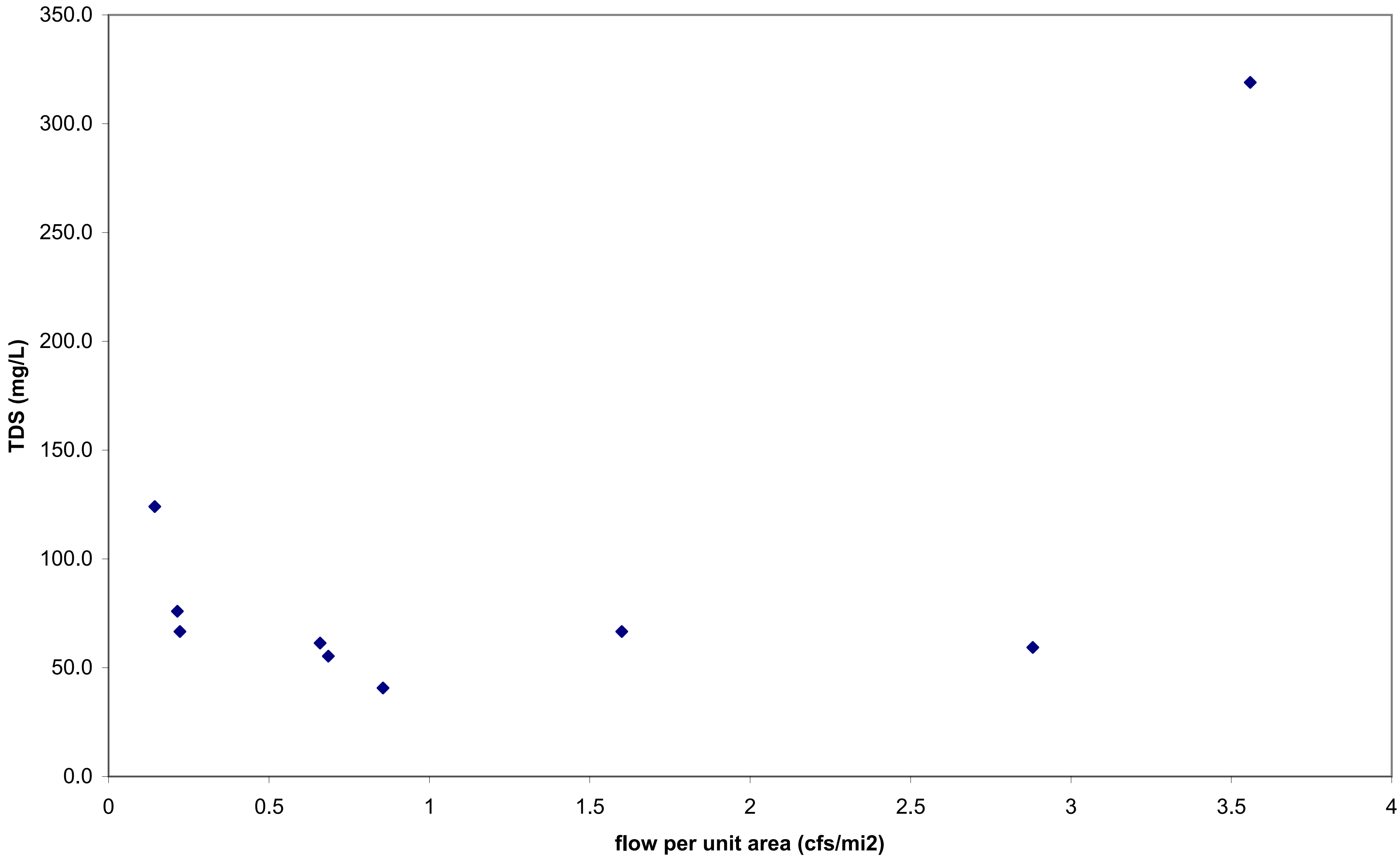


Figure C.6 Flow vs TDS for Larto Lake west of New Era, LA (1226)



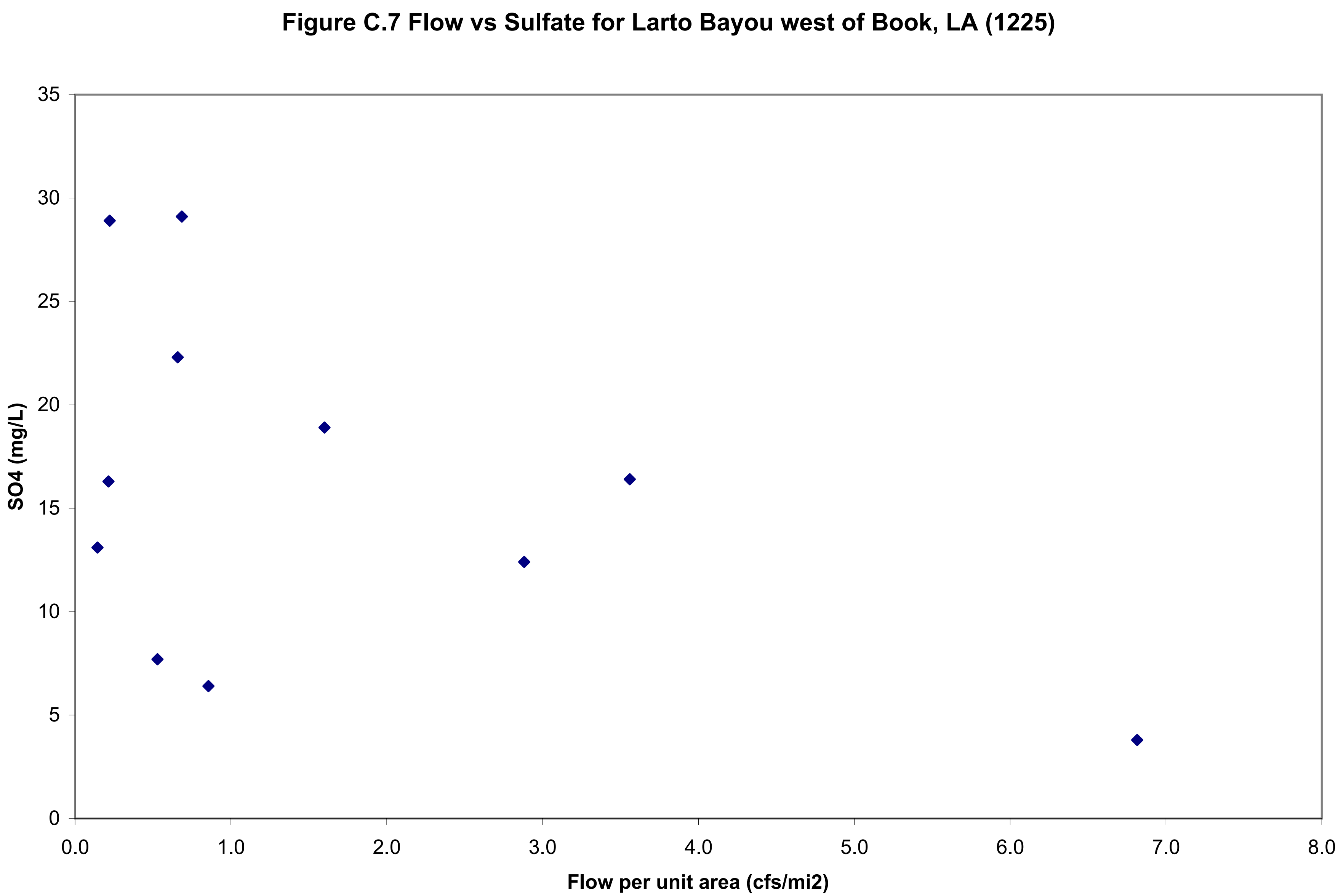
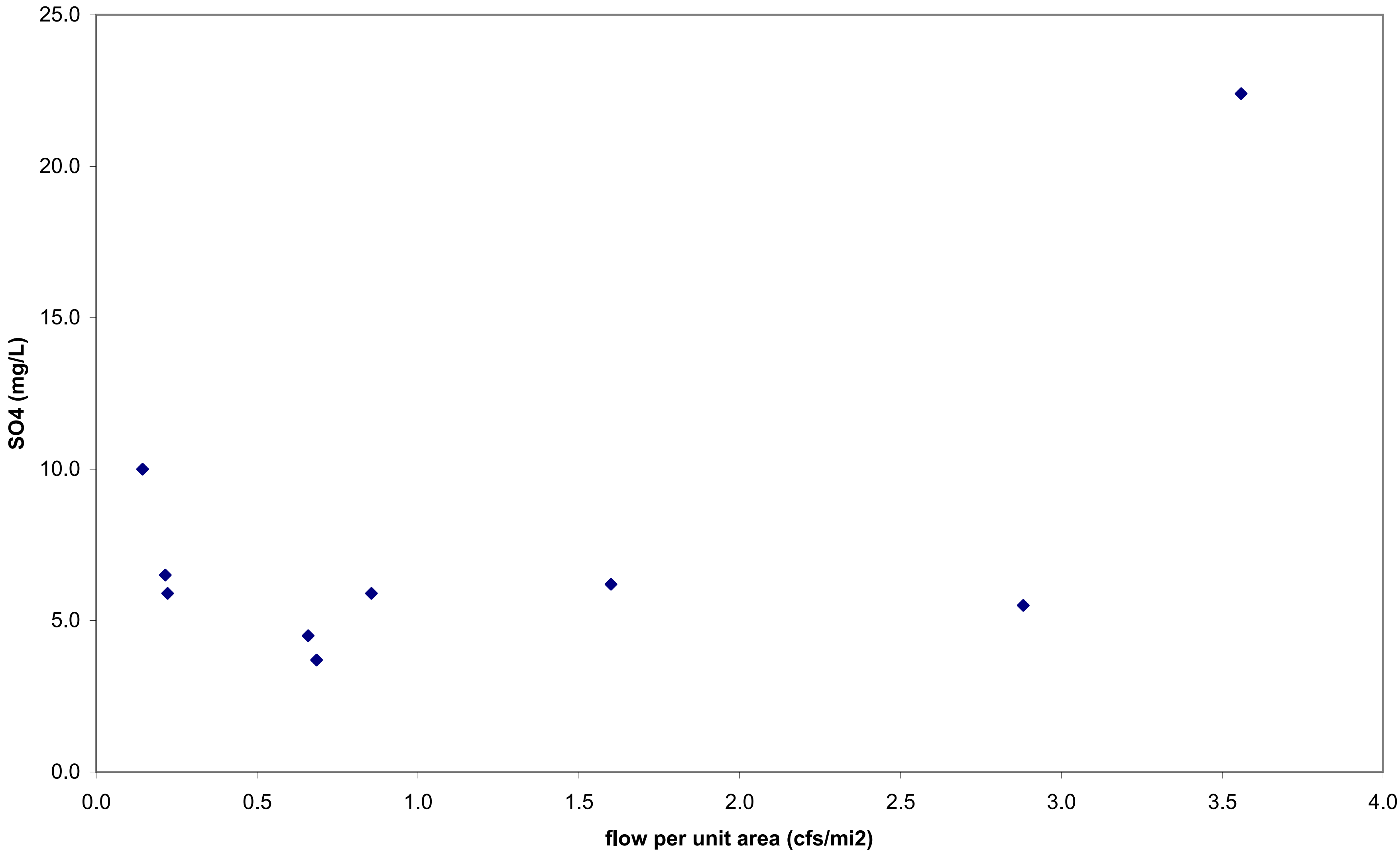


Figure C.7 Flow vs Sulfate for Larto Bayou west of Book, LA (1225)
35
30
25
20
15
10
5
0
SO4 (mg/L)
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
Flow per unit area (cfs/mi2)

Figure C.8 Flow vs Sulfate for Larto Lake west of New Era, LA (1226)



APPENDIX D

Calculations for Subsegment 101503 TSS TMDL

Figure D.1. TSS Load Duration Curve for Saline Bayou (101503)

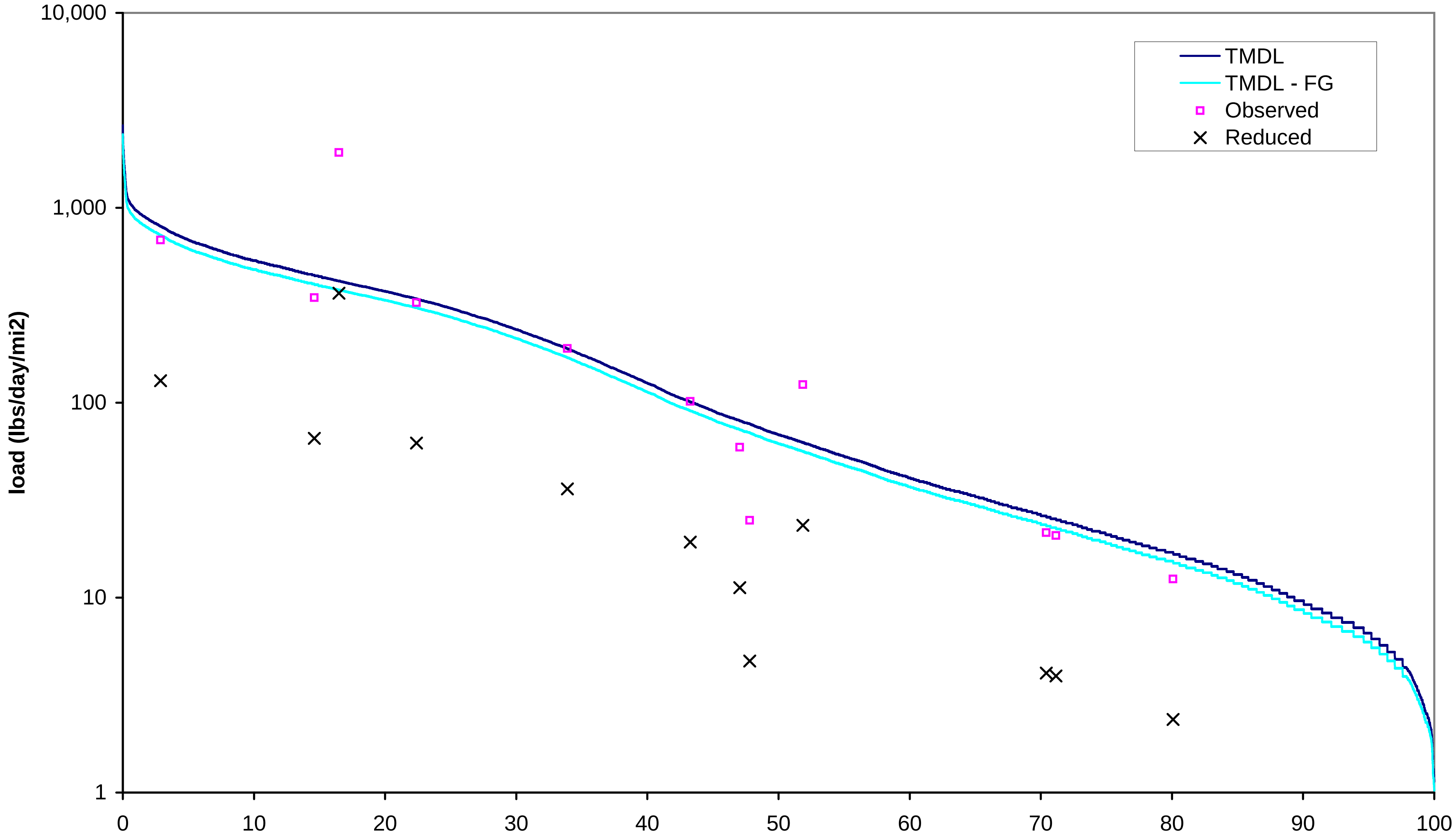


TABLE D.1 ALLOWABLE LOAD FOR TSS FOR SALINE BAYOU EAST OF ALEXANDRIA, LA (0371)

drainage	270	mi2, of USGS gage	25	NTU = TURB standard
	24.39	mi2, of watershed 101503	22	mg/L = TSS Target

TSS target = 189.92 lbs/day/mi2

Date	Bayou Des Glaises Div. Ch. flow (cfs)	Percent non exceed-ance	Percent exceed-ance	Flow per unit area (cfs/mi2)	Flow per unit area (cms/mi2)	Width on plot between data points (unitless)	TSS TMDL load (lbs/day/mi2)	TSS TMDL - FG load (lbs/day/mi2)	Area under TMDL curve (width times allowable load) (lbs/day/mi2)
10/29/2000	2.6	0.00	100.00	0.010	0.0003	0.00462	1.14	1.03	5.28E-05
10/30/2000	2.6	0.01	99.99	0.010	0.0003	0.00462	1.14	1.03	5.28E-05
10/26/1964	2.8	0.01	99.99	0.010	0.0003	0.00462	1.23	1.11	5.68E-05
10/27/1964	2.8	0.02	99.98	0.010	0.0003	0.00462	1.23	1.11	5.68E-05
10/13/1972	2.8	0.02	99.98	0.010	0.0003	0.00462	1.23	1.11	5.68E-05
10/14/1972	2.8	0.03	99.97	0.010	0.0003	0.00462	1.23	1.11	5.68E-05
10/31/2000	2.8	0.03	99.97	0.010	0.0003	0.00462	1.23	1.11	5.68E-05
10/11/1972	2.9	0.03	99.97	0.011	0.0003	0.00462	1.27	1.15	5.89E-05

For brevity, most of the rows in this spreadsheet have been hidden (between the 99.95% and the 0.05% exceedances).

								0.00	
5/27/1953	4680	99.97	0.03	17.333	0.4908	0.00693	2,056.52	1,850.86	1.43E-01
4/13/1995	4700	99.97	0.03	17.407	0.4928	0.00462	2,065.30	1,858.77	9.54E-02
5/24/1953	4830	99.97	0.03	17.889	0.5065	0.00462	2,122.43	1,910.19	9.81E-02
5/26/1953	4860	99.98	0.02	18.000	0.5096	0.00462	2,135.61	1,922.05	9.87E-02
5/25/1953	4910	99.98	0.02	18.185	0.5149	0.00462	2,157.58	1,941.83	9.97E-02
4/12/1995	5200	99.99	0.01	19.259	0.5453	0.00462	2,285.02	2,056.52	1.06E-01
5/19/1953	5640	99.99	0.01	20.889	0.5914	0.00462	2,478.37	2,230.53	1.15E-01
5/18/1953	6030	100.00	0.00	22.333	0.6323	0.00347	2,649.74	2,384.77	9.18E-02
								TOTAL =	189.92

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TABLE D.2 EXISTING LOAD AND PERCENT REDUCTION FOR TSS FOR SALINE BAYOU EAST OF ALEXANDRIA, LA (0371)

TSS target= 22 mg/L

Percent reduction needed = 81%

Error check for reduction is / is not needed: ok

Error check for less or more reduction needed: ok

Date	Observed TSS at stn 371 (mg/L)	Flow per unit area on sampling day (cms/mi2)	Percent exceedance for flow on sampling day	Current TSS load (lbs/day)/mi2	Reduced TSS load (lbs/day)/mi2	Allowable TSS load (lbs/day)/mi2	Reduced load less than or equal to allow. load?
22-JAN-2002	22.0	0.05	33.91	189.83	36.07	170.85	Yes
18-FEB-2002	22.0	0.02	43.26	101.51	19.29	91.36	Yes
26-MAR-2002	21.0	0.08	22.38	326.34	62.00	307.69	Yes
16-APR-2002	100.0	0.10	16.47	1919.50	364.71	380.06	Yes
21-MAY-2002	18.0	0.01	71.16	20.85	3.96	22.94	Yes
18-JUN-2002	18.0	0.01	70.41	21.57	4.10	23.73	Yes
23-JUL-2002	16.0	0.00	80.09	12.46	2.37	15.42	Yes
20-AUG-2002	7.0	0.02	47.81	24.89	4.73	70.40	Yes
24-SEP-2002	16.0	0.02	47.04	59.12	11.23	73.16	Yes
22-OCT-2002	43.3	0.01	51.85	123.68	23.50	56.55	Yes
18-NOV-2002	18.6	0.19	2.87	683.59	129.88	727.69	Yes
17-DEC-2002	16.8	0.11	14.61	345.63	65.67	407.35	Yes

Total number of values =	12
Allowable % of exceedances =	0%
Allowable no. of exceedances =	0
No. of exceedances before reductions =	2
No. of exceedances after reductions =	0

Total allowable loading per unit area to meet TSS target (from Table D.1) =	189.92	lbs/day/mi2
Total allowable loading for Subsegment 101503 = 189.92 * 24 mi2 =	2.32	tons/day
Explicit MOS for TSS for Subsegment 101503 (implicit)	0.00	tons/day
Future growth for TSS for Subsegment 101503 (10% of TMDL) =	0.23	tons/day

Sum of design flows for point sources of TSS for Subsegment 101503 =	0.000	cms
Assumed effluent TSS concentration for point sources =	0	mg/L
Existing point source TSS load for Subsegment 101503 =	0.00	tons/day
WLA for TSS for Subsegment 101503 (same as existing Point Source load) =	0.00	tons/day
LA for TSS for Subsegment 101503 = total - MOS - WLA - FG =	2.09	tons/day

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APPENDIX E

Calculation for Subsegment 101505 TSS TMDL

Figure E.1. TSS Load Duration for Larto Lake (subsegment 101505)

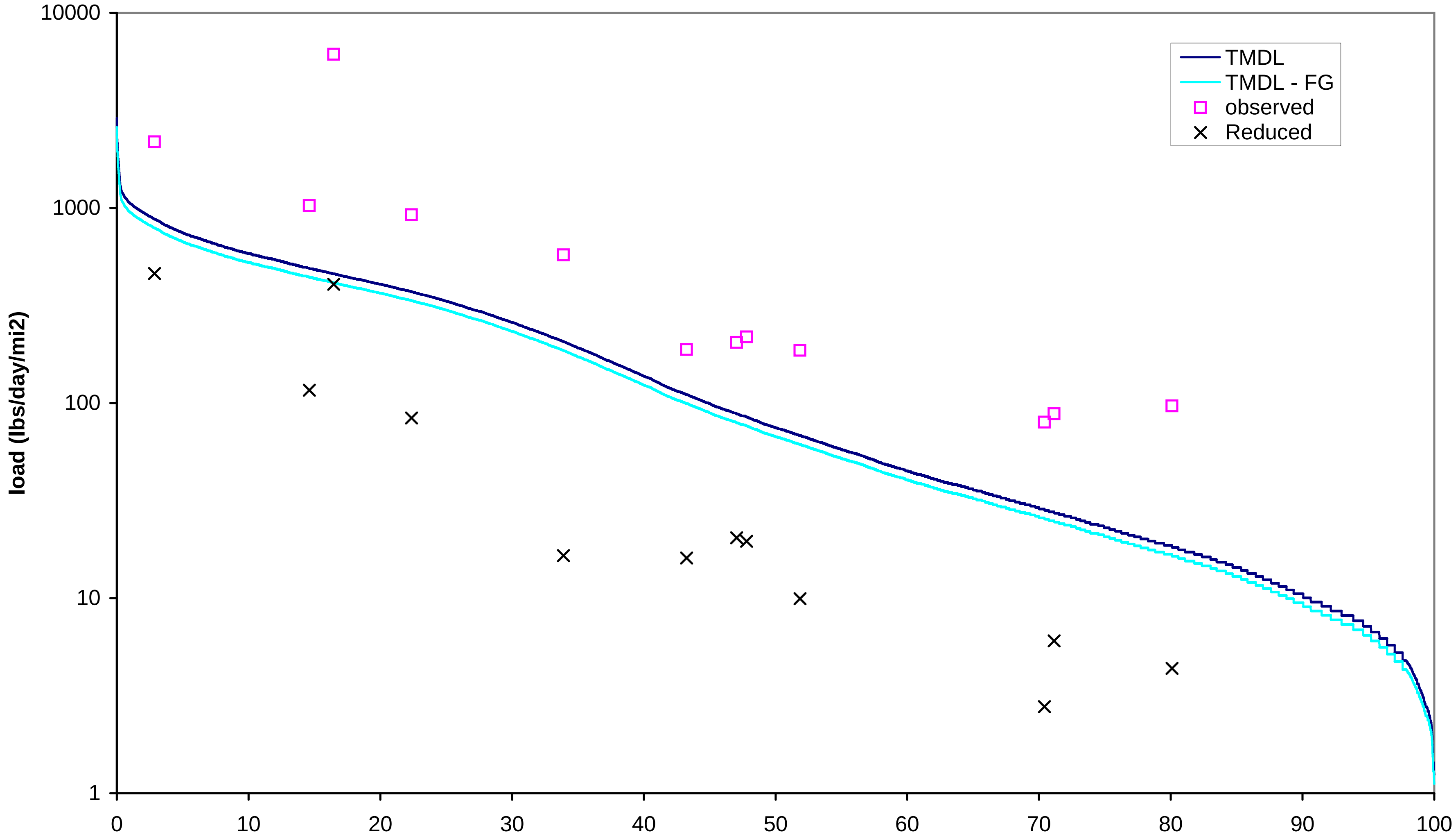

TABLE E.1 ALLOWABLE LOADS FOR TSS FOR LARTO LAKE WEST OF NEW ERA, LA (1226)

drainage	270	mi2, of gage
	32.80	mi2, of subwatershed 101505
TSS target =	207.09	lbs/day/mi2

25 NTU, Turbidity Criterion
24 mg/L, TSS target concetration

Date	Bayou Des Glaises Div. Ch. flow (cfs)	Percent non exceed-ance	Percent exceed-ance	Flow per unit area (cfs/mi2)	Flow per unit area (cms/mi2)	Width on plot between data points (unitless)	TSS TMDL load (lbs/day/mi2)	TSS TMDL - FG load (lbs/day/mi2)	Area under TMDL curve (width times allowable load) (lbs/day/mi2)
10/29/2000	2.6	0.00	100.00	0.010	0.00	0.00462	1.25	1.12	5.76E-05
10/30/2000	2.6	0.01	99.99	0.010	0.00	0.00462	1.25	1.12	5.76E-05
10/26/1964	2.8	0.01	99.99	0.010	0.00	0.00462	1.34	1.21	6.20E-05
10/27/1964	2.8	0.02	99.98	0.010	0.00	0.00462	1.34	1.21	6.20E-05
10/13/1972	2.8	0.02	99.98	0.010	0.00	0.00462	1.34	1.21	6.20E-05
10/14/1972	2.8	0.03	99.97	0.010	0.00	0.00462	1.34	1.21	6.20E-05
10/31/2000	2.8	0.03	99.97	0.010	0.00	0.00462	1.34	1.21	6.20E-05
10/11/1972	2.9	0.03	99.97	0.011	0.00	0.00462	1.39	1.25	6.42E-05
For brevity, most of the rows in this spreadsheet have been hidden (between the 99.97% and the 0.03% exceedances).									
5/27/1953	4,680.0	99.97	0.03	17.333	0.49	0.00462	2,243.47	2,019.12	1.04E-01
4/13/1995	4,700.0	99.97	0.03	17.407	0.49	0.00462	2,253.06	2,027.75	1.04E-01
5/24/1953	4,830.0	99.97	0.03	17.889	0.51	0.00462	2,315.38	2,083.84	1.07E-01
5/26/1953	4,860.0	99.98	0.02	18.000	0.51	0.00462	2,329.76	2,096.78	1.08E-01
5/25/1953	4,910.0	99.98	0.02	18.185	0.51	0.00462	2,353.73	2,118.36	1.09E-01
4/12/1995	5,200.0	99.99	0.01	19.259	0.55	0.00462	2,492.75	2,243.47	1.15E-01
5/19/1953	5,640.0	99.99	0.01	20.889	0.59	0.00462	2,703.67	2,433.30	1.25E-01
5/18/1953	6,030.0	100.00	0.00	22.333	0.63	0.00347	2,890.63	2,601.56	1.00E-01
								TOTAL =	207.09

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TABLE E.2 EXISTING LOAD AND PERCENT REDUCTION FOR TSS FOR LAKE LARTO WEST OF NEW ERA, LA (1226)

TSS target = 24 mg/L
Percent reduction needed = 71%

Error check for reduction is / is not needed: ok
Error check for less or more reduction needed: ok

Date	Observed TSS at stn 1226 (mg/L)	Flow per unit area on sampling day (cms/mi2)	Percent exceedance for flow on sampling day	Current TSS load (lbs/day)/mi2	Reduced TSS load (lbs/day)/mi2	TMDL - FG TSS load (lbs/day)/mi2	Reduced load less than or equal to allow. load?
22-Jan-02	6.6	0.05	33.90	56.95	16.52	186.38	Yes
18-Feb-02	12.0	0.02	43.26	55.37	16.06	99.66	Yes
26-Mar-02	18.6	0.08	22.38	289.04	83.82	335.66	Yes
16-Apr-02	73.0	0.10	16.47	1401.24	406.36	414.61	Yes
21-May-02	18.0	0.01	71.16	20.85	6.05	25.02	Yes
18-Jun-02	8.0	0.01	70.41	9.59	2.78	25.89	Yes
23-Jul-02	19.3	0.00	80.09	15.03	4.36	16.83	Yes
20-Aug-02	19.0	0.02	47.80	67.55	19.59	76.80	Yes
24-Sep-02	19.0	0.02	47.04	70.21	20.36	79.82	Yes
22-Oct-02	12.0	0.01	51.85	34.28	9.94	61.70	Yes
18-Nov-02	43.3	0.19	2.86	1591.37	461.50	793.85	Yes
17-Dec-02	19.5	0.11	14.61	401.18	116.34	444.38	Yes

Total number of values =	12
Allowable % of exceedances =	0%
Allowable no. of exceedances =	0
No. of exceedances before reductions =	2
No. of exceedances after reductions =	0

Total allowable loading per unit area to meet TSS Target (from Table E.1) =	207.09	lbs/day/mi2
Total allowable loading for Subsegment 101505 = 207.09 * 33 mi2 =	3.40	tons/day
Explicit MOS for TSS for Subsegment 101505 (implicit)	0.00	tons/day
Future growth for TSS for Subsegment 101505 (10% of TMDL) =	0.34	tons/day

Sum of design flows for point sources of TSS for Subsegment 101505 =	0.000	cms
Assumed effluent TSS concentration for point sources =	0	mg/L
Existing point source TSS load for Subsegment 101505 =	0.00	tons/day
WLA for TSS for Subsegment 101505 (same as existing Point Source load) =	0.00	tons/day
LA for TSS for Subsegment 101505 = total - MOS - WLA - FG =	3.06	tons/day

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APPENDIX F

Calculation for Subsegment 101601 TSS TMDL

Figure F.1. TSS Load Duration Curve for Bayou Cocodrie (101601)

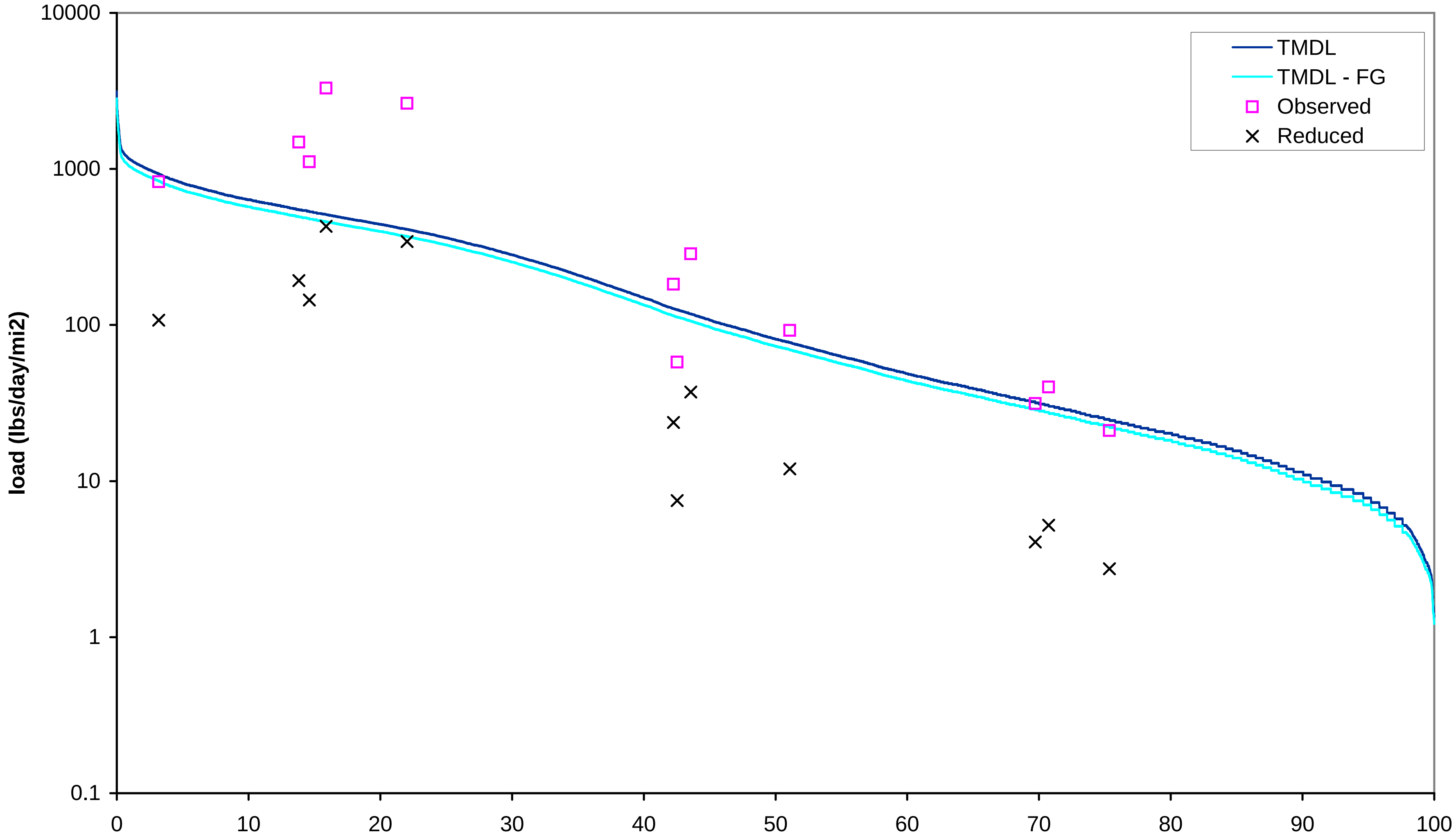

TABLE F.1 ALLOWABLE LOAD FOR TSS FOR BAYOU COCODRIE S MONTEREY, LA (1228)

drainage	270 mi2, of gage	25	NTU = TURB standard
	99.20 mi2, of watershed 101601	26.1	mg/L = TSS Target

TSS Target 225.35 lbs/day/mi2

Date	Bayou Des Glaises Div. Ch. flow (cfs)	Percent non exceed-ance	Percent exceed-ance	Flow per unit area (cfs/mi2)	Flow per unit area (cms/mi2)	Width on plot between data points (unitless)	TSS TMDL load (lbs/day/mi2)	TSS TMDL - FG load (lbs/day/mi2)	Area under TMDL curve (width times TMDL load) (lbs/day/mi2)
10/29/2000	2.6	0.00	100.00	0.010	2.726E-04	0.00462	1.36	1.22	6.26E-05
10/30/2000	2.6	0.01	99.99	0.010	2.726E-04	0.00462	1.36	1.22	6.26E-05
10/26/1964	2.8	0.01	99.99	0.010	2.936E-04	0.00462	1.46	1.31	6.74E-05
10/27/1964	2.8	0.02	99.98	0.010	2.936E-04	0.00462	1.46	1.31	6.74E-05
10/13/1972	2.8	0.02	99.98	0.010	2.936E-04	0.00462	1.46	1.31	6.74E-05
10/14/1972	2.8	0.03	99.97	0.010	2.936E-04	0.00462	1.46	1.31	6.74E-05
10/31/2000	2.8	0.03	99.97	0.010	2.936E-04	0.00462	1.46	1.31	6.74E-05
10/11/1972	2.9	0.03	99.97	0.011	3.041E-04	0.00462	1.51	1.36	6.99E-05

For brevity, most of the rows in this spreadsheet have been hidden (between the 99.97% and the 0.03% exceedances).

5/27/1953	4,680	99.97	0.03	17.333	0.491	0.00693	2,439.78	2,195.80	1.69E-01
4/13/1995	4,700	99.97	0.03	17.407	0.493	0.00462	2,450.20	2,205.18	1.13E-01
5/24/1953	4,830	99.97	0.03	17.889	0.506	0.00462	2,517.97	2,266.18	1.16E-01
5/26/1953	4,860	99.98	0.02	18.000	0.510	0.00462	2,533.61	2,280.25	1.17E-01
5/25/1953	4,910	99.98	0.02	18.185	0.515	0.00462	2,559.68	2,303.71	1.18E-01
4/12/1995	5,200	99.99	0.01	19.259	0.545	0.00462	2,710.86	2,439.78	1.25E-01
5/19/1953	5,640	99.99	0.01	20.889	0.591	0.00462	2,940.24	2,646.22	1.36E-01
5/18/1953	6,030	100.00	0.00	22.333	0.632	0.00462	3,143.56	2,829.20	1.45E-01
								TOTAL =	225.35

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TABLE F.2 EXISTING LOAD AND PERCENT REDUCTION FOR TSS FOR BAYOU COCODRIE S MONTEREY, LA (1228)

TSS Target = 26 mg/L
Percent reduction needed = 87%

Error check for reduction is / is not needed: ok
Error check for less or more reduction needed: ok

Date	Observed TSS at stn 1228 (mg/L)	Flow per unit area on sampling day (cms/mi2)	Percent exceedance for flow on sampling day	Current TSS load (lbs/day)/mi2	Reduced TSS load (lbs/day)/mi2	TMDL - FG TSS load (lbs/day)/mi2	Reduced load less than or TMDL - FG?
28-Jan-02	168.00	0.10	15.90	3,295.23	428.38	460.74	Yes
25-Feb-02	167.00	0.08	22.04	2,635.17	342.57	370.66	Yes
25-Mar-02	63.00	0.02	43.56	285.65	37.13	106.51	Yes
15-Apr-02	54.00	0.11	14.61	1,110.96	144.42	483.27	Yes
20-May-02	34.00	0.01	70.73	40.07	5.21	27.68	Yes
17-Jun-02	25.30	0.01	69.71	31.33	4.07	29.09	Yes
22-Jul-02	22.00	0.01	75.35	21.09	2.74	22.52	Yes
19-Aug-02	12.00	0.03	42.52	57.76	7.51	113.07	Yes
23-Sep-02	37.30	0.03	42.25	182.53	23.73	114.95	Yes
21-Oct-02	31.00	0.02	51.08	92.26	11.99	69.91	Yes
19-Nov-02	23.00	0.19	3.17	826.92	107.50	844.54	Yes
16-Dec-02	70.00	0.11	13.83	1,482.07	192.67	497.34	Yes

Total number of values =	12
Allowable % of exceedances =	0%
Allowable no. of exceedances =	0
No. of exceedances before reductions =	8
No. of exceedances after reductions =	0

Total allowable loading per unit area to meet TSS Target (from Table F.1) =	225.35	lbs/day/mi2
Total allowable loading for Subsegment 101601 = 225.35 * 99 mi2 =	11.18	tons/day
Explicit MOS for TSS for Subsegment 101601 (implicit) =	0.00	tons/day
Future growth for TSS for Subsegment 101601 (10% of TMDL) =	1.12	tons/day
Sum of design flows for point sources of TSS for Subsegment 101601 =	0.000	cms

Assumed effluent TSS concentration for point sources =	0	mg/L
Existing point source TSS load for Subsegment 101601 =	0.00	tons/day
WLA for TSS for Subsegment 101601 (same as existing Point Source load) =	0.00	tons/day
LA for TSS for Subsegment 101601 = total - MOS - WLA - FG =	10.06	tons/day

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APPENDIX G

Calculations for Subsegment 101602 TSS TMDL

Figure G.1. TSS Load Duration for Cocodrie Lake (101505)

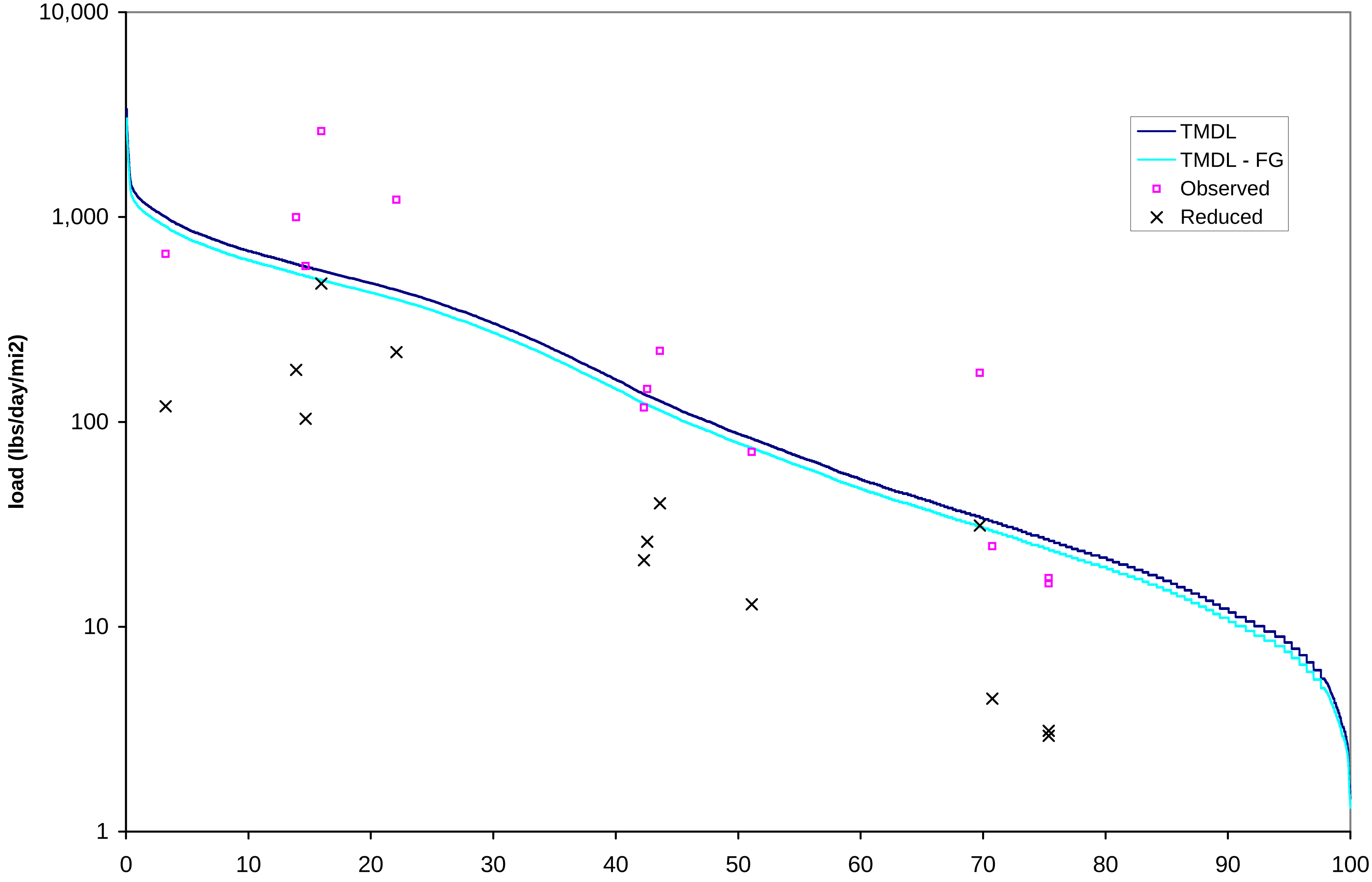

TABLE G.1. ALLOWABLE LOAD FOR TSS FOR COCODRIE LAKE NORTH OF MONTEREY, LA (1229)

drainage	270	mi2, of gage	25	NTU = TURB standard
	121.63	mi2, of watershed 101505	28	mg/L = TSS Target

TSS Target 242.85 lbs/day/mi2

Date	Bayou Des Glaises Div. Ch. flow (cfs)	Percent non exceed-ance	Percent exceed-ance	Flow per unit area (cfs/mi2)	Flow per unit area (cms/mi2)	Width on plot between data points (unitless)	TSS TMDL load (lbs/day/mi2)	TSS TMDL - FG load (lbs/day/mi2)	Area under TMDL curve (width times allowable load) (lbs/day/mi2)
10/29/2000	2.6	0.002	100.00	0.01	2.726E-04	0.00462	1.45	1.31	6.71E-05
10/30/2000	2.6	0.007	99.99	0.01	2.726E-04	0.00462	1.45	1.31	6.71E-05
10/26/1964	2.8	0.012	99.99	0.01	2.936E-04	0.00462	1.57	1.41	7.23E-05
10/27/1964	2.8	0.016	99.98	0.01	2.936E-04	0.00462	1.57	1.41	7.23E-05
10/13/1972	2.8	0.021	99.98	0.01	2.936E-04	0.00462	1.57	1.41	7.23E-05
10/14/1972	2.8	0.025	99.97	0.01	2.936E-04	0.00462	1.57	1.41	7.23E-05
10/31/2000	2.8	0.030	99.97	0.01	2.936E-04	0.00462	1.57	1.41	7.23E-05
10/11/1972	2.9	0.035	99.97	0.01	3.041E-04	0.00462	1.62	1.46	7.49E-05

For brevity, most of the rows in this spreadsheet have been hidden (between the 99.95% and the 0.05% exceedances).

5/27/1953	4,680	99.89	0.11	17.33	0.49	0.00693	2,617.38	2,355.65	0.18
4/13/1995	4,700	99.89	0.11	17.41	0.49	0.00462	2,628.57	2,365.71	0.12
5/24/1953	4,830	99.90	0.10	17.89	0.51	0.00462	2,701.27	2,431.15	0.12
5/26/1953	4,860	99.90	0.10	18.00	0.51	0.00462	2,718.05	2,446.25	0.13
5/25/1953	4,910	99.91	0.09	18.19	0.51	0.00462	2,746.02	2,471.41	0.13
4/12/1995	5,200	99.91	0.09	19.26	0.55	0.00462	2,908.20	2,617.38	0.13
5/19/1953	5,640	99.91	0.09	20.89	0.59	0.00462	3,154.28	2,838.85	0.15
5/18/1953	6,030	99.92	0.08	22.33	0.63	0.04271	3,372.40	3,035.16	1.44
								TOTAL =	242.85

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TABLE G.2 EXISTING LOAD AND PERCENT REDUCTION FOR TSS FOR COCODRIE LAKE NORTH OF MONTEREY, LA (1229)

TSS Target = 28 mg/L
Percent reduction needed = 82%

Error check for reduction is / is not needed: ok
Error check for less or more reduction needed: ok

Date	Observed TSS at 1229 (mg/L)	Flow per unit area on sampling day (cms/mi2)	Percent exceedance for flow on sampling day	Current TSS load (lbs/day)/mi2	Reduced TSS load (lbs/day)/mi2	Allowable TSS load with MOS and FG incorporated (lbs/day)/mi2	Reduced load less than or equal to allow. load?
1/28/02	134.0	0.10	15.96	2,628.34	473.10	494.29	Yes
2/25/02	77.0	0.08	22.10	1,215.02	218.70	397.64	Yes
3/25/02	49.0	0.02	43.60	222.17	39.99	114.26	Yes
4/15/02	28.0	0.11	14.68	576.05	103.69	518.45	Yes
5/20/02	21.0	0.01	70.75	24.75	4.45	29.70	Yes
6/17/02	140.0	0.01	69.73	173.37	31.21	31.21	Yes
7/22/02	17.0	0.01	75.37	16.30	2.93	24.16	Yes
7/22/02	18.0	0.01	75.37	17.26	3.11	24.16	Yes
8/19/02	30.0	0.03	42.57	144.41	25.99	121.31	Yes
9/23/02	24.0	0.03	42.30	117.45	21.14	123.32	Yes
10/21/02	24.0	0.02	51.12	71.43	12.86	75.00	Yes
11/19/02	18.4	0.19	3.25	661.54	119.08	906.02	Yes
12/16/02	47.1	0.11	13.89	997.22	179.50	533.55	Yes

Total number of values = 13
Allowable % of exceedances = 0%
Allowable no. of exceedances = 0
No. of exceedances before reductions = 6
No. of exceedances after reductions = 0

Total allowable loading per unit area to meet TSS Target (from Table G.1) = 242.85 lbs/day/mi2
Total allowable loading for Subsegment 101602 = 242.85 * 122 mi2 = 14.77 tons/day

Explicit MOS for TSS for Subsegment 101602 (implicit)	0.00	tons/day
Future growth for TSS for Subsegment 101602 (10% of TMDL) =	1.48	tons/day
Sum of design flows for point sources of TSS for Subsegment 101602 =	0.000	cms
Assumed effluent TSS concentration for point sources =	0	mg/L
Existing point source TSS load for Subsegment 101602 =	0.00	tons/day
WLA for TSS for Subsegment 101602 (same as existing Point Source load) =	0.00	tons/day
LA for TSS for Subsegment 101602 = total - MOS - WLA - FG =	13.29	tons/day

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APPENDIX H

Calculations for Subsegment 101505 sulfate TMDL

Figure H.1. Sulfate Load Duration for Lake Larto (Subsegment 101505)

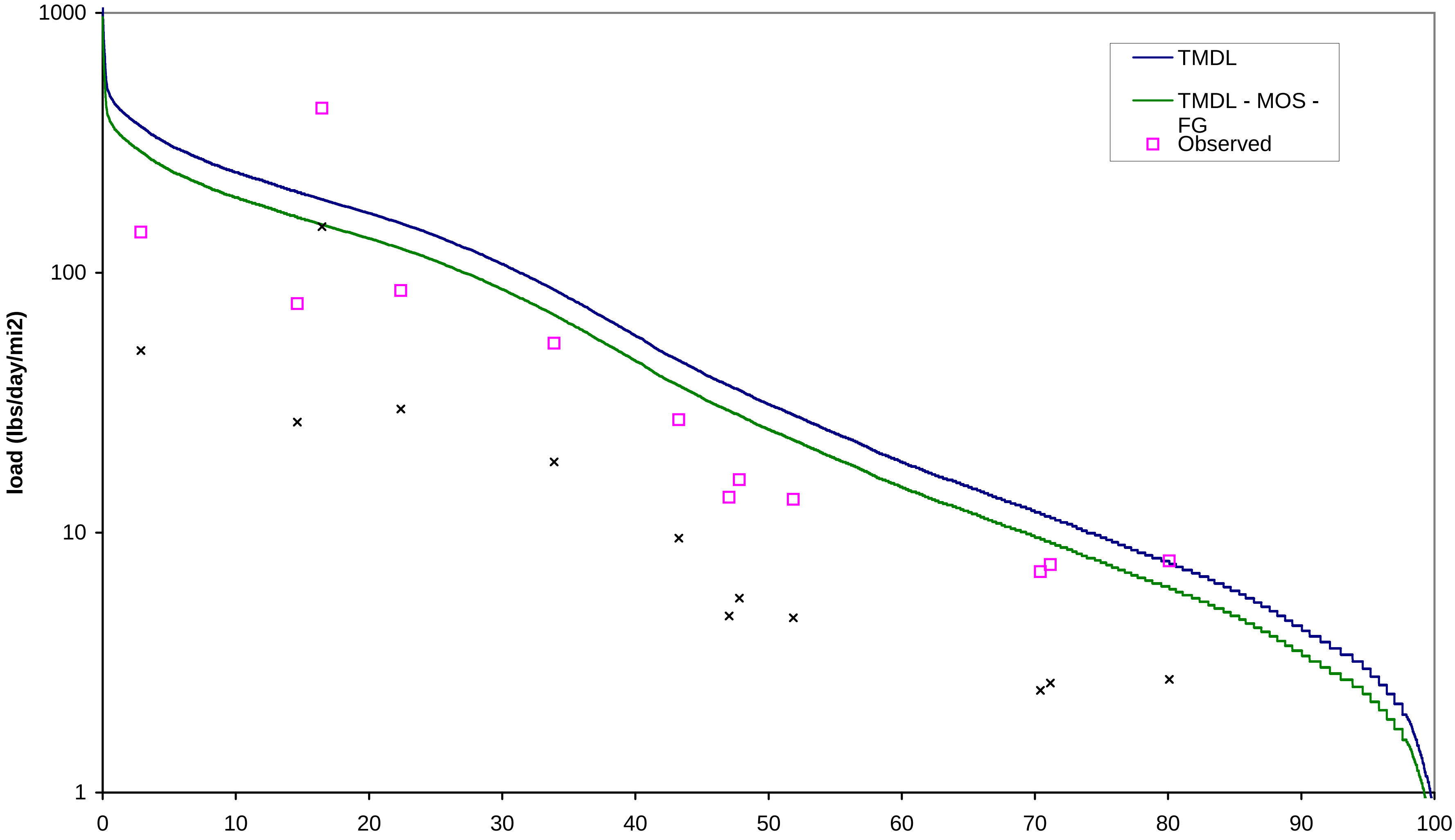

TABLE H.1 ALLOWABLE LOADS FOR SULFATE FOR LARTO LAKE WEST OF NEW ERA, LA (1226)

drainage 270 mi2, of gage
32.80 mi2, of subwatershed 101505

10 mg/L = SO4 standard

SO4 target = 86.29 lbs/day/mi2

Date	Bayou Des Glaises Div. Ch. flow (cfs)	Percent non exceed-ance	Percent exceed-ance	Flow per unit area (cfs/mi2)	Flow per unit area (cms/mi2)	Width on plot between data points (unitless)	SO4 TMDL load (lbs/day/mi2)	SO4 TMDL - MOS - FG load (lbs/day/mi2)	Area under TMDL curve (width times allowable load) (lbs/day/mi2)
10/29/2000	2.6	0.00	100.00	0.010	0.00	0.00462	0.52	0.42	2.40E-05
10/30/2000	2.6	0.01	99.99	0.010	0.00	0.00462	0.52	0.42	2.40E-05
10/26/1964	2.8	0.01	99.99	0.010	0.00	0.00462	0.56	0.45	2.58E-05
10/27/1964	2.8	0.02	99.98	0.010	0.00	0.00462	0.56	0.45	2.58E-05
10/13/1972	2.8	0.02	99.98	0.010	0.00	0.00462	0.56	0.45	2.58E-05
10/14/1972	2.8	0.03	99.97	0.010	0.00	0.00462	0.56	0.45	2.58E-05
10/31/2000	2.8	0.03	99.97	0.010	0.00	0.00462	0.56	0.45	2.58E-05
10/11/1972	2.9	0.03	99.97	0.011	0.00	0.00462	0.58	0.46	2.68E-05

For brevity, most of the rows in this spreadsheet have been hidden (between the 99.97% and the 0.03% exceedances).

5/27/1953	4,680.0	99.97	0.03	17.333	0.49	0.00462	934.78	747.82	4.32E-02
4/13/1995	4,700.0	99.97	0.03	17.407	0.49	0.00462	938.77	751.02	4.34E-02
5/24/1953	4,830.0	99.97	0.03	17.889	0.51	0.00462	964.74	771.79	4.46E-02
5/26/1953	4,860.0	99.98	0.02	18.000	0.51	0.00462	970.73	776.59	4.49E-02
5/25/1953	4,910.0	99.98	0.02	18.185	0.51	0.00462	980.72	784.58	4.53E-02
4/12/1995	5,200.0	99.99	0.01	19.259	0.55	0.00462	1,038.64	830.92	4.80E-02
5/19/1953	5,640.0	99.99	0.01	20.889	0.59	0.00462	1,126.53	901.22	5.21E-02
5/18/1953	6,030.0	100.00	0.00	22.333	0.63	0.00347	1,204.43	963.54	4.17E-02
								TOTAL =	86.29

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TABLE H.2 EXISTING LOAD AND PERCENT REDUCTION FOR SULFATE FOR LAKE LARTO WEST OF NEW ERA, LA (1226)

WQ standard for SO4 = 10 mg/L
Percent reduction needed = 65%

Error check for reduction is / is not needed: ok
Error check for less or more reduction needed: ok

Date	Observed SO4 at stn 1226 (mg/L)	Flow per unit area on sampling day (cms/mi2)	Percent exceedance for flow on sampling day	Current SO4 load (lbs/day)/mi2	Reduced SO4 load (lbs/day)/mi2	Allowable SO4 load (lbs/day)/mi2	Reduced load less than or equal to allow. load?
22-Jan-02	6.2	0.05	33.90	53.50	18.72	69.03	Yes
18-Feb-02	5.9	0.02	43.26	27.22	9.53	36.91	Yes
26-Mar-02	5.5	0.08	22.38	85.47	29.91	124.32	Yes
16-Apr-02	22.4	0.10	16.47	429.97	150.49	153.56	Yes
21-May-02	6.5	0.01	71.16	7.53	2.64	9.27	Yes
18-Jun-02	5.9	0.01	70.41	7.07	2.47	9.59	Yes
23-Jul-02	10.0	0.00	80.09	7.79	2.73	6.23	Yes
20-Aug-02	4.5	0.02	47.80	16.00	5.60	28.44	Yes
24-Sep-02	3.7	0.02	47.04	13.67	4.79	29.56	Yes
22-Oct-02	4.7	0.01	51.85	13.42	4.70	22.85	Yes
18-Nov-02	3.9	0.19	2.86	143.33	50.17	294.02	Yes
17-Dec-02	3.7	0.11	14.61	76.12	26.64	164.59	Yes

Total number of values =	12
Allowable % of exceedances =	0%
Allowable no. of exceedances =	0
No. of exceedances before reductions =	2
No. of exceedances after reductions =	0

Total allowable loading per unit area to meet SO4 target (from Table H.1) =	86.29	lbs/day/mi2
Total allowable loading for Subsegment 101505 = 86.29 * 33 mi2 =	1.42	tons/day
Explicit MOS for SO4 for Subsegment 101505 (10% * 1.42) =	0.14	tons/day
Future growth for SO4 for Subsegment 101505 (10% of TMDL) =	0.14	tons/day

Sum of design flows for point sources of SO_4 for Subsegment 101505 =	0.000	cms
Assumed effluent SO_4 concentration for point sources =	30	mg/L
Existing point source SO_4 load for Subsegment 101505 =	0.00	tons/day
WLA for SO_4 for Subsegment 101505 (same as existing Point Source load) =	0.00	tons/day
LA for SO_4 for Subsegment 101505 = total - MOS - WLA =	1.14	tons/day

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APPENDIX I

Calculations for Subsegment 101505 TDS TMDL

Figure I.1. TDS Load Duration for Larto Lake (Subsegment 101505)

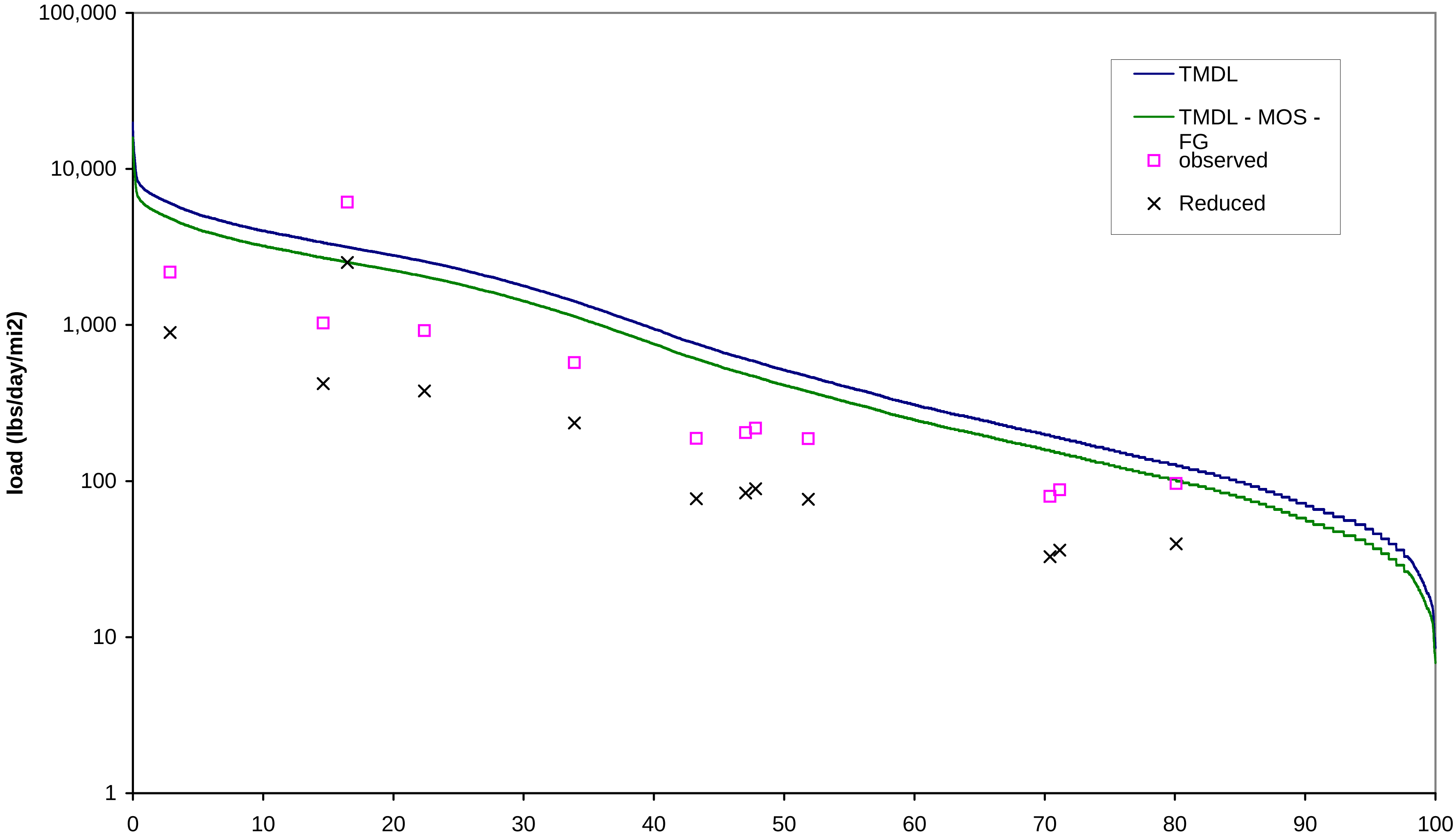

TABLE I.1 ALLOWABLE LOADS FOR TDS FOR LARTO LAKE WEST OF NEW ERA, LA (1226)

drainage 270 mi2, of gage
32.80 mi2, of subwatershed 101505

165 mg/L = TDS standard

TDS target = 1423.77 lbs/day/mi2

Date	Bayou Des Glaises Div. Ch. flow (cfs)	Percent non exceed-ance	Percent exceed-ance	Flow per unit area (cfs/mi2)	Flow per unit area (cms/mi2)	Width on plot between data points (unitless)	TDS TMDL load (lbs/day/mi2)	TDS TMDL - MOS - FG load (lbs/day/mi2)	Area under TMDL curve (width times allowable load) (lbs/day/mi2)
10/29/2000	2.6	0.00	100.00	0.010	0.00	0.00462	8.57	6.86	3.96E-04
10/30/2000	2.6	0.01	99.99	0.010	0.00	0.00462	8.57	6.86	3.96E-04
10/26/1964	2.8	0.01	99.99	0.010	0.00	0.00462	9.23	7.38	4.26E-04
10/27/1964	2.8	0.02	99.98	0.010	0.00	0.00462	9.23	7.38	4.26E-04
10/13/1972	2.8	0.02	99.98	0.010	0.00	0.00462	9.23	7.38	4.26E-04
10/14/1972	2.8	0.03	99.97	0.010	0.00	0.00462	9.23	7.38	4.26E-04
10/31/2000	2.8	0.03	99.97	0.010	0.00	0.00462	9.23	7.38	4.26E-04
10/11/1972	2.9	0.03	99.97	0.011	0.00	0.00462	9.56	7.65	4.42E-04
For brevity, most of the rows in this spreadsheet have been hidden (between the 99.97% and the 0.03% exceedances).									
5/27/1953	4,680.0	99.97	0.03	17.333	0.49	0.00462	15,423.87	12,339.10	7.13E-01
4/13/1995	4,700.0	99.97	0.03	17.407	0.49	0.00462	15,489.78	12,391.83	7.16E-01
5/24/1953	4,830.0	99.97	0.03	17.889	0.51	0.00462	15,918.22	12,734.58	7.36E-01
5/26/1953	4,860.0	99.98	0.02	18.000	0.51	0.00462	16,017.10	12,813.68	7.40E-01
5/25/1953	4,910.0	99.98	0.02	18.185	0.51	0.00462	16,181.88	12,945.50	7.48E-01
4/12/1995	5,200.0	99.99	0.01	19.259	0.55	0.00462	17,137.63	13,710.11	7.92E-01
5/19/1953	5,640.0	99.99	0.01	20.889	0.59	0.00462	18,587.74	14,870.19	8.59E-01
5/18/1953	6,030.0	100.00	0.00	22.333	0.63	0.00347	19,873.06	15,898.45	6.89E-01
								TOTAL =	1423.77

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TABLE I.2 EXISTING LOAD AND PERCENT REDUCTION FOR TDS FOR LAKE LARTO WEST OF NEW ERA, LA (1226)

TDS Standard =	165 mg/L	Error check for reduction is / is not needed:	ok
Percent reduction needed =	59%	Error check for less or more reduction needed:	ok

Date	Observed TDS at stn 1226 (mg/L)	Flow per unit area on sampling day (cms/mi2)	Percent exceedance for flow on sampling day	Current TDS load (lbs/day)/mi2	Reduced TDS load (lbs/day)/mi2	Allowable TDS load (lbs/day)/mi2	Reduced load less than or equal to allow. load?
22-Jan-02	66.6	0.05	33.90	574.68	235.62	1139.00	Yes
18-Feb-02	40.7	0.02	43.26	187.79	76.99	609.05	Yes
26-Mar-02	59.3	0.08	22.38	921.51	377.82	2051.25	Yes
16-Apr-02	319.0	0.10	16.47	6123.22	2510.52	2533.74	Yes
21-May-02	76.0	0.01	71.16	88.05	36.10	152.92	Yes
18-Jun-02	66.6	0.01	70.41	79.82	32.72	158.19	Yes
23-Jul-02	124.0	0.00	80.09	96.59	39.60	102.83	Yes
20-Aug-02	61.3	0.02	47.80	217.94	89.36	469.31	Yes
24-Sep-02	55.3	0.02	47.04	204.34	83.78	487.77	Yes
22-Oct-02	65.3	0.01	51.85	186.52	76.47	377.03	Yes
18-Nov-02	59.3	0.19	2.86	2179.41	893.56	4851.29	Yes
17-Dec-02	50.0	0.11	14.61	1028.66	421.75	2715.67	Yes

Total number of values =	12
Allowable % of exceedances =	0%
Allowable no. of exceedances =	0
No. of exceedances before reductions =	1
No. of exceedances after reductions =	0

Total allowable loading per unit area to meet stds (from Table I.1) =	1423.77	lbs/day/mi2
Total allowable loading for Subsegment 101505 = 1423.77 * 33 mi2 =	23.35	tons/day
Explicit MOS for TDS for Subsegment 101505 (10% * 23.35) =	2.34	tons/day
Future growth for TSS for Subsegment 101505 (10% of TMDL) =	2.34	tons/day

Sum of design flows for point sources of TDS for Subsegment 101505 =	0.000	cms
Assumed effluent TDS concentration for point sources =	0	mg/L
Existing point source TDS load for Subsegment 101505 =	0.00	tons/day
WLA for TDS for Subsegment 101505 (same as existing Point Source load) =	0.00	tons/day
LA for TDS for Subsegment 101505 = total - MOS - WLA =	18.68	tons/day

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