SOURCE WATER PROTECTION PROGRAM
ASSESSMENT/PLANNING PROJECT FINAL REPORT

Bayou Lafourche Fecal Coliform Sources

by

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CFMS Interagency Agreement No. 658936
OCR Interagency Agreement No. 853 800283

EXECUTIVE SUMMARY

Project Title: Bayou Lafourche Fecal Coliform Sources

CFMS Interagency Agreement No. 658936
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Grant Source: Louisiana Department of Environmental Quality

Initiation Date: January 1, 2008 Expiration Date: September 30, 2009

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Total LDEQ Contract: Cash	$49,999.00
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TOTAL FUNDING	$49,999.00

EXPENDITURES	$49,994.53
Expenditures of LDEQ Funds	$49,994.53
TOTAL EXPENDITURES	$49,994.53

The goal of this project was to identify and enumerate anthropogenic nonpoint source (NPS) fecal coliform (FC) contamination from malfunctioning home package sewage systems in the Bayou Lafourche watershed within two "protection areas" (PAs) designated by the Louisiana Department of Environmental Quality (LDEQ) to determine whether onsite sewage systems are a significant contributing source of high fecal coliform levels to Bayou Lafourche which is the drinking water source for 300,000 people in five parishes of south Louisiana. The protection areas were delineated by LDEQ as areas that could conceivably impact the four drinking water plant intake pumps in B. Lafourche for the City of Thibodaux's Water Treatment Plant, the Lafourche Parish Water District No. 1 North Plant on LA Hwy 1 south of Thibodaux, the Terrebonne Parish Water Treatment Plant intake pump in Lefort Canal from Bayou Lafourche, and the Main Lafourche Parish Plant on LA 308 at Clotilda. The objectives of the project to meet this goal were: (1) to determine whether onsite sewage systems are a significant contributing source of the high fecal coliform levels to Bayou Lafourche; (2) to combine targeted FC sampling with optical brightener (OB) fluorometry to identify "hot spots" that may be contributing human fecal coliforms to the bayou; and (3) to provide information that may be used by LDEQ to encourage local government to pass an ordinance to address the problem of malfunctioning onsite sewage systems using "Best Management Practices" (BMPs). Government, academic, and environmental industry sources were investigated to obtain GIS information, maps, and other documents and databases to help select sampling sites within the protection areas of upper Lafourche Parish. GIS data was collected for all available potential fecal coliform (FC) sources. GIS data for single dwelling package plants (6,966 in Lafourche), subdivision package plants (284), culverts (310), drinking water intake pumps (6), drainage pump stations (91), and other drainage locations were all entered in the protection area shapefiles. A sampling protocol was developed using 10 geographically related clusters of sites (Clusters A – J) that are spatially located north to south in the study area with multiple sampling sites within each cluster for a total of 54 sampling sites. A rotating temporal (morning, mid-morning and evening) and spatial sampling protocol of 54 sampling sites within the 10 sampling clusters (A to J) occurred 3 weeks each month during the 4 seasons of the year. Our GIS maps were used in conjunction with new aerial post Hurricane Gustov GIS maps and Microsoft Virtual Earth bird's eye view software to identify surface drainage inaccessible by land and to see targeted package plant clusters. Overall the project plan and method of using a combination of GIS cluster maps, Virtual Earth aerial views, and a field fluorometer to identify (OBs) and "hot spots" of potential anthropogenic FC input into Bayou Lafourche worked well toward meeting the goal and objectives of the project. The LDEQ can use the results of the potential sources of anthropogenic fecal or sewage input into the Bayou Lafourche drainage basin to better address the problem of meeting the EPA TMDL for Bayou Lafourche. Possible solutions will be to work with LDEQ officials and local and parish governments to foster the passage of local ordinances to address the faulty treatment systems. This could include the implementation of Best Management Practices (BMP's).

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1.0 INTRODUCTION

The Safe Drinking water Act Amendments (SDW A) of 1996 required all states to develop a Source Water Assessment Program (SWAP) to ensure safe drinking water for citizens through protection of water sources. The Congress intended the states to utilize the SWAP information to substantially implement a source water protection strategy developed by each state. The strategy is designed to protect both surface water and groundwater sources of drinking water. Historical data for Bayou Lafourche have failed to meet the criteria for acceptable water quality based upon a Total Maximum Daily Load (TMDL) for Bayou Lafourche (EPA 2004). The drainage basin for Bayou Lafourche has a mixed land use of agricultural, industrial and residential. The treatment and release of residential wastewater is the responsibility of the homeowner and in unincorporated areas, this release is into ditches which drain to the bayou and ultimately contribute to the TMDL. We seek to identify specific areas that are contributing to the quality of this water used as a human drinking water and recreation source, and for an aquatic wildlife habitat.

Bayou Lafourche, located in the Barataria Basin of southern Louisiana, branches off of the Mississippi River curving and winding for 110 miles through three parishes and eventually emptying into the Gulf of Mexico. See Figure 1 below. Bayou Lafourche is a vital asset to the communities and towns that line its banks. It serves as a habitat for a variety of seafoods, provides a location for numerous recreational activities, gives boats access to the Gulf of Mexico and many other waterways, and supplies the main source of drinking water in five parishes for about 300,000 people. However non-point source microbiological and chemical contaminants enter Bayou Lafourche through forced drainage areas or through natural overland drainage such as cropland and storm water drainage systems, canals, ditches, and culverts. Incomplete sewage treatment from subdivisions and rural communities introduces nutrients, toxics, sewage indicator bacteria, and microbial, viral, and protozoan pathogens to Bayou Lafourche waters. Septic tanks, sewage overflow, and unsewered communities also contribute contaminants to the Bayou and our wetlands as a whole (Kilgen et al. 1995). As a result of pollution, the nutrient loads in the ecosystem have increased and frequent eutrophication occurrences have been reported (BTNEP 1995).

Figure 1. Location of Bayou Lafourche in the Barataria Terrebonne National Estuary and acting as the boundary between the Barataria and Terrebonne estuaries of the Coastal Louisiana Delta.

The Federal Clean Water Act requires all states to identify those bodies of water that are not meeting their designated water quality standards and to develop total maximum daily pollutant loads (TMDL) for those water bodies. A TMDL is the maximum amount of pollutant that a water body can assimilate without exceeding the established water quality standard for that pollutant (EPA 2004).

The State of Louisiana's Department of Environmental Quality (LDEQ) sets designated use water quality standards for its bodies of water. These include microbial fecal coliform (FC) standards for drinking water supply, primary contact recreation, secondary contact recreation, oyster propagation and harvesting, and fish and wildlife propagation (dissolved oxygen).

Table 1 and the information below is taken from the State of Louisiana 2008 Water Quality Management Plan Water Quality Inventory Integrated Report (Section 305(b) 2008 Report). It summarizes the designated uses, standards, and the percentage of water bodies meeting these standards, LAC 33:IX.1123 (LDEQ 2009).

Table 1. Parameters for each designated use; Louisiana's 2008 Integrated Report (LDEQ 2009)

Numerical Criteria and Designated Uses									
A-Primary Contact Recreation; B-Secondary Contact Recreation; C-Fish And Wildlife Propagation; L-Limited Aquatic Life and Wildlife Use; D-Drinking Water Supply; E-Oyster Propagation; F-Agriculture; G-Outstanding Natural Resource Waters									
Code	**Stream Description**	**Designated Uses**	**Numerical Criteria**						
			CL	**SO_4**	**DO**	**pH**	**BAC**	**°C**	**TDS**
Barataria Basin (02)									
020401	Bayou Lafourche–From Donaldsonville to ICWW at Larose	A B C D	70	55	2.3 Mar.-Nov.; 5.0 Dec.-Feb.	6.0-8.5	1*	32	500

Bacterial Criteria (BAC): The code numbers associated with the following designated uses are used in Table 1 under the Numerical Criteria subheading "BAC."

Code	Designated Use
*1	Primary Contact Recreation
2	Secondary Contact Recreation
3	Drinking Water Supply
4	Oyster Propagation

The code number identified under the Numerical Criteria subheading "BAC" in Table 1 represents the most stringent bacterial criteria that apply to each individual subsegment. Where applicable, additional less stringent bacterial criteria also apply, depending on the designated uses of the subsegment. The specified numeric bacterial criteria for each designated use listed in this Paragraph can be found in LAC 33:IX.1113.C.

Designated Uses. The following notations for water use designations are used in Table 1 under the subheading "Designated Uses." (LDEQ 2009)

Notation	Designated Use
A	Primary Contact Recreation (PCR)
B	Secondary Contact Recreation (SCR)
C	Fish and Wildlife Propagation (FWP)
L	Limited Aquatic Life and Wildlife Use
D	Drinking Water Supply (DWS)
E	Oyster Propagation
F	Agriculture
G	Outstanding Natural Resource Waters

For most water bodies, criteria are as follows: PCR, 400 colonies/100 mL; SCR, 2,000 colonies/100 mL; DWS, 2,000 colonies/100 mL; SFP, 43 colonies/100 mL; dissolved oxygen (DO) criteria for fish and wildlife propagation (5 mg/L DO for fresh water and 4 mg/L for estuarine water). No designated standards for BOD are cited by LDEQ, however, the average normal BOD in surface fresh and estuarine waters should be less than 15 mg/L. (see LAC 33:IX.1123). Low D.O. and high BOD are associated with high nutrient levels (LDEQ 2009).

LAC 33:IX.1123: For water quality monitoring and assessment purposes the following criteria shall be used to determine support for the designated uses (LDEQ 2009).

a. Primary Contact Recreation. No more than 25 percent of the total samples collected on a monthly or near-monthly basis shall exceed a fecal coliform density of 400/100 mL. This primary contact recreation criterion shall apply only during the defined recreational period of May 1 through October 31. During the non-recreational period of November 1 through April 30, the criteria for secondary contact recreation shall apply.

b. Secondary Contact Recreation. No more than 25 percent of the total samples collected on a monthly or near-monthly basis shall exceed a fecal coliform density of 2,000/100 mL. This secondary contact recreation criterion shall apply year round.

c. Drinking Water Supply. No more than 30 percent of the total samples collected on a monthly or near-monthly basis shall exceed a fecal coliform density of 2,000/100 mL.

d. Oyster Propagation. The fecal coliform median most probable number (MPN) shall not exceed 14 fecal coliforms per 100 mL, and not more than 10 percent of the samples shall exceed an MPN of 43 per 100 mL for a five-tube decimal dilution test in those portions of the area most probably exposed to fecal contamination during the most unfavorable hydrographic and pollution conditions.

Bayou Lafourche's significance as the main source of drinking water for five parishes with many communities and a large population not incorporated into municipal sewage made this study significant in identifying the non- point sources of fecal coliform pollution to the system. Bayou Lafourche is not able to consistently meet its designated use standards year round for fecal coliform levels for primary contact recreation (PCR), drinking water source (DWS), secondary contact recreation (SCR), and for dissolved oxygen (D.O.) levels to support aquatic wildlife. The data collected from this study will be used by the LDEQ to help target human fecal coliform (FC) sources and work with local governments to determine Best Management Practices (BMPs) to remediate the NPS fecal coliform pollution problem in Bayou Lafourche which has caused the Environmental Protection Agency to list Bayou Lafourche, Subsegment 020401 from its origin at Donaldsonville to the Intracoastal Waterway at Larose, as "not fully supporting its designated uses, and to be ranked as priority # 3 for total maximum daily load (TMDL) development." See Table 2 below taken from the EPS Region VI, Watershed Management Section's Bayou Lafourche TDML Report. (EPA 2004). Total fecal coliform TMDL summer load reduction for Bayou Lafourche Subsegment 020401 is a very significant 45%.

This project evaluated the possible input of fecal coliform sewage indicators from single dwelling on-sight or community (subdivision) sewage package plant effluents to drainage structures (culverts, ditches, canals) in Lafourche Parish that can potentially drain into Bayou Lafourche and impair the microbial water quality standards for its designated uses – particularly for primary contact recreation and drinking water source.

Table 2. Fecal coliform TMDL for Bayou Lafourche (subsegment 020401) (Table 4.4 from EPA 2004)

Source	Summer Current Load (10^8 colonies/day)	Summer Reduction %	Summer Target Load (10^8 colonies/day)	Winter Current Load	Winter Reduction %	Winter Target Load (10^8 colonies/day)
WLA (waste load allocation)						
Treated wastewater	5.4	0	5.4	5.4	0	5.4
Thibodaux Storm water	4.0	47	2.1	4.0	0	4.0
Lockport Storm water	0.7	47	0.4	0.7	0	0.7
LA (load allocation)						
Wildlife	19.2	0	19.2	19.2	0	19.2
Failing Septic Systems	16.4	47	8.7	16.4	0	16.4
Other Storm water	32.6	47	17.3	32.6	0	32.6
*Mississippi River Pumping	477	47	252	514	0	514
Total Load	556	45	306	514	0	514
Future Growth			38.2			74.0
MOS			38.2			74.0
TMDL			382			740

***Note:** The Mississippi River source water was originally targeted for 47% reduction in fecal coliforms. However, after further assessment, EPA inserted into the TMDL report the following paragraph intended to exempt diversion of water from the River into Bayou Lafourche from any TMDL-related restrictions or reductions: *"Based on the assessment of pollutant sources in Section 4.2, it will be impossible to achieve a 45% reduction in fecal coliform levels without reducing the inputs to Bayou Lafourche from the Mississippi River (Table 4.4). However, this analysis assumed that fecal coliform levels in the Mississippi River were below the log mean water quality standards.** Therefore, the Mississippi River water should not be causing any violations of water quality standards in Bayou Lafourche and no reductions should be required for loading from the Mississippi River. This indicates that the assessment of pollutant sources in Section 4.2 is likely underestimating contributions from sources other than the Mississippi River water (e.g., septic systems, urban runoff, waterfowl and wildlife). The TMDL shown in Table 4.4 assumes a 47% reduction in fecal coliform loads from pumped Mississippi River water."*

" Water pumped from the Mississippi River at Donaldsonville: Median values of fecal coliform counts for the Mississippi River east of Plaquemines (LDEQ station 0319) were 130/100 mL for summer and 140/100 mL for winter (based on 1991-2002 data)"*(Section 4-2, Table 4.1, EPA 2004).

The study area of this project was defined by LDEQ as “Protection Areas 1 and 2.” These areas were provided to the contractors in GIS shapefiles by LDEQ. The protection areas were delineated by LDEQ as areas that could conceivably impact the four drinking water plant intake pumps in B. Lafourche for the City of Thibodaux’s Water Treatment Plant, the Lafourche Parish Water District No. 1 North Plant on LA Hwy 1 south of the Thibodaux, the Terrebonne Parish Water Treatment Plant intake pump in Lefort Canal from Bayou Lafourche, and the Main Lafourche Parish Plant on LA 308 at Clotilda.

Figure 2 below shows the entire study area from the LA 398 bridge over B. Lafourche in Labadieville, LA in Assumption parish north to the Valentine, LA bridge over B. Lafourche in Lafourche Parish south. These two sites were the first and last sites of the study and were outside the actual LDEQ protection areas in Lafourche Parish.

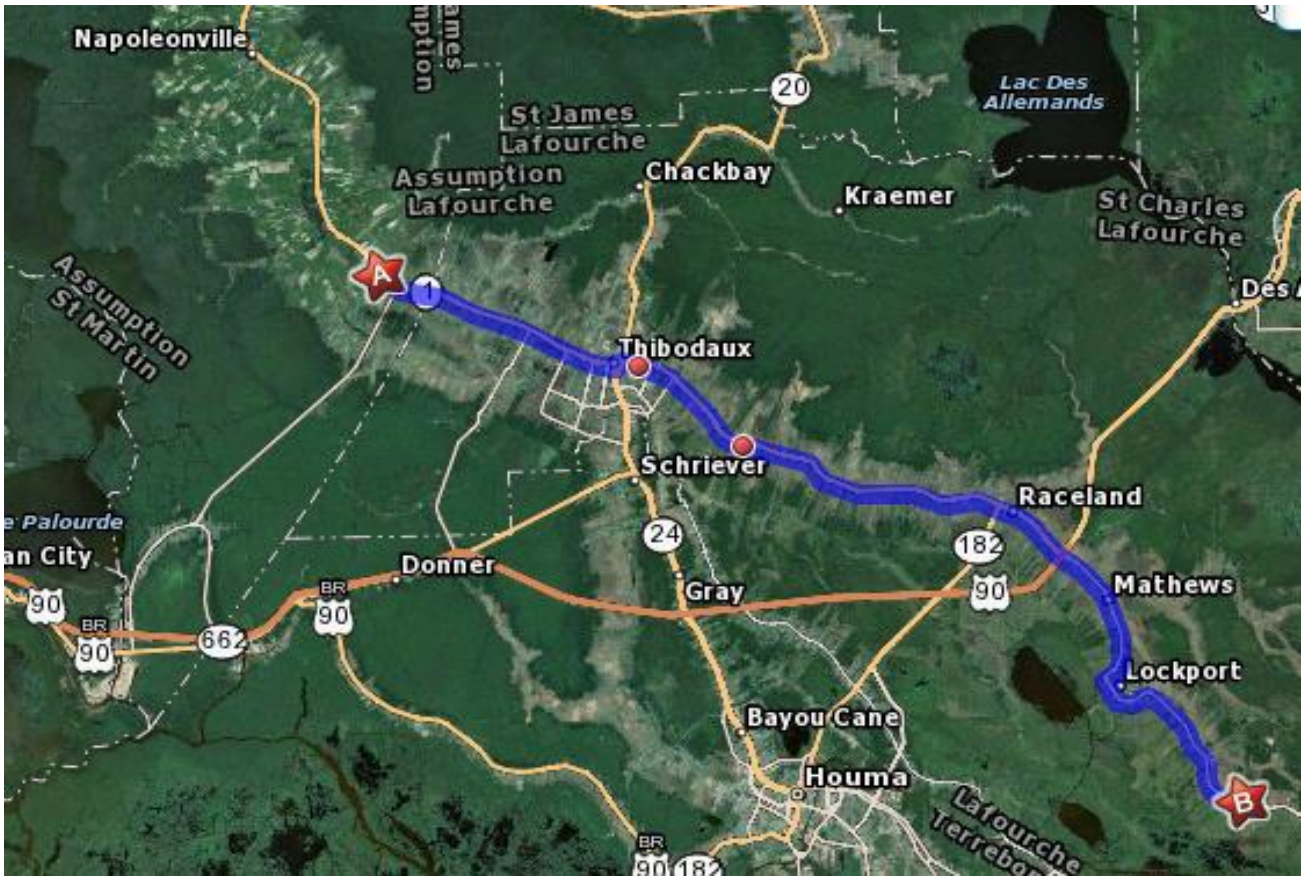


Figure 2. Project study area from the Labadieville Hwy 398 bridge over Bayou Lafourche to the Valentine, LA bridge over the Bayou

2.0 PROJECT GOALS, OBJECTIVES, AND ACTIVITIES

Project Goal: To identify and enumerate anthropogenic nonpoint source (NPS) fecal coliform (FC) contamination from malfunctioning home package sewage systems in the Bayou Lafourche watershed within two "protection areas" (PAs) designated by the Louisiana Department of Environmental Quality (LDEQ).

Objective 1: To determine whether onsite sewage systems are a significant contributing source of the high fecal coliform levels to Bayou Lafourche which is the drinking water source for 300,000 people in five parishes of south Louisiana.

Objective 2: To combine targeted FC sampling with optical brightener (OB) fluorometry to identify "hot spots" that may be contributing human fecal coliforms to the Bayou.

Objective 3: To provide information that may be used by LDEQ to encourage local government to pass an ordinance to address the problem of malfunctioning onsite sewage systems using "Best Management Practices" (BMPs).

In order to accomplish the goal and objectives of this project, the fecal coliform (FC) source contamination sites for sampling locations within the defined study site protection areas 1 and 2 (Figure 3) were selected through a process of researching as much background information and data from previous work in the area that was available. The P.I.'s met first with LDEQ officials who provided a map and GIS shape files delineating Protection Areas 1 and 2 in the northern Subsegment 020401 of the Bayou Lafourche drainage basin. The P.I.'s then met with officials of the Bayou Lafourche Fresh Water District, State, Parish, City, and other local government officials, and also private environmental company sources to obtain information and possible maps, blueprints, or other documents to help in determining the best sampling locations within the LDEQ designated protection areas that indicated sources of drainage to the culverts, ditches, and canals emptying directly into the Bayou.

GIS data that was collected for all available potential fecal coliform (FC) sources included data for single dwelling package plants (6,966 in Lafourche), subdivision package plants (284), culverts (310), drinking water intake pumps (6), drainage pump stations (91), and other drainage locations were all entered in the protection area shapefiles. GIS maps with all of this information (Figures 3 and 4) were used in conjunction with Microsoft Virtual Earth bird's eye view software and recently new post Hurricane Gustov GIS aerial maps to identify surface drainage inaccessible by land and to see targeted package plant clusters.

Although sites within the protection areas are a higher priority, one site (A1) was above the study protection area 1. It was in Assumption Parish (Labadieville) and was selected for potential impact to the protection area downstream. The last site (J9) was also out of Protection Area 2 at the Valentine Bridge, near the old Valentine Sugar Mill, but was selected to determine the potential downstream impact of the subdivision cluster south of Lockport (sites J5-J9) that had culverts emptying into the Bayou which drained the front of this subdivision and also had large ditches and side canals draining back to the 40 Arpent Canal which is connected to the Company Canal that exerts a direct impact on Bayou Lafourche.

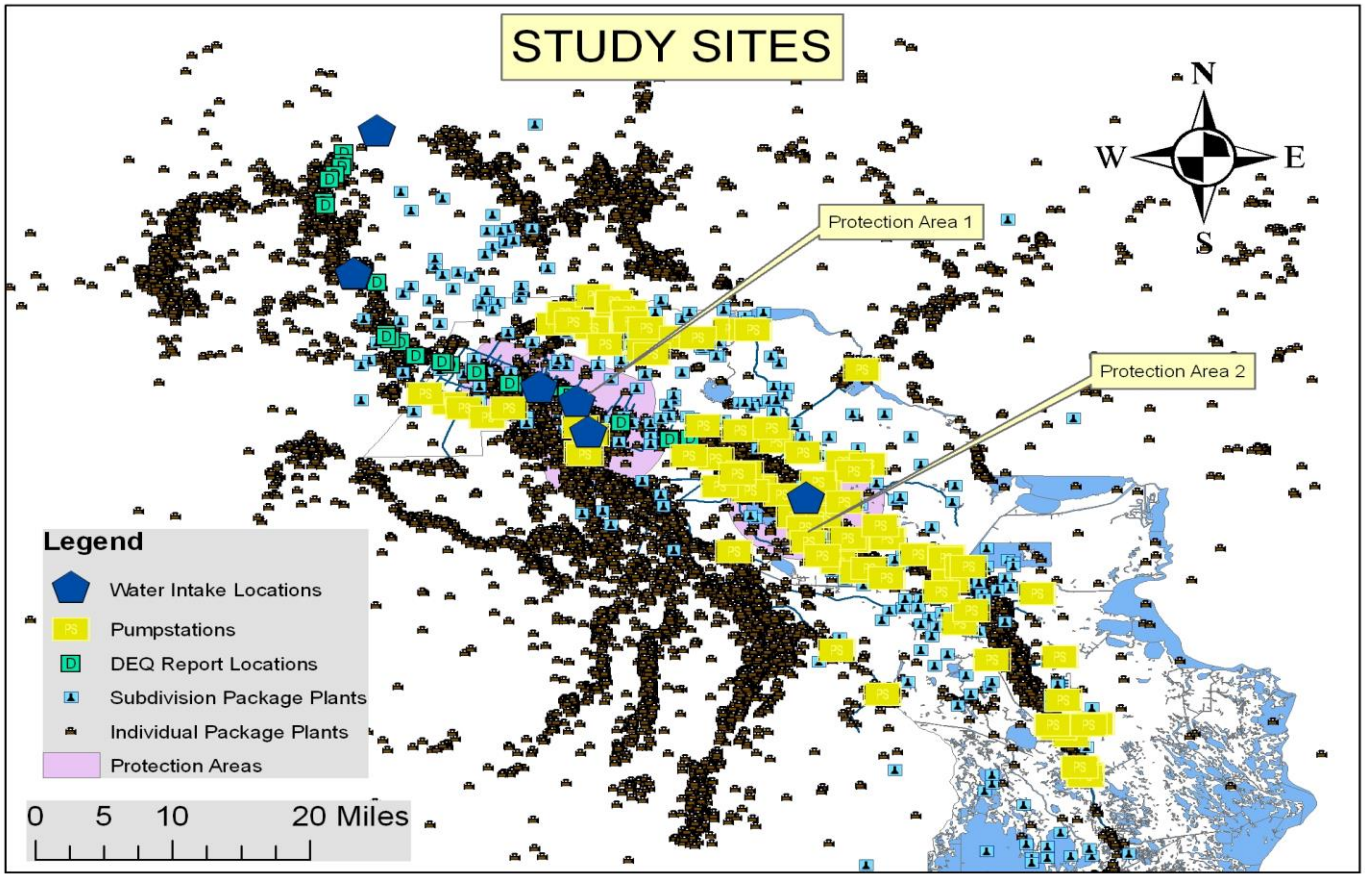


Figure 3. Single Dwelling Sewage Treatment Package Plants, Drinking Water Treatment Intake Pumps, LDEQ Report Locations, and Subdivision Package Plants in the Study Area

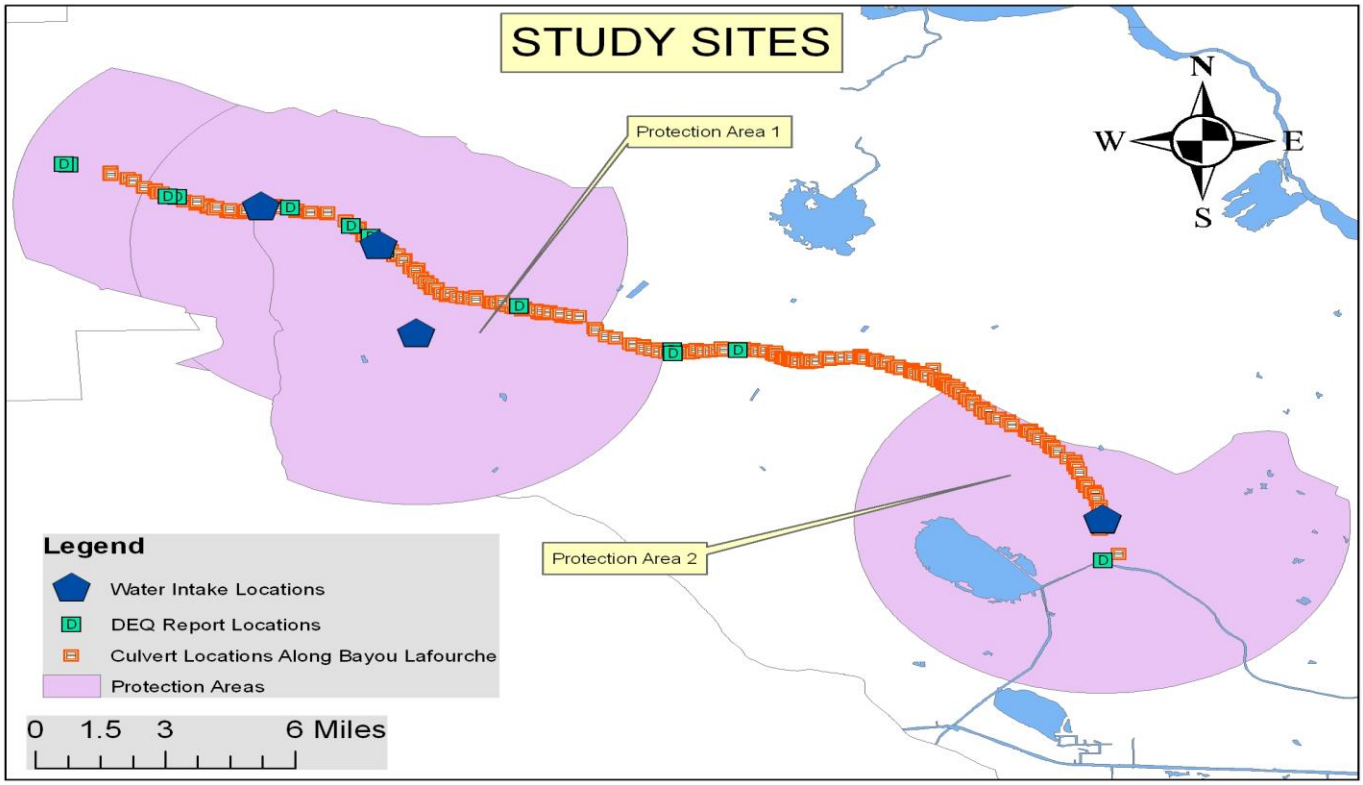


Figure 4. GIS Locations of the Drainage Culverts and an LDEQ Report of Drainage Emptying into the Study Area, and Drinking Water Treatment Intake Pumps

One problem that became apparent after much research into existing data and interviews with all of the state, parish, and local officials with the most professional experience in the drainage system of the parish as it impacts Bayou Lafourche was discovering that **there are no known plans or blueprints that outline the drainage system(s) to the culverts that empty into Bayou Lafourche (Figure 4)**. However, it was generally agreed by all hydrological experts interviewed that only the sewage effluent from dwellings or businesses located on the batture of the Bayou itself or in the first 200 feet or more (depends on elevations of culverts) drains into the Bayou. Sewage package plant effluent behind those houses and/or businesses located beyond that region generally flow by gravity or by forced drainage (pumps) into ditches and canals draining back away from the Bayou, into canals which drain toward swamps, or into canals which eventually make their way into the 40 arpent canal. Problems arise because some of these drainage structures are interconnected at some locations. Some are also directly connected to Bayou Lafourche, and drainage from home sewage plants could conceivable be pushed back toward the Bayou by tidal influences, heavy winds and rains, tropical storms, or hurricanes.

The sample selection strategy used to determine exactly which subdivision clusters or other sources seen in Figures 3 and 4 were impacting the Bayou with high fecal coliform (FC) levels was to first identify each "cluster" of homes with single dwelling sewage package plants from Labadieville in Assumption Parish above Protection Area 1 in Lafourche Parish to Valentine just outside Protection Area 2. We were targeting clusters of homes with individual sewage package plants upstream of drinking water treatment plant intake pumps for the city of Thibodaux, the Lafourche Parish Water District Number 1 North Plant below the Bayou Country Club south of Thibodaux, the Terrebonne Parish Water District Plant intake in Lefort Canal in Lafourche Parish, and the Lafourche Parish Water District Number 1 main plant at Clotilda on Highway 308.

Bayou Lafourche is considered a riverine system from Donaldsonville to the weir in downtown Thibodaux, flowing south to the Gulf of Mexico. Only a major weather event like a hurricane that would cause flooding over the weir in downtown Thibodaux would cause possible tidal or wind driven water to move north. South of the weir in Thibodaux, the Bayou is tidal. However, the Lafourche Parish Water Plant District No. 1 on 308 at Clotilda is subject to a southerly tidal flow from the Gulf or from the Company Canal at Lockport which empties into Bayou Lafourche just south of Clotilda. The Company Canal is directly connected to the 40 Arpent Canal which drains to the Company Canal from both sides.

We began to evaluate potential sources in subdivisions by visually inspecting drainage ditches along streets in each cluster of homes with individual package plants. We tried to locate ditches within those subdivisions which had effluent pipes from the homes draining into standing water in the ditches. Unfortunately, many subdivision ditches were either dry except in heavy rain events or were buried as culverts with only catch basins found on corners. These did not always have standing water, and many were too small to insert a sampling bag. In these subdivision clusters we first located storm drains or catch basins on the highway on both the subdivision and bayou sides that collected water from subdivision ditches. If it was possible to obtain a sample directly from culverts from these catch basins draining into the bayou itself, we took those also. However, most of those were behind houses or businesses on private property, or were not visible or assessable from the bayou side due to heavy weed growth in the area of the culverts.

Initial screening of some of preliminary sampling areas utilized a Turner Systems field fluorometer to detect optical brighteners. If these samples were high in FC and in fluorometer OB readings, human fecal or gray water pollution was indicated. High FC levels and low OB readings indicated animal fecal contamination. Low FC levels and high OB readings indicated areas of "gray water" contamination with detergents or organic compounds from homes or businesses (Hartel et al. 2008). The determination of whether the levels of fecal coliforms in a body of water are too high is based on fecal coliform designated use standards set by the LDEQ (LDEQ 2004). These are in Table 1 on p.7 above. Of primary concern for this project were drinking water source (2,000 cfu FC/100ml), primary recreational contact (400 colony forming units (cfu) FC/100ml) and secondary contact recreation (2,000 cfu FC/100ml). The dissolved oxygen (D.O.) levels (mg/l) must also be at least 5mg/l for fish and wildlife. If the D.O. levels drop below this, a fish kill will result. If they drop below 1mg/l, the body of water will revert to anaerobic microbial decomposition which results in the production of fermentative toxic and noxious end products, and

renders the body of water unsuitable for all of its designated uses. The already low D.O. levels of Bayou Lafourche dropped to 0 mg/l during Hurricane Gustov due to inversion of the anaerobic sludge bottom in the hurricane force winds and addition of a tremendous amount of plant and other organic debris. This resulted in a fish kill and caused the Bayou to turn a dark brown to almost black color with a noxious odor and taste, mainly due to the H2S from anaerobic microbial decomposition and manganese leaching from the organic material and sludge.

A method to determine the best sampling locations for this project was developed by estimating which ditches or culverts along subdivision streets actually drained back by elevation or were force pumped back away from the Bayou to a collection drainage ditch like the 40 Arpent Canal which originates in Peltier Park on the south side of Thibodaux to drain storm water from the more southern area of the City. It was deemed subdivision drainage ditches mainly impacted the Bayou in approximately the first 200 to 300 feet back (including houses on the batture itself). The rest of the subdivision should not impact the bayou directly unless water in the drainage ditches and culverts is forced back toward the bayou through flooding, extreme weather conditions, or through the few drainage canals or large ditches which were found to connect the 40 arpent canal back to Bayou Lafourche. Some of these canals and large ditches connecting the 40 arpent canal to Bayou Lafourche are actually gated to prevent the Bayou water from backing up into the subdivision ditches during Bayou flooding or high water weather conditions. However, in heavy flooding some of the drainage ditches and canals may drain back toward the bayou. The main canals in Lafourche Parish connecting the 40 arpent drainage canal behind LA Hwy 1 include: 1) the Dugas Canal at the Ronald Adams Construction Company on LA Hwy 1 just north of Lafourche Crossing (gated before crossing under Hwy 1 in a culvert to prevent the Bayou from backing up into the drainage area); 2) Four Point Canal on LA Hwy 1 near Raceland (mechanically gated about 2 blocks from the Bayou to allow passage of small boats and prevent backup of the Bayou into the drainage canal); and 3) the Company Canal at Lockport which is connected to the Forty Arpent Canal by a pump system which seems to be in place to pump potential flood waters from the 40 arpent canal back of the Lockport Heights subdivision (not incorporated into the Lockport City Sewage Treatment System) into the Company Canal which drains directly into Bayou Lafourche just south of the Lafourche Parish District No. 1 Water Plant intake at Clotilda. The Company Canal is also connected to the 40 Arpent Canal south of Lockport at the Romy St. to Mar St. subdivision (Sites J5-J7, which were found to have very high human fecal coliform input).

To evaluate which non-incorporated subdivision drainage ditches did impact the Bayou we developed a protocol to select catch basins on Hwy 1 or Hwy 308 that collected drainage from ditches or underground culverts from homes in the first 200ft or more from the Bayou. These culverts passed under the highways to catch basins and/or to culverts on the Bayou side of the highway. If samples taken from these drainage structures were high in FC and OBs, we also selected a ditch, culvert, or catch basin site more than 300 ft back from the bayouside drainage, and finally took a sample at the back drainage 40 arpent canal (if possible) to evaluate the levels of FC and OBs there. This was to help determine whether the majority of the sewage effluents from the package plants in the subdivision were draining to the back drainage area or to the bayouside.

To help identify potential human fecal coliform (FC) sources from sampling sites, *relative levels* of fluorescence of optical brighteners (OBs) from laundry detergents were correlated to FC levels at that same site. Deionized water (0.0µl /liter of OBs) was used as the negative control, and 50.0µl/liter deionized water 2X Tide liquid detergent (Tide Original Scent 2X, Proctor and Gamble, Cincinnati, OH) was used as a standard source of OBs to calibrate a hand-held Turner Designs field fluorometer to 100 fluorometric units (FU). Although the type and concentrations of OBs in different detergents vary greatly from product to product and are proprietary, this method proved to be very useful in establishing a relative level of OBs compared to a deionized water negative control of 0 µl /liter at each site. Relative FU levels of OBs in conjunction with fecal coliform levels are a screening indicator of the amount of anthropogenic input. A high OB number in conjunction with a high fecal coliform (FC) level is a good indication that the FCs are of anthropogenic origin. However, high FC levels combined with very low OBs at a site indicate that the contamination is probably from animal origin. High OB numbers in conjunction with low FC numbers can indicate a source of “gray water (wash water) without input from actual human fecal matter from toilets or other facilities that normally empty into a septic tank, package plant, or other source of

sewage disposal. (Cao et al, 2009, Hartel P.G. et al. 2008, Saluta et al. 2007, Hartel P.G. 2006). In this project, we were looking for sources of faulty single dwelling electric sewage package plants. The GPS locations of clusters of package plants for individual dwellings, drinking water treatment intake pumps, LDEQ report locations, and subdivision package plants in the study area were used to develop the maps seen in Figures 3 and 4 above.

Figure 5 below shows the locations of the final 54 sampling sites within the designated protection areas 1 and 2 of north to central Lafourche Parish.

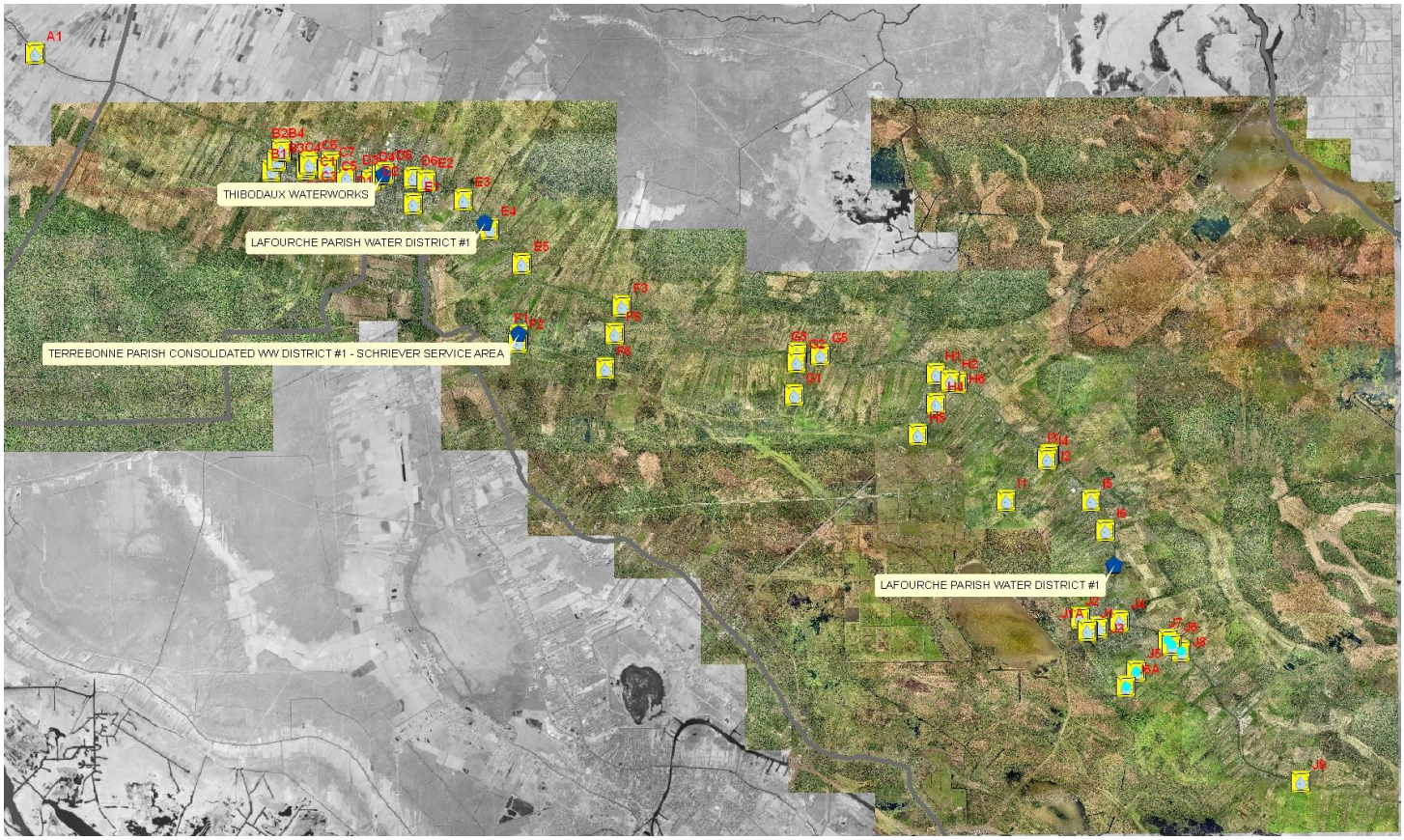


Figure 5. Study area with the 10 Clusters of sites (Clusters A – J) and the 54 final sampling sites within these 10 Clusters

The protection areas were delineated by LDEQ as areas that could conceivably impact the four drinking water plant intake pumps in B. Lafourche for the City of Thibodaux's Water Treatment Plant, the Lafourche Parish Water District No. 1 North Plant on LA Hwy 1 south of Thibodaux, the Terrebonne Parish Water Treatment Plant intake pump in Lefort Canal from Bayou Lafourche, and the Main Lafourche Parish Plant on LA 308 at Clotilda.

Figure 6 below shows the 2 protection areas on the new post Gustov GIS aerial map (provided by Lafourche Parish) seen in Figure 5 above.

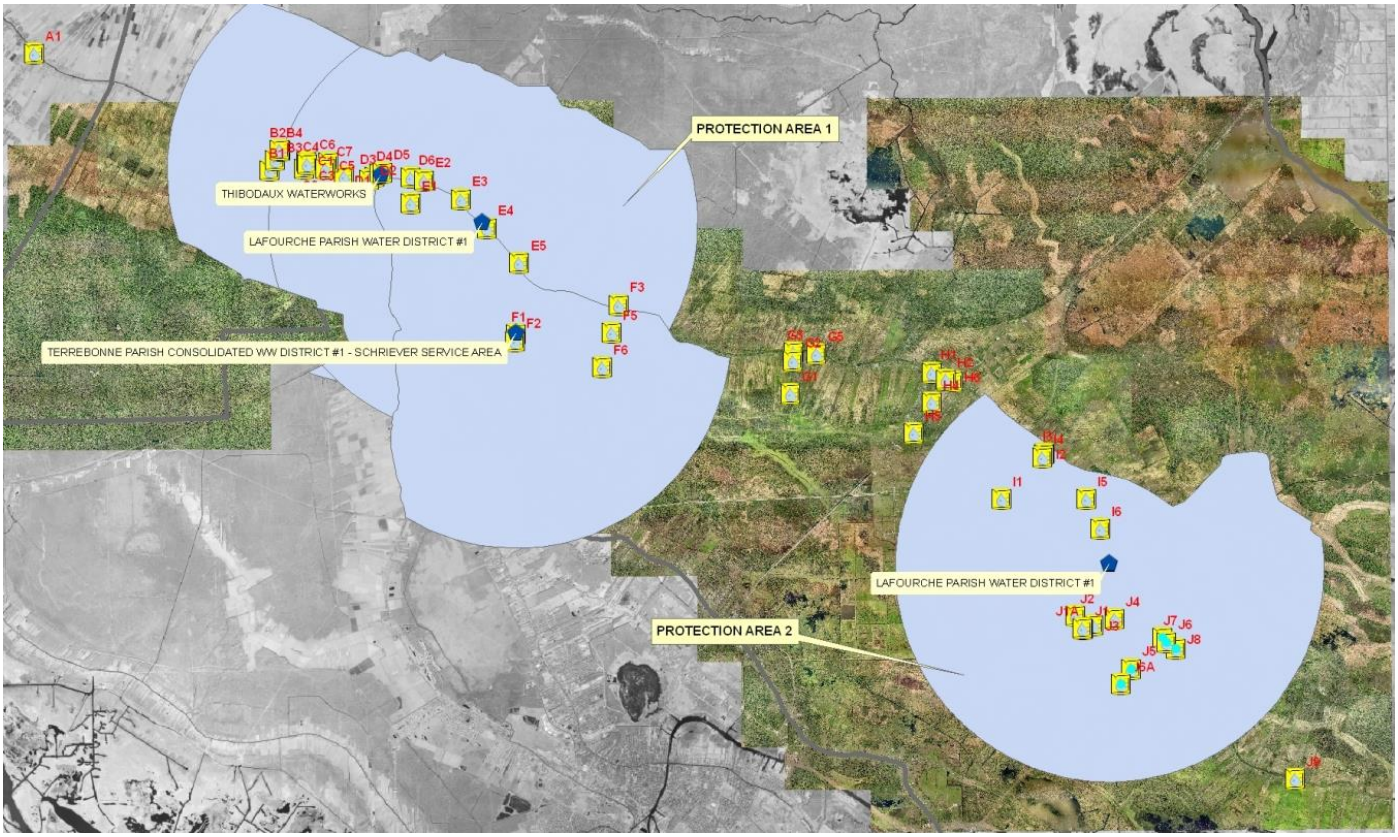


Figure 6. Protection Areas 1 and 2 showing the 10 Site Clusters (A-J) and 54 total sampling sites in those Clusters

Table 3 has a list of the 54 final sampling sites. The sampling sites start north above the Protection Area 1 at the Labadieville Church in Assumption Parish. They follow the Bayou south mainly on Hwy 1, but there are also some on Hwy 308. They are numbered in clusters of samples (A-J) that are related geographically, and they end outside of Protection Area 2 at the Valentine Bridge. Codes for sampling sites were designated in collaboration with requirements of the LDEQ Project Officers. The temporal and spatial sampling strategy monitoring schedule for the 10 clusters of sites (A-J) with 54 sampling sites within the 10 clusters is found in Table 3 below. At the end of the 3 week sampling period each month, the last set of samples moves temporally from the evening to the morning sampling time, and all of the other clusters of sampling sites move over one to be collected at the next temporal period for 3 weeks of the next month. So for each sampling quarter (3 months), each of the selected sites will have been collected at a morning, noon and evening time period. The 4th week of each month during the project is for data entry and/or for "catch up" sampling in case samples could not be taken during one of the first 3 weeks of that month.

Table 3. Temporal Spatial Sampling Protocol for the 54 sampling sites

Sl	SAMPLE ID	WEEK1			WEEK2			WEEK3		
		DAY1 (Morn)	DAY2 (Noon)	DAY3 (Even)	DAY1 (Morn)	DAY2 (Noon)	DAY3 (Even)	DAY1 (Morn)	DAY2 (Noon)	DAY3 (Even)
1	A1	X								
2	B1	X								
3	B2	X								
4	B3	X								
5	B4	X								
6	C1		X							
7	C2		X							
8	C3		X							
9	C4		X							
10	C5		X							
11	C6		X							
12	C7		X							
13	D1			X						
14	D2			X						
15	D3			X						
16	D4			X						
17	D5			X						
18	D6			X						
19	E1				X					
20	E2				X					
21	E3				X					
22	E4				X					
23	E5				X					
24	F1					X				
25	F2					X				
26	F3					X				
27	F5					X				
28	F6					X				
29	G1						X			
30	G2						X			
31	G3						X			
32	G5						X			
33	H1							X		
34	H2							X		
35	H4							X		
36	H5							X		
37	H6							X		
38	I1								X	
39	I2								X	
40	I3								X	
41	I4								X	
42	I5								X	
43	I6								X	
44	J1									X
45	J1A									X
46	J2									X
47	J3									X
48	J4									X
49	J5									X
50	J6									X
51	J6A									X
52	J7									X
53	J8									X
54	J9									X

The project QAPP and SOP's describe the collection and analysis methods in detail. FC levels above the designated use guidelines were correlated to relative levels of optical brighteners (OBs) from laundry detergents as a rapid **rough screening indicator** of potential anthropogenic input from targeted package plant cluster areas. The QAPP and SOP's have already been submitted to LDEQ and approved by both LDEQ and EPA. Our required update of the QAPP was also submitted and approved.

Table 4. Laboratory Measurement Performance Criteria

Parameter	Analytical Method	Method Detection Limitation	Maximum Holding Times	Container Type
Fecal Coliforms	SM 9222D	1 CFU/100mL	6 hrs on ice (including travel and incubation set up	Sterile Whirl Pak Bags (0.5L)

Table 5 found in **SECTION 3.0** Monitoring Results has the Sample IDs, descriptions, GPS locations, and fecal coliform and OB results of 12 months of sampling using this temporal spatial sampling strategy above.

2.1 PLANNED AND ACTUAL MILESTONES, PRODUCTS, AND COMPLETION DATES

Activity	Dates (start dates; submissions)	Approvals/Deliverables
Contract approved/signed		Effective: Jan 1, 2008 – Sept 30, 2009
Program Element 1 Tasks	Purchase Equipment and Supplies and Develop QAPP and SOPs	
Task 1.1 Purchase Equipment & Supplies.	After approval of QAPP/SOPs (March 20, 2008)	Completed 9-30-09
Task 1.2 Develop QAPP & SOPs	Within 30 days of "Notice to Proceed" (2-20-09) Submitted: 3-20-08	Approved 5-23-08 Update approved 5-4-2009
Program Element 2 Tasks	Identification of Sample Locations and Sample Code Numbers	
Task 2.1 Select sampling locations	Within 60 days of "Notice to Proceed"	Completed final sites 8-30-08
Program Element 3 Task	Sample Collection and Transport and Laboratory Processing	
Task 3.1 Monitor sample locations according to determined monitoring schedule	Sampling of sites from July, 2008 – September 2009	Deliverables: 5 Quarterly Reports submitted: QR#1 2-20-08 to 6-31-08 (Submitted final 7-30) QR#2 7-1-08 to 9-30-08 (Submitted final 10-30) QR#3 10-1-08 to 12-31-08 (Submitted final 1-30-09 QR#4 1-1-09 to 3-31-09 (Submitted 4-30-09) QR#5 4-1-09 to 6-31-09 (Submitted 7-30-09) QR#6 7-31-09 to 8-30-09 (Draft Due 10-10-09) (Final Due 10-30-09) Completed Sample Monitoring 9-2-2009
Program Element 4 Task	Final Report	
Task 4.1	Report final results upon completion of the monitoring schedule	Draft Final Report (Submitted 6-31-09) Final Report (Submitted 9-30-09)

2.2 EVALUATION OF GOAL ACHIEVEMENT AND RELATIONSHIP TO THE STATE NPS MANAGEMENT PLAN

The Project Sponsor, LDEQ will provide a description of events leading to the achievement of each goal, and describe how the project will help to contribute to controlling NPS pollution.

2.3 SUPPLEMENTAL INFORMATION

The Project Sponsor will complete this section.

3.0 MONITORING RESULTS

The monitoring strategy was described in detail in **SECTION 2.0**. The temporal and spatial sampling strategy monitoring schedule for the 10 clusters of sites (A-J) with 54 sampling sites within the 10 clusters is found in Table 3 p.16. At the end of the 3 week sampling period each month, the last set of samples moves temporally from the evening to the morning sampling time, and all of the other clusters of sampling sites move over one to be collected at the next temporal period for 3 weeks of the next month. So for each sampling quarter (3 months), each of the selected sites will have been collected at a morning, noon and evening time period. The 4th week of each month during the project is for data entry and/or for "catch up" sampling in case samples could not be taken during one of the first 3 weeks of that month.

The sampling and analysis techniques followed the SOPs for sample collection and for fecal coliform laboratory processing, use the fecal coliform number (colony forming units (CFU) per 100 mL) using the membrane filter (MF) single step method (9222 D). A 0.45 µm membrane filter (MF) was used to fully retain organisms to be cultivated and has to be free of extractables which could interfere with their growth as stated in the Federal Register/ Vol. 72, No. 57/ Monday, March 26, 2007/Rules and Regulations. Further referenced in the register is the book Standard Methods, 20th edition (APHA et al. 1998).

The NSU Research team handled all sample collection, preservation, holding times, materials and methods in accordance with the LDEQ and EPA approved project QAPP and SOPs which provide descriptions of sample collection and transport in compliance with elements of LAC 33:1 Chapter 53 and the 2003 NELAC Standards. The fecal coliform microbial analysis followed the 20th edition of Standard Methods mFC 9222D, utilizing the membrane filtration (MF) method, and a minimum of 3 dilutions of the samples to get high turbidity drainage samples and Bayou samples through the 0.45 µm membrane filters.

As discussed previously in **SECTION 2.0** above, initial fecal coliform screening of some of potential sampling locations utilized a Turner Systems handheld field fluorometer to detect optical brighteners in the water samples. If these samples were high in FC and in fluorometer OB readings, human fecal or gray water pollution was indicated. High FC levels and low OB readings indicated animal fecal contamination. Low FC levels and high OB readings indicated areas of "gray water" contamination with detergents or organic compounds from homes or businesses (Hartel et al. 2008). The determination of whether the levels of fecal coliforms in a body of water are too high is based on fecal coliform designated use standards set by the LDEQ (LDEQ 2004). These are in Table 1 on p.7 above. Of primary concern for this project were drinking water source (2,000 cfu FC/100ml), primary recreational contact (400 colony forming units (cfu) FC/100ml) and secondary contact recreation (2,000 cfu FC/100ml). Table 5 below has the results of the fecal coliform monitoring for the entire project. From this table of results, the fecal coliform cfu FC/100ml were correlated with the OB fluorometric unit (FU) readings. Scatter plots for each cluster were developed to easily demonstrate those sites that indicated consistent anthropogenic human fecal coliform input with FC counts of 2,000/100mL or greater - too high for drinking water source (DWS)

and secondary contact recreation (SCR). FC counts > 200 cfu FC/100mL are too high for primary contact recreation (PCR).

Using the method of Hartel et al. 2006, the handheld field fluorometer was calibrated to 100 FU with a 50μL/liter standard solution of 2X Tide To help identify potential human fecal coliform (FC) sources from sampling sites, *relative levels* of fluorescence of optical brighteners (OBs) from laundry detergents were correlated to FC levels at that same site. Deionized water (0.0μl /liter of OBs) was used as the negative control, and 50.0μL/liter deionized water 2X Tide liquid detergent (Tide Original Scent 2X, Proctor and Gamble, Cincinnati, OH) was used as a standard source of OBs to calibrate a hand-held Turner Designs field fluorometer to 100 fluorometric units (FU). Although the type and concentrations of OBs in different detergents vary greatly from product to product and are proprietary, this method proved to be very useful in establishing a relative level of OBs compared to a deionized water negative control of 0 μl /liter at each site.

Relative levels of OBs in conjunction with fecal coliform levels are a good screening indicator of anthropogenic input with the following scenarios:

1. High OBs in conjunction with a high fecal coliform (FC) level is a good indication that the FCs are of anthropogenic origin.

2. High FC levels combined with very low OB s at a site indicate that the contamination is probably from animal origin. Several of our sites were impacted by semi-wild ducks living in B. Lafourche at certain sites where people tend to feed them.

3. High OBs in conjunction with low FC numbers can indicate a source of “gray water (wash water) without input from actual human fecal matter from toilets or other facilities that normally empty into a septic tank, package plant, or other source of sewage disposal. (Cao et al, 2009, Hartel P.G. et al. 2008, Saluta et al. 2007, Hartel P.G. 2006).

4. Low FC numbers with low OB FUs are those sites that are considered clean and not impacted by human FC.

In this project, we were looking for sources of faulty single dwelling electric sewage package plants.

In addition to the Table 5 of results below, each cluster of sampling sites is mapped and a scatter plot showing all sampling sites within each cluster was made of each cluster. These scatter plots have delineating lines that clearly show which of the sites have both high fecal coliforms and high OBs. These are considered “hot spots” of human contamination, and will have first priority to develop BMP’s or other methods of mitigating contamination to the Bayou drainage basin.

Table 5. Sampling Results and Designated Use Impacts from Fecal Coliforms and OBs

EQ ID	Latitude	Longitude	Site ID	Site Description	Date sampled	TOC	mFC/ 100 ml	Impact of Fecal Coliforms*	OB	OB indications**	Comments
Assu-A1	29.840064075	-90.954336025	b-h398	Bridge HWY 398	7/10/2008	8:40 AM	3,363	exceeds DWS&SCR	3.90	possible anthropogenic	
					7/22/2008	1:42 PM	180	none	3.20	possible anthropogenic	grass cutters in bayou
					10/7/2008	8:00 AM	300	none	4.31	possible anthropogenic	
					12/9/2008	12:23 PM	80	none	2.21	none	
					12/11/2008	5:02 PM	920	exceed PCR	2.56	none	
					1/20/2009	3:12 PM	100	none	3.75	possible anthropogenic	
					2/3/2009	8:45 AM	40	none	2.25	none	
					3/4/2009	10:55 AM	20	none	3.01	none	
					5/1/2009	8:46 AM	300	none	2.83	none	
					5/19/2009	12:55 PM	160	none	3.74	possible anthropogenic	
					6/8/2009	3:50 PM	180	none	4.51	possible anthropogenic	
					7/20/2009	10:00 AM	600	exceed PCR	3.03	none	post major rain
					8/19/2009	1:20 PM	640	exceed PCR	3.90	possible anthropogenic	post major rain
Lafo-B1	29.800310164	-90.863407632	dc-pr	Degravel Canal - Parish Road	7/10/2008	9:40 AM	12,700	exceeds DWS&SCR	4.08	possible anthropogenic	
					7/22/2008	2:50 PM	1,800	exceed PCR	4.11	possible anthropogenic	
					10/7/2008	8:25 AM	360	none		none	not flowing
					12/9/2008	12:43 PM	300	none	4.22	possible anthropogenic	
					12/11/2008	5:27 PM	3,000	exceeds DWS&SCR	4.01	possible anthropogenic	
					1/20/2009	2:50 PM	40	none	3.93	possible anthropogenic	
					2/3/2009	9:11 AM	20	none	3.56	possible anthropogenic	

EQ ID	Latitude	Longitude	Site ID	Site Description	Date sampled	TOC	mFC/ 100 ml	Impact of Fecal Coliforms*	OB	OB indications**	Comments
					3/4/2009	11:20 AM	60	none	4.05	possible anthropogenic	
					5/1/2009	9:05 AM	780	exceed PCR	6.55	probable anthropogenic	
					5/19/2009	1:11 PM	100	none	4.17	possible anthropogenic	
					6/8/2009	4:05 PM	1,840	exceed PCR	6.13	probable anthropogenic	
					7/20/2009	10:15 AM	4,300	exceeds DWS&SCR	3.98	possible anthropogenic	post major rain
					8/19/2009	12:45 PM	6,900	exceeds DWS&SCR	7.62	probable anthropogenic	post major rain
Lafo-B2	29.807052994	-90.859149239	dc-hwy1	Degravel Canal_ HWY 1	7/10/2008	9:08 AM	10,000	exceeds DWS&SCR	4.22	possible anthropogenic	
					7/22/2008	2:15 PM	6,200	exceeds DWS&SCR	4.09	possible anthropogenic	
					10/7/2008	8:13 AM	810	exceed PCR	5.12	probable anthropogenic	
					12/9/2008	12:55 PM	6,000	exceeds DWS&SCR	5.15	probable anthropogenic	
					12/11/2008	5:20 PM	2,420	exceeds DWS&SCR	5.33	probable anthropogenic	
					1/20/2009	3:25 PM	280	none	4.81	possible anthropogenic	
					2/3/2009	9:05 AM	80	none	3.72	possible anthropogenic	
					3/4/2009	11:10 AM	160	none	5.44	probable anthropogenic	
					5/1/2009	9:25 AM	1,580	exceed PCR	5.53	probable anthropogenic	not flowing to bayou
					5/19/2009						not enough water
					6/8/2009						not enough water
					7/20/2009	10:30 AM	3,200	exceeds DWS&SCR	4.51	possible anthropogenic	post major rain

EQ ID	Latitude	Longitude	Site ID	Site Description	Date sampled	TOC	mFC/ 100 ml	Impact of Fecal Coliforms*	OB	OB indications**	Comments
					8/19/2009	1:00 PM	3,400	exceeds DWS&SCR	6.86	probable anthropogenic	post major rain
Lafo-B3	29.803866494	-90.861128039	dc-mid	Degravel Canal-middle point	10/7/2008	8:31 AM	100	none	4.30	possible anthropogenic	
					12/9/2008	12:46 PM	1,400	exceed PCR	4.26	possible anthropogenic	
					12/11/2008	5:35 PM	12,600	exceeds DWS&SCR	4.45	possible anthropogenic	
					1/20/2009	2:54 PM	40	none	4.87	possible anthropogenic	
					2/3/2009	9:18 AM	100	none	3.54	possible anthropogenic	
					3/4/2009	11:25 AM	20	none	4.31	possible anthropogenic	
					5/1/2009	9:11 AM	820	exceed PCR	4.60	possible anthropogenic	
					5/19/2009	1:16 PM	180	none	2.35	none	
					6/8/2009						not enough water
					7/20/2009	10:20 AM	8,000	exceeds DWS&SCR	4.28	possible anthropogenic	post major rain
					8/19/2009	12:50 PM	3,140	exceeds DWS&SCR	6.11	probable anthropogenic	post major rain
Lafo-B4	29.807118067	-90.859176652	dc-bs	Degravel Canal - Bayou side	7/10/2008	9:14 AM	4,000	exceeds DWS&SCR	3.44	possible anthropogenic	
					7/22/2008	2:25 PM	2,100	exceeds DWS&SCR	3.32	possible anthropogenic	
					10/7/2008	8:15 AM	900	exceed PCR	4.96	possible anthropogenic	
					12/9/2008	1:00 PM	1,600	exceed PCR	5.27	probable anthropogenic	
					12/11/2008	5:15 PM	2,800	exceeds DWS&SCR	5.31	probable anthropogenic	
					1/20/2009	3:27 PM	960	exceed PCR	4.73	possible anthropogenic	
					2/3/2009	9:15 AM	420	exceed PCR	3.93	possible anthropogenic	

EQ ID	Latitude	Longitude	Site ID	Site Description	Date sampled	TOC	mFC/ 100 ml	Impact of Fecal Coliforms*	OB	OB indications**	Comments
					3/4/2009	11:12 AM	160	none	5.34	probable anthropogenic	
					5/1/2009						not enough water
					5/19/2009						not enough water
					6/8/2009						not enough water
					7/20/2009	10:35 AM	12,000	exceeds DWS&SCR	3.66	possible anthropogenic	post major rain
					8/19/2009	1:00 PM	2,400	exceeds DWS&SCR	7.01	probable anthropogenic	post major rain
Lafo-C1	29.803092579	-90.848876095	H308-Abby Canal	Abby canal Hwy 308 before draining to B.L.	8/5/2008	10:58 AM	3,000	exceeds DWS&SCR	7.66	probable anthropogenic	
					11/20/2008	3:07 PM	2,000	exceeds DWS&SCR	5.45	probable anthropogenic	
					12/9/2008	8:55 AM	2,200	exceeds DWS&SCR	6.89	probable anthropogenic	
					1/21/2009	9:44 AM	2,000	exceeds DWS&SCR	5.75	probable anthropogenic	soap bubbles in water
					2/4/2009	12:15 PM	56	none	4.01	possible anthropogenic	
					3/29/2009	3:45 PM	2,640	exceeds DWS&SCR	5.11	probable anthropogenic	
					4/29/2009	12:20 PM	3,600	exceeds DWS&SCR	7.00	probable anthropogenic	
					5/29/2009	4:45 PM	1,000	exceed PCR	9.97	probable anthropogenic	
					6/24/2009	10:30 AM	2,500	exceeds DWS&SCR	9.55	probable anthropogenic	not flowing to bayou
					7/29/2009	1:47 PM	1,080	exceed PCR	8.98	probable anthropogenic	
Lafo-C2	29.800755062	-90.849771600	H3185 - a	Ditch draining apartments on Hwy 3185 behind Rouse's	7/10/2008	10:43 AM	13,000	exceeds DWS&SCR	5.68	probable anthropogenic	

EQ ID	Latitude	Longitude	Site ID	Site Description	Date sampled	TOC	mFC/ 100 ml	Impact of Fecal Coliforms*	OB	OB indications**	Comments
					7/22/2008	2:56 PM	180	none	6.60	probable anthropogenic	
					10/7/2008	8:57 AM					not enough water
					11/20/2008						not enough water
					12/9/2008						not enough water
					1/21/2009	9:39 AM	60	none	4.25	possible anthropogenic	
					2/4/2009			none		none	not enough water
					3/29/2009	3:40 PM	660	exceed PCR	6.43	probable anthropogenic	
					4/29/2009	12:16 PM					not enough water
					5/29/2009						not enough water
					6/24/2009						not enough water
					7/29/2009	1:45 PM	960	exceed PCR	5.98	probable anthropogenic	
Lafo-C3	29.802379100	-90.848616880	H3185-C	Hwy 3185 culvert at B.L.	7/10/2008	10:43 AM	1,800	exceed PCR	3.92	possible anthropogenic	grease/orange
					7/22/2008	3:18 PM	1,200	exceed PCR	4.64	possible anthropogenic	grease/orange
					9/30/2008	9:15 AM	0	none	5.18	probable anthropogenic	not detected
					10/7/2008	8:14 AM	0	none	4.55	possible anthropogenic	not detected
					11/20/2008	3:20 PM	40	none	3.16	possible anthropogenic	
					12/9/2008	8:35 AM	80	none	2.46	none	
					1/21/2009	9:27 AM	40	none	3.18	possible anthropogenic	grease/orange, not flowing
					2/4/2009	11:57 AM	20	none	5.27	probable anthropogenic	grease/orange, not flowing

EQ ID	Latitude	Longitude	Site ID	Site Description	Date sampled	TOC	mFC/ 100 ml	Impact of Fecal Coliforms*	OB	OB indications**	Comments
					3/29/2009	3:31 PM	40	none	4.76	possible anthropogenic	not flowing to bayou
					4/29/2009	12:05 PM	280	none	4.89	possible anthropogenic	not flowing to bayou
					5/29/2009	4:25 PM	20	none	5.92	probable anthropogenic	not flowing to bayou
					6/24/2009	10:20 AM	120	none	5.61	probable anthropogenic	
					7/29/2009	1:35 PM	40	none	4.66	possible anthropogenic	
Lafo-C4	29.802348828	-90.848562046	H3185-B	Downstream on Hwy 3185 bridge over B.L.	7/10/2008	10:50 AM	900	exceed PCR	3.61	possible anthropogenic	
					7/22/2008	3:22 PM	120	none	3.02	none	
					10/7/2008	10:07 AM	810	exceed PCR	3.76	possible anthropogenic	
					11/20/2008	3:24 PM	20	none	2.45	none	
					12/9/2008	8:35 AM	80	none	2.46	none	
					1/21/2009	9:23 AM	40	none	3.77	possible anthropogenic	
					2/4/2009	12:00 PM	0	none	2.20	none	not detected
					3/29/2009	3:37 PM	1,140	exceed PCR	3.00	none	
					4/29/2009	12:10 PM	780	exceed PCR	2.64	none	
					5/29/2009	4:30 PM	180	none	3.51	possible anthropogenic	
					6/24/2009	10:25 AM	1,440	exceed PCR	3.71	possible anthropogenic	
					7/29/2009	1:40 PM	220	none	3.17	possible anthropogenic	
Lafo-C5	29.802994829	-90.840571591	L-L	Lake in "The Lakes" subdivision	11/20/2008	2:43 PM	0	none	2.24	none	not detected
					12/9/2008	8:09 AM	0	none	2.16	none	not detected
					1/21/2009	9:50 AM	60	none	2.69	none	
					2/4/2009	12:20 PM	0	none	1.87	none	not detected
					3/29/2009	3:47 PM	40	none	2.55	none	

EQ ID	Latitude	Longitude	Site ID	Site Description	Date sampled	TOC	mFC/ 100 ml	Impact of Fecal Coliforms*	OB	OB indications**	Comments
					4/29/2009	12:28 PM	60	none	1.47	none	
					5/29/2009	4:50 PM	120	none	2.68	none	
					6/24/2009	10:35 AM	1,040	exceed PCR	2.55	none	dead fish in the lake
					7/29/2009	1:53 PM	40	none	2.53	none	
Lafo-C6	29.802969276	-90.840607006	G-L	The Lake drainage canal at control gate	11/20/2008	2:45 PM	0	none	4.45	possible anthropogenic	not detected
					12/9/2008	8:12 AM	0	none	3.16	possible anthropogenic	not detected
					1/21/2009	9:53 AM	20	none	2.09	none	
					2/4/2009	12:25 PM	80	none	2.73	none	
					3/29/2009	3:50 PM	300	none	3.26	possible anthropogenic	
					4/29/2009	12:30 PM	300	none	3.10	none	
					5/29/2009	4:55 PM	60	none	3.88	possible anthropogenic	
					6/24/2009	10:36 AM	600	exceed PCR	3.88	possible anthropogenic	
					7/29/2009	1:54 PM	200	None	3.15	possible anthropogenic	
Lafo-C7	29.800755893	-90.841659526	L-308	Lakes drainage canal at Hwy 308 Bayou side	8/5/2008	11:12 AM	240	none	2.97	none	
					11/20/2008	3:10 AM	17,600	exceeds DWS&SCR	4.02	possible anthropogenic	
					12/9/2008	8:17 AM	1,800	exceed PCR	8.13	probable anthropogenic	
					1/21/2009	9:56 AM	920	exceed PCR	5.62	probable anthropogenic	
					2/4/2009	12:30 PM	40	none	4.33	possible anthropogenic	
					3/29/2009	3:57 PM	20,000	exceeds DWS&SCR	4.82	possible anthropogenic	
					4/29/2009	12:37 PM	1,200	exceed PCR	3.19	possible anthropogenic	

EQ ID	Latitude	Longitude	Site ID	Site Description	Date sampled	TOC	mFC/ 100 ml	Impact of Fecal Coliforms*	OB	OB indications**	Comments
					5/29/2009	5:00 PM	200	none	3.74	possible anthropogenic	
					6/24/2009	10:50 AM	2,000	exceeds DWS&SCR	3.67	possible anthropogenic	lakes not flowing to bayou
					7/29/2009	2:00 PM	800	exceed PCR	4.14	possible anthropogenic	
Lafo-D1	29.798034839	-90.834472212	b-td	Tiger Drive Bridge	7/10/2008	11:10 AM	1,181	exceed PCR	3.50	possible anthropogenic	
					7/22/2008	3:32 PM	180	none	3.07	none	
					10/7/2008	9:02 AM	50	none	3.80	possible anthropogenic	
					10/28/2008	5:11 PM	50	none	2.59	none	
					11/11/2008	6:50 AM	100	none	2.24	none	
					12/8/2008	12:20 PM	60	none	2.37	none	
					1/20/2009	12:21 AM	20	none	3.55	possible anthropogenic	
					2/18/2009	2:57 PM	160	none	2.28	none	
					3/27/2009	10:08 AM	9,600	exceeds DWS&SCR	5.08	probable anthropogenic	post major rain/flood
					4/29/2009	4:08 PM	280	None	2.47	none	
					5/13/2009	9:35 AM	260	none	3.47	possible anthropogenic	
					6/10/2009	11:10 AM	160	none	3.54	possible anthropogenic	
					8/3/2009	7:05 PM	260	none	3.46	possible anthropogenic	
					8/30/2009	10:15 AM	240	none	3.38	possible anthropogenic	
Lafo-D2	29.796923792	-90.824594641	Hwy1 - Lib	Jean Lafitte Library dock at B. Lafourche	9/30/2008	9:35 AM	40	none	3.06	none	Ducks at site
					10/7/2008	9:09 AM	40	none	3.92	possible anthropogenic	
					10/28/2008	5:42 PM	240	None	2.38	none	
					11/11/2008	7:03 AM	380	none	2.24	none	
					12/8/2008	12:10 PM	1,450	exceed	2.51	none	

EQ ID	Latitude	Longitude	Site ID	Site Description	Date sampled	TOC	mFC/ 100 ml	Impact of Fecal Coliforms*	OB	OB indications**	Comments
								PCR			
					1/20/2009	12:15 PM	160	none	3.75	possible anthropogenic	
					2/18/2009	2:48 PM	140	none	2.26	none	
					3/27/2009	10:00 AM	20,000	exceeds DWS&SCR	4.91	possible anthropogenic	post major rain/flood
					4/29/2009	4:00 PM	300	exceed PCR	2.57	none	
					5/13/2009	9:30 AM	2,800	exceeds DWS&SCR	3.43	possible anthropogenic	
					6/10/2009	11:00 AM	1,140	exceed PCR	3.79	possible anthropogenic	
					8/3/2009	6:58 PM	10,000	exceeds DWS&SCR	3.81	possible anthropogenic	
					8/30/2009	10:10 AM	260	none	3.82	possible anthropogenic	
Lafo-D3	29.797979003	-90.822411267	b-H20	Bridge HWY 20	7/10/2008	11:35 AM	6,364	exceeds DWS&SCR	3.30	possible anthropogenic	
					7/22/2008	3:50 PM	120	none	3.02	none	
					7/24/2008	4:30 AM	340	none	3.15	possible anthropogenic	
					9/30/2008	9:50 AM	60	none	3.06	none	
					10/7/2008	9:18 AM	50	none	3.86	possible anthropogenic	
					10/28/2008	5:35 PM	190	none	2.42	none	
					11/11/2008	6:56 AM	250	none	2.22	none	
					12/8/2008	12:05 PM	40	none	2.22	none	
					1/20/2009	12:11 PM	40	none	3.34	possible anthropogenic	
					2/18/2009	2:45 PM	80	none	2.38	none	
					3/27/2009	9:52 AM	16,000	exceeds DWS&SCR	5.16	probable anthropogenic	post major rain/flood
					4/29/2009	3:54 PM	200	none	2.57	none	
					5/13/2009	9:25 AM	3,040	exceeds DWS&SCR	3.43	possible anthropogenic	
					6/10/2009	10:55 AM	240	none	3.51	possible anthropogenic	

EQ ID	Latitude	Longitude	Site ID	Site Description	Date sampled	TOC	mFC/ 100 ml	Impact of Fecal Coliforms*	OB	OB indications**	Comments
					8/3/2009	6:55 PM	9,700	exceeds DWS&SCR	4.11	possible anthropogenic	
					8/30/2009	10:00 AM	440	exceed PCR	4.51	possible anthropogenic	
Lafo-D4	29.799071660	-90.820579387	308 CW	308 car wash	7/10/2008	11:54 AM	200,000	exceeds DWS&SCR	3.25	possible anthropogenic	Duck site - fresh grass
					7/22/2008	4:05 PM	700	exceed PCR	3.03	none	
					10/28/2008	5:18 PM	1,200	exceed PCR	2.39	none	
					11/11/2008	7:18 AM	1,600	exceed PCR	2.76	none	
					12/8/2008	12:25 PM	520	exceed PCR	3.95	possible anthropogenic	
					1/20/2009	12:27 PM	100	none	3.81	possible anthropogenic	
					2/18/2009	3:05 PM	600	exceed PCR	2.76	none	
					3/27/2009	10:16 AM	10,000	exceeds DWS&SCR	3.25	possible anthropogenic	post major rain/flood
					4/29/2009	4:17 PM	800	exceed PCR	2.54	none	
					5/13/2009	9:45 AM	2,500	exceeds DWS&SCR	3.48	possible anthropogenic	
					6/10/2009	11:20 AM	1,760	exceed PCR	3.56	possible anthropogenic	
					8/3/2009	7:15 PM	2,800	exceeds DWS&SCR	3.57	possible anthropogenic	
					8/30/2009	10:22 AM	440	exceed PCR	3.46	possible anthropogenic	
Lafo-D5	29.799359016	-90.819485519	Thib-WP	Thibodaux Water Plant Intake	10/28/2008						water plant closed
					11/11/2008	7:27 AM	160	none	2.18	none	
					12/8/2008	12:28 PM	60	none	2.29	none	
					1/20/2009	12:33 PM	140	none	3.27	possible anthropogenic	
					2/18/2009	3:10 PM	120	none	2.34	none	

EQ ID	Latitude	Longitude	Site ID	Site Description	Date sampled	TOC	mFC/ 100 ml	Impact of Fecal Coliforms*	OB	OB indications**	Comments
					3/27/2009	10:21 AM	12,000	exceeds DWS&SCR	4.50	possible anthropogenic	
					4/29/2009	4:25 PM	320	none	2.58	none	
					5/13/2009						water plant closed
					6/10/2009	11:25 AM	600	exceed PCR	3.45	possible anthropogenic	
					8/3/2009						water plant closed
					8/30/2009						water plant closed (Sunday)
Lafo-D6	29.797682875	-90.808601374	b-ped	Pedestrian bridge	7/22/2008	4:30 PM	3,500	exceeds DWS&SCR	2.95	none	
					7/24/2008	4:40 PM	1,200	exceed PCR	3.13	possible anthropogenic	no current
					9/30/2008	9:55 AM	200	none	3.08	none	
					10/28/2008	5:28 AM	170	none	2.39	none	
					11/11/2008	7:31 AM	110	none	2.46	none	
					12/8/2008	12:35 PM	60	none	2.31	none	
					1/20/2009	11:58 AM	80	none	3.49	possible anthropogenic	
					2/18/2009	2:35 PM	1,600	exceed PCR	2.41	none	
					3/27/2009	10:30 AM	60,000	exceeds DWS&SCR	4.67	possible anthropogenic	post major rain/flood
					4/29/2009	4:35 PM	540	exceed PCR	2.27	none	
					5/13/2009	9:50 AM	1,900	exceed PCR	3.40	possible anthropogenic	
					6/10/2009	11:35 AM	180	none	3.33	possible anthropogenic	
					8/3/2009	7:25 PM	1,500	exceed PCR	4.08	possible anthropogenic	
					8/30/2009	10:33 AM	380	none	3.35	possible anthropogenic	

EQ ID	Latitude	Longitude	Site ID	Site Description	Date sampled	TOC	mFC/ 100 ml	Impact of Fecal Coliforms*	OB	OB indications**	Comments
Lafo-E1	29.788855544	-90.808597292	40A-PP	40 Arpent at Peltier Park	7/17/2008	7:50 AM	7,000	exceeds DWS&SCR	6.05	probable anthropogenic	
					10/14/2008	8:11 AM	3,200	exceeds DWS&SCR	7.03	probable anthropogenic	
					11/12/2008	9:50 AM	2,000	exceeds DWS&SCR	3.77	possible anthropogenic	rainy
					12/8/2008	3:45 PM	80	none	3.29	possible anthropogenic	
					1/21/2009	3:00 PM	40	none	3.25	possible anthropogenic	
					2/17/2009	8:38 AM	2,400	exceeds DWS&SCR	5.58	probable anthropogenic	
					3/25/2009	11:18 AM	1,600	exceed PCR	3.81	possible anthropogenic	
					5/3/2009	8:50 AM	1,600	exceed PCR	6.35	probable anthropogenic	
					5/20/2009	1:35 PM	580	exceed PCR	4.52	possible anthropogenic	
					6/24/2009						not enough water
					8/3/2009	9:30 AM	380	none	6.53	probable anthropogenic	
					8/29/2009	1:20 PM	5,000	exceeds DWS&SCR	4.98	possible anthropogenic	
Lafo-E2	29.796719524	-90.803282648	b-AD	Bridge at Audubon Drive	7/24/2008	4:50 PM	1,400	exceed PCR	3.22	possible anthropogenic	Ducks near site
					10/14/2008	9:05 AM	1,500	exceed PCR	3.25	possible anthropogenic	
					11/12/2008	10:20 AM	100	none	2.17	none	rainy
					12/8/2008	4:20 PM	60	none	2.26	none	
					1/21/2009	3:30 PM	60	none	5.31	probable anthropogenic	
					2/17/2009	9:41 AM	520	exceed PCR	4.71	possible anthropogenic	
					3/25/2009	11:09 AM	460	exceed PCR	2.70	none	

EQ ID	Latitude	Longitude	Site ID	Site Description	Date sampled	TOC	mFC/ 100 ml	Impact of Fecal Coliforms*	OB	OB indications**	Comments
					5/3/2009	9:20 AM	1,760	exceed PCR	4.00	possible anthropogenic	
					5/20/2009	1:30 PM	180	none	2.37	none	
					6/24/2009	3:15 PM	60	none	2.40	none	
					8/3/2009	10:55 AM	2,880	exceeds DWS&SCR	3.34	possible anthropogenic	
					8/29/2009	1:50 PM	1,000	exceed PCR	3.44	possible anthropogenic	
Lafo-E3	29.790268986	-90.789011435	b-S648	Bridge at Spur 648	7/16/2008	5:25 PM	1,500	exceed PCR	2.78	none	
					10/14/2008	8:55 AM	1,500	exceed PCR	3.26	possible anthropogenic	
					11/20/2008	10:11 AM	140	none	2.13	none	rainy
					12/8/2008	4:08 PM	40	none	2.27	none	
					1/21/2009	3:21 PM	60	none	3.31	possible anthropogenic	
					2/17/2009	9:22 AM	280	none	4.73	possible anthropogenic	
					3/25/2009	11:05 AM	540	exceed PCR	2.50	none	
					5/3/2009	9:15 AM	2,200	exceeds DWS&SCR	3.58	possible anthropogenic	
					5/20/2009	1:20 PM	6,000	exceeds DWS&SCR	2.40	none	
					6/24/2009	3:45 PM	320	none	2.40	none	
					8/3/2009	10:48 AM	2,460	exceeds DWS&SCR	3.60	possible anthropogenic	
					8/29/2009	1:45 PM	1,300	exceed PCR	2.55	none	
Lafo-E4	29.780375262	-90.779068281	C-RA-hwy1	Dugas Canal at Ronald Adams	7/9/2008	11:59 AM	96,360	exceeds DWS&SCR	2.85	none	rainy
					10/14/2008	8:30 AM	800	exceed PCR	3.30	possible anthropogenic	
					11/12/2008	10:00 AM	0	none	2.19	none	not detected
					12/8/2008	3:55 PM	0	none	2.52	none	not detected
					1/21/2009	3:09 AM	40	none	3.25	possible anthropogenic	

EQ ID	Latitude	Longitude	Site ID	Site Description	Date sampled	TOC	mFC/ 100 ml	Impact of Fecal Coliforms*	OB	OB indications**	Comments
					2/17/2009	8:55 AM	600	exceed PCR	4.33	possible anthropogenic	
					3/25/2009	10:49 AM	140	none	2.58	none	
					5/3/2009	9:05 AM	1,140	exceed PCR	3.23	possible anthropogenic	
					5/20/2009	1:15 PM	110,000	exceeds DWS&SCR	2.41	none	
					6/24/2009	3:30 PM	2,000	exceeds DWS&SCR	2.40	none	
					8/3/2009	9:40 AM	540	exceed PCR	3.81	possible anthropogenic	
					8/29/2009	1:32 PM	20,000	exceeds DWS&SCR	3.69	possible anthropogenic	
Lafo-E5	29.768590473	-90.766556403	1265- LA1	1265 HWY LA1	7/9/2008	11:39 AM	57,272	exceeds DWS&SCR	7.05	probable anthropogenic	
					7/29/2008	11:50 AM	9,000	exceeds DWS&SCR	15.51	anthropogenic	
					10/14/2008	8:40 AM	38,000	exceeds DWS&SCR	9.91	probable anthropogenic	
					11/12/2008	10:05 AM					not enough water
					12/8/2008	4:08 PM	81,000	exceeds DWS&SCR	5.78	probable anthropogenic	
					1/21/2009						not enough water
					2/17/2009	9:10 AM	380	none	6.88	probable anthropogenic	
					3/25/2009						not enough water
					5/3/2009						not enough water
					5/20/2009						not enough water
					6/24/2009						not enough water
					8/3/2009						not enough water

EQ ID	Latitude	Longitude	Site ID	Site Description	Date sampled	TOC	mFC/ 100 ml	Impact of Fecal Coliforms*	OB	OB indications**	Comments
					8/29/2009						not enough water
Lafo-F1	29.744363310	-90.768130927	40A at Lefort	40A at Lefort Canal	7/8/2008	7:47 AM	712	exceed PCR	3.94	possible anthropogenic	
					10/15/2008	10:29 AM	400	exceed PCR	8.15	probable anthropogenic	
					11/13/2008	12:40 PM	160	none	3.10	possible anthropogenic	
					12/1/2008	8:32 AM	260	none	5.93	probable anthropogenic	
					1/21/2009	10:37 AM	60	none	3.52	possible anthropogenic	
					2/11/2009	11:46 AM	180	none	2.11	none	rain earlier in the morning
					4/1/2009	5:06 PM	200	none	3.22	possible anthropogenic	
					4/30/2009	10:30 AM	60	none	2.65	none	
					5/19/2009	3:05 PM	220	none	5.84	probable anthropogenic	
					7/2/2009	9:10 AM	180	none	3.11	possible anthropogenic	
					7/18/2009	1:45 PM	500	exceed PCR	3.54	possible anthropogenic	post major rain
					9/2/2009	4:45 PM	700	exceed PCR	3.55	possible anthropogenic	
					7/8/2008	8:17 AM	1,730	exceed PCR	10.46	anthropogenic	
Lafo-F2	29.742190106	-90.768236778	PS-40A / LR	Pump station at Lefort Rd / 40 Arpent Canal	10/15/2008	10:31 AM	260	None	7.01	probable anthropogenic	
					11/16/2008	12:50 PM	300	none	6.56	probable anthropogenic	
					12/1/2008	8:44 AM	1,320	exceed PCR	7.06	probable anthropogenic	
					1/21/2009	10:41 AM	180	none	8.28	probable anthropogenic	

EQ ID	Latitude	Longitude	Site ID	Site Description	Date sampled	TOC	mFC/ 100 ml	Impact of Fecal Coliforms*	OB	OB indications**	Comments
					2/11/2009	11:50 AM	1,080	exceed PCR	6.41	probable anthropogenic	rain earlier in the morning
					4/1/2009	5:12 PM	780	exceed PCR	7.14	probable anthropogenic	
					4/30/2009	10:38 AM	40	none	6.38	probable anthropogenic	
					5/19/2009	3:10 PM	40	none	7.86	probable anthropogenic	
					7/2/2009	9:15 AM	580	exceed PCR	7.24	probable anthropogenic	
					7/18/2009	1:50 PM	2,500	exceeds DWS&SCR	7.43	probable anthropogenic	post major rain
					9/2/2009	4:52 PM	3,000	exceeds DWS&SCR	7.45	probable anthropogenic	
Lafo-F3	29.754182821	-90.727999199	b-LA1-SC	Bridge LA1 at St. Charles	7/8/2008	9:32 AM	227	none	2.80	none	
					7/16/2008	5:20 PM	500	exceed PCR	2.58	none	
					10/15/2008	10:45 AM	80	none	3.16	possible anthropogenic	
					11/13/2008	1:11 AM	120	none	6.79	probable anthropogenic	
					12/10/2008	9:20 AM	280	none	2.63	none	
					1/21/2009	11:01 AM	100	none	3.44	possible anthropogenic	
					2/11/2009	11:29 AM	100	none	2.10	none	rain earlier in the morning
					4/1/2009	4:56 PM	160	none	3.00	none	
					4/30/2009	11:10 AM	100	none	2.17	none	
					5/19/2009	3:35 PM	200	none	2.71	none	
					7/2/2009	9:40 AM	60	none	3.01	none	
					7/18/2009	2:15 PM	1,150	exceed PCR	2.87	none	post major rain
					9/2/2009	5:20 PM	700	exceed PCR	2.87	none	
Lafo-F5	29.744760803	-90.730964572	321 SC	321 St. Charles Bypass	7/8/2008	9:10 AM	10,900	exceeds DWS&SCR	9.35	probable anthropogenic	
					10/15/2008	11:00 AM	150	none	15.07	anthropogenic	

EQ ID	Latitude	Longitude	Site ID	Site Description	Date sampled	TOC	mFC/ 100 ml	Impact of Fecal Coliforms*	OB	OB indications**	Comments
					11/13/2008	1:21 AM	3,460	exceeds DWS&SCR	13.50	anthropogenic	
					12/10/2008	9:13 AM	110,000	exceeds DWS&SCR	11.16	anthropogenic	
					1/21/2009	10:52 AM	7,900	exceeds DWS&SCR	6.48	probable anthropogenic	
					2/11/2009	11:05 AM	4,100	exceeds DWS&SCR	7.39	probable anthropogenic	rain earlier in the morning
					4/1/2009	4:45 PM	140	none	7.64	probable anthropogenic	
					4/30/2009	10:52 AM	300,000	exceeds DWS&SCR	12.56	anthropogenic	
					5/19/2009	3:30 PM	100,000	exceeds DWS&SCR	7.75	probable anthropogenic	
					7/2/2009						not enough water
					7/18/2009	2:05 PM	30,000	exceeds DWS&SCR	10.76	anthropogenic	post major rain
					9/2/2009	5:00 PM	28,000	exceeds DWS&SCR	11.71	anthropogenic	
Lafo-F6	29.733096861	-90.734706534	b-40A-SC	Bridge over 40 Arpent at St. Charles	7/8/2008	8:52 AM	243	none	4.20	possible anthropogenic	
					10/15/2008						no sample due to vegetation blockage
					11/13/2008	1:26 AM	40	none	2.04	none	
					12/10/2008	9:02 AM	180	none	4.97	possible anthropogenic	
					1/21/2009	10:56 AM	140	none	6.18	probable anthropogenic	
					2/11/2009	11:15 AM	60	none	2.40	none	rain earlier in the morning
					4/1/2009	4:50 PM	300	none	3.34	possible anthropogenic	
					4/30/2009	11:00 AM	40	none	7.54	probable anthropogenic	

EQ ID	Latitude	Longitude	Site ID	Site Description	Date sampled	TOC	mFC/ 100 ml	Impact of Fecal Coliforms*	OB	OB indications**	Comments
					5/19/2009	3:25 PM	100	none	6.55	probable anthropogenic	
					7/2/2009	9:30 AM	300	none	3.41	possible anthropogenic	
					7/18/2009	2:09 PM	1,850	exceed PCR	6.43	probable anthropogenic	post major rain
					9/2/2009	5:10 PM	2,300	exceeds DWS&SCR	6.47	probable anthropogenic	
Lafo-G1	29.723710782	-90.661639507	4ptc-g-40A	4 point canal gate (40A side)	7/17/2008	11:42 AM	200	none	3.14	possible anthropogenic	
					10/28/2008	6:12 PM	20	none	4.01	possible anthropogenic	
					11/18/2008	8:56 AM	0	none	2.88	none	Less Than Detectable
					12/11/2008	12:05 PM	340	none	5.21	probable anthropogenic	
					1/21/2009	2:00 PM	0	none	2.38	none	Less Than Detectable
					2/18/2009	2:00 PM	180	none	2.38	none	
					3/27/2009	10:55 AM	14,000	exceeds DWS&SCR	3.11	possible anthropogenic	Post Major Rain/Flood
					5/1/2009	5:45 PM	140	none	2.56	none	
					5/20/2009	9:05 AM	220	none	4.69	possible anthropogenic	
					6/10/2009	12:00 PM	80	none	3.35	possible anthropogenic	Gates Closed
					7/18/2009	3:40 PM	25,000	exceeds DWS&SCR	3.24	possible anthropogenic	Post Major Rain
					8/31/2009	10:09 AM	980	exceed PCR	3.24	possible anthropogenic	
Lafo-G2	29.734993403	-90.660589030	4ptc-g-b	4 point canal gate (bayou)	7/17/2008	11:40 AM	900	exceed PCR	2.83	none	
					10/28/2008	6:20 PM	40	none	2.49	none	
					11/18/2008	9:11 AM	20	none	2.21	none	
					12/10/2008	12:10 PM	160	none	2.53	none	
					1/21/2009	2:06 PM	40	none	2.82	none	
					2/18/2009	2:08 PM	40	none	2.41	none	

EQ ID	Latitude	Longitude	Site ID	Site Description	Date sampled	TOC	mFC/ 100 ml	Impact of Fecal Coliforms*	OB	OB indications**	Comments
					3/27/2009	11:00 AM	1,100	exceed PCR	3.10	possible anthropogenic	post major rain/flood
					5/1/2009	5:53 PM	260	exceed PCR	2.32	none	
					5/20/2009	9:10 AM	1,600	exceed PCR	3.79	possible anthropogenic	
					6/10/2009	12:05 PM	60	none	3.16	possible anthropogenic	gates closed/ not flowing to bayou
					7/18/2009	3:45 PM	1,200	exceed PCR	3.11	possible anthropogenic	post major rain/ clogged with vegetation
					8/31/2009	10:19 AM	2,400	exceeds DWS&SCR	3.12	possible anthropogenic	
Lafo-G3	29.737707404	-90.660360099	b-LA1-4PT	Bridge HWY LA1 at 4PT	7/8/2008	10:10 AM	1,545	exceed PCR	2.94	none	
					7/16/2008	5:00 PM	290	none	2.48	none	duck weed
					10/28/2008	6:25 PM	40	none	2.38	none	
					11/18/2008	9:15 AM	40	none	2.10	none	
					12/10/2008	12:19 PM	500	exceed PCR	2.49	none	
					1/21/2009	2:02 PM	20	none	2.80	none	
					2/18/2009	2:10 PM	200	none	2.25	none	
					3/27/2009	11:04 AM	4,000	exceeds DWS&SCR	3.04	none	post major rain/flood
					5/1/2009	5:58 AM	380	none	2.03	none	
					5/20/2009	9:20 AM	180	none	2.89	none	
					6/10/2009	12:15 PM	120	none	3.02	none	
					7/18/2009	3:50 PM	500	exceed PCR	3.05	none	post major rain/ clogged with vegetation
					8/31/2009	10:25 AM	700	exceed PCR	3.03	none	
Lafo-G5	29.737168781	-90.651523281	C-PD	Culvert - Plaisance Dr	7/24/2008	3:27 PM	18,000	exceeds DWS&SCR	6.52	probable anthropogenic	post major rain
					10/28/2008						not enough water

EQ ID	Latitude	Longitude	Site ID	Site Description	Date sampled	TOC	mFC/ 100 ml	Impact of Fecal Coliforms*	OB	OB indications**	Comments
					11/8/2008						not enough water
					12/10/2008						not enough water
					1/21/2009						not enough water
					2/18/2009						not enough water
					3/27/2009	11:11 AM	8,000	exceeds DWS&SCR	6.35	probable anthropogenic	post major rain/flood
					5/1/2009						not enough water
					5/20/2009						not enough water
					6/10/2009						not enough water
					7/18/2009						not enough water
					8/31/2009						not enough water
Lafo-H1	29.730662249	-90.606935427	b-N-h182-LA1	North Bridge HWY 182 - LA1	7/16/2008	4:40 PM	120	none	2.74	none	
					10/21/2008	8:05 AM	50	none	3.45	possible anthropogenic	
					11/19/2008	9:10 AM	20	none	2.15	none	
					12/9/2008	4:40 PM	80	none	2.33	none	
					1/28/2009	2:25 PM	60	none	2.79	none	rainy
					2/28/2009	10:26 AM	60	none	2.34	none	light rain
					3/25/2009	12:33 PM	260	none	2.63	none	
					5/2/2009	9:55 AM	400	exceed PCR	3.37	possible anthropogenic	
					5/20/2009	12:45 PM	140	none	2.50	none	
					7/2/2009	4:25 PM	100	none	3.41	possible anthropogenic	
					8/3/2009	10:25 AM	300	none	3.73	possible anthropogenic	

EQ ID	Latitude	Longitude	Site ID	Site Description	Date sampled	TOC	mFC/ 100 ml	Impact of Fecal Coliforms*	OB	OB indications**	Comments
					8/29/2009	2:50 PM	2,000	exceeds DWS&SCR	3.49	possible anthropogenic	
Lafo-H2	29.728105630	-90.601404008	C-SP	Culvert - LA1/St. Patrick St.	1/28/2009	2:10 PM	660	exceed PCR	6.20	probable anthropogenic	rainy
					2/28/2009						not enough water
					3/25/2009						not enough water
					5/2/2009						not enough water
					5/20/2009						not enough water
					7/2/2009						not enough water
					8/3/2009						not enough water
					8/29/2009						not enough water
Lafo-H4	29.720534485	-90.606863753	378 Greenville St	378, Greenville St. Raceland	7/24/2008	9:48 AM	80,000	exceeds DWS&SCR	11.00	anthropogenic	
					10/21/2008						not enough water
					11/19/2008						not enough water
					12/9/2008						not enough water
					1/28/2009	2:06 PM	3,480	exceeds DWS&SCR	8.94	probable anthropogenic	rainy
					2/28/2009	10:13 AM	500	exceed PCR	4.16	possible anthropogenic	light rain
					3/25/2009						not enough water
					5/2/2009						not enough water
					5/20/2009						not enough water

EQ ID	Latitude	Longitude	Site ID	Site Description	Date sampled	TOC	mFC/ 100 ml	Impact of Fecal Coliforms*	OB	OB indications**	Comments
					7/2/2009						not enough water
					8/3/2009						not enough water
					8/29/2009						not enough water
Lafo-H5			b-Ayo	Bridge at Ayo St. over 40 A	7/24/2008	10:00 AM	800	exceed PCR	9.59	probable anthropogenic	
					10/21/2008	7:45 AM	250	none	11.29	anthropogenic	
					11/19/2008	9:26 AM	740	exceed PCR	13.93	anthropogenic	
					12/8/2008	4:08 PM	1,800	exceed PCR	10.14	anthropogenic	
					1/28/2009	2:00 PM	620	exceed PCR	19.37	anthropogenic	rainy
					2/28/2009	10:05 AM	360	none	5.71	probable anthropogenic	light rain
					3/25/2009	11:56 PM	10,000	exceeds DWS&SCR	11.80	anthropogenic	
					5/2/2009	9:35 AM	360	none	13.68	anthropogenic	
					5/20/2009	12:25 PM	12,000	exceeds DWS&SCR	2.50	none	
					7/2/2009	4:05 PM	2,800	exceeds DWS&SCR	14.12	anthropogenic	
					8/3/2009	10:05 AM	2,500	exceeds DWS&SCR	13.87	anthropogenic	
					8/29/2009	2:30 PM	18,000	exceeds DWS&SCR	11.91	anthropogenic	
Lafo-H6	29.727713031	-90.598681322	b-h182-LA1	Bridge HWY 182 and LA1	7/9/2008	10:53 AM	345	none	2.81	none	
					7/16/2008	4:25 PM	130	none	2.79	none	water movement and duck weed
					10/21/2008	7:35 AM	30	none	3.17	possible anthropogenic	
					11/19/2008	9:45 AM	120	none	2.08	none	
					12/9/2008	4:30 PM	40	none	2.29	none	
					1/28/2009	2:20 AM	140	none	2.93	none	rainy

EQ ID	Latitude	Longitude	Site ID	Site Description	Date sampled	TOC	mFC/ 100 ml	Impact of Fecal Coliforms*	OB	OB indications**	Comments
					2/28/2009	10:20 AM	100	none	2.34	none	light rain
					3/25/2009	12:25 PM	180	none	2.44	none	
					5/2/2009	9:45 AM	540	exceed PCR	3.31	possible anthropogenic	
					5/20/2009	12:40 PM	0	none	4.63	possible anthropogenic	
					7/2/2009	4:18 PM	200	None	3.21	possible anthropogenic	
					8/3/2009	10:20 AM	200	none	4.37	possible anthropogenic	
					8/29/2009	2:45 PM	3,400	exceeds DWS&SCR	2.33	none	
Lafo-I1	29.687689632	-90.580203965	40A - SLCC	40A Canal at Sugarland Country Club	8/11/2008	10:40 AM	2,800	exceeds DWS&SCR	8.84	probable anthropogenic	
					10/22/2008	10:45 AM	3,200	exceeds DWS&SCR			too much debris in sample no OB available
					12/10/2008	2:56 PM	3,000	exceeds DWS&SCR	8.38	probable anthropogenic	
					1/7/2009	10:25 AM	3,500	exceeds DWS&SCR	8.42	probable anthropogenic	
					1/27/2009	7:27 AM	240	none	8.89	probable anthropogenic	
					2/27/2009	2:12 PM	2,000	exceeds DWS&SCR	5.42	probable anthropogenic	
					3/29/2009	4:50 PM	2,820	exceeds DWS&SCR	8.46	probable anthropogenic	
					5/2/2009	1:05 PM	8,000	exceeds DWS&SCR	7.64	probable anthropogenic	
					5/27/2009	4:55 PM	400,000	exceeds DWS&SCR	10.91	anthropogenic	
					7/2/2009	10:10 AM	30,000	exceeds DWS&SCR	9.13	probable anthropogenic	
					7/29/2009	12:25 PM	700	exceed PCR	9.56	probable anthropogenic	

EQ ID	Latitude	Longitude	Site ID	Site Description	Date sampled	TOC	mFC/ 100 ml	Impact of Fecal Coliforms*	OB	OB indications**	Comments
					8/29/2009	3:30 PM	80,000	exceeds DWS&SCR	9.01	probable anthropogenic	
Lafo-I2	29.702939464	-90.563261022	C -GS/ Hwy1 - Ac	Culvert- gas station/Hwy 1-Acadia Rd	8/11/2008	9:45 AM	300	None	3.42	possible anthropogenic	through the grid on top of the catch basin
					10/22/2008	10:57 AM	230	none	9.37	probable anthropogenic	not flowing
					12/10/2008	2:56 PM					not enough water
					1/7/2009	11:10 AM	60	none	6.49	probable anthropogenic	
					1/27/2009	8:27 AM	120	none	8.86	probable anthropogenic	
					2/27/2009						not enough water
					3/29/2009						not enough water
					5/2/2009						not enough water
					5/27/2009						not enough water
					7/2/2009						not enough water
					7/29/2009						not enough water
					8/29/2009						not enough water
Lafo-I3	29.702907359	-90.563512541	C-Hwy1 - Ac Rd	Culvert Hwy 1-Acadia Rd Bank	8/11/2008	10:08 AM	1,000	exceed PCR	6.34	probable anthropogenic	through the grid on top of the catch basin
					10/22/2008						not enough water
					12/10/2008						not enough water

EQ ID	Latitude	Longitude	Site ID	Site Description	Date sampled	TOC	mFC/ 100 ml	Impact of Fecal Coliforms*	OB	OB indications**	Comments
					1/7/2009	10:45 AM	200	none	5.31	probable anthropogenic	
					1/27/2009	7:48 AM	1,220	exceed PCR	6.48	probable anthropogenic	through the grid on top of the catch basin
					2/27/2009						not enough water
					3/29/2009	5:00 PM	1,780	exceed PCR	5.98	probable anthropogenic	
					5/2/2009						not enough water
					5/27/2009						not enough water
					7/2/2009						not enough water
					7/29/2009						not enough water
					8/29/2009						not enough water
Lafo-I4	29.701787886	-90.564125753	D-AR-R	Ditch (Acadia Rd/ Raceland)	10/22/2008						not enough water
					12/10/2008						not enough water
					1/7/2009	10:38 AM	0	none	3.57	possible anthropogenic	FC not detected
					1/27/2009	7:42 AM	200	none	2.89	none	
					2/27/2009						not enough water
					3/29/2009	4:57 PM	1,000	exceed PCR	3.23	possible anthropogenic	
					5/2/2009						not enough water
					5/27/2009						not enough water
					7/2/2009						not enough water

EQ ID	Latitude	Longitude	Site ID	Site Description	Date sampled	TOC	mFC/ 100 ml	Impact of Fecal Coliforms*	OB	OB indications**	Comments
					7/29/2009						not enough water
					8/29/2009						not enough water
Lafo-I5	29.687470357	-90.547271676	4962 LA1	4962 HWY LA1Mathews	7/9/2008	10:30 AM	97,272	exceeds DWS&SCR	7.66	probable anthropogenic	
					7/16/2008						not enough water
					10/22/2008	11:18 AM	70	none	11.18	anthropogenic	not flowing
					12/10/2008						not enough water
					1/7/2009	10:55 AM	550	exceed PCR	6.98	probable anthropogenic	
					1/27/2009	7:54 AM	40	none	8.97	probable anthropogenic	
					2/27/2009	2:23 PM	16,000	exceeds DWS&SCR	7.17	probable anthropogenic	
					3/29/2009	5:07 PM	700	exceed PCR	8.77	probable anthropogenic	
					5/2/2009						not enough water
					5/27/2009	5:10 PM	36,000	exceeds DWS&SCR	9.69	probable anthropogenic	
					7/2/2009						not enough water
					7/29/2009						not enough water
					8/29/2009						not enough water
Lafo-I6	29.677380789	-90.542004876	b-H654	Bridge HWY 654 to Gheens	7/9/2008	10:07 AM	1,621	exceed PCR	2.82	none	
					7/16/2008	3:40 PM	200	none	2.34	none	
					10/22/2008	11:28 AM	10	none	3.20	possible anthropogenic	
					12/11/2008						sample not taken due to severe weather

EQ ID	Latitude	Longitude	Site ID	Site Description	Date sampled	TOC	mFC/ 100 ml	Impact of Fecal Coliforms*	OB	OB indications**	Comments
					1/7/2009	11:02 AM	160	none	2.57	none	
					1/27/2009	8:03 AM	300	none	9.00	probable anthropogenic	
					2/27/2009	2:34 PM	320	none	1.78	none	
					3/29/2009	5:15 AM	640	exceed PCR	2.75	none	
					5/2/2009	1:30 PM	740	exceed PCR	2.00	none	
					5/27/2009	5:20 PM	600	exceed PCR	3.18	possible anthropogenic	
					7/2/2009	10:30 AM	220	None	3.10	possible anthropogenic	
					7/29/2009	12:50 PM	200	none	3.00	none	
					8/29/2009	3:45 PM	1,100	exceed PCR	3.01	none	
Lafo-J1	29.643556287	-90.548817789	PS-Lockport	Company Canal side of Lockport Pump Station	10/29/2008	5:45 PM	300	none	9.16	probable anthropogenic	pumps not running
					11/4/2008	7:43 AM	400	exceed PCR	7.70	probable anthropogenic	pumps not running
					12/11/2008	11:35 AM	5,500	exceeds DWS&SCR	8.40	probable anthropogenic	
					2/8/2009	1:12 PM	20	none	3.08	none	
					2/27/2009	3:25 PM	1,600	exceed PCR	3.14	possible anthropogenic	
					4/1/2009	10:40 AM	80	none	3.27	possible anthropogenic	
					5/3/2009	6:00 PM	1,600	exceed PCR	7.14	probable anthropogenic	
					5/29/2009	9:15 AM	120	none	4.67	possible anthropogenic	
					6/17/2009	10:55 AM	500	exceed PCR	3.52	possible anthropogenic	
					8/3/2009	5:18 PM	140	none	4.62	possible anthropogenic	
					8/31/2009	8:35 AM	120,000	exceeds DWS&SCR	3.83	possible anthropogenic	

EQ ID	Latitude	Longitude	Site ID	Site Description	Date sampled	TOC	mFC/ 100 ml	Impact of Fecal Coliforms*	OB	OB indications**	Comments
Lafo-J1A	29.643749199	-90.549041412	40A-PS-LP	40A side of the Lkpt. Pump Station	2/8/2009	1:12 PM	60	none	5.46	probable anthropogenic	
					2/27/2009	3:28 PM	440	exceed PCR	7.50	probable anthropogenic	
					4/1/2009	10:43 AM	240	none	6.50	probable anthropogenic	
					5/3/2009	6:05 PM	1,200	exceed PCR	6.98	probable anthropogenic	
					5/29/2009	9:15 AM	100	none	4.57	possible anthropogenic	
					6/17/2009	11:00 AM	600	exceed PCR	4.70	possible anthropogenic	
					8/3/2009	5:20 PM	300	none	6.90	probable anthropogenic	
					8/31/2009	8:31 AM	6,000	exceeds DWS&SCR	5.91	probable anthropogenic	
Lafo-J2	29.647974148	-90.551750143	D- LH	Large cement ditch draining Lkpt. Heights	10/29/2008						not enough water
					11/4/2008						not enough water
					12/11/2008						not enough water
					2/8/2009	12:59 PM	2,000	exceeds DWS&SCR	15.33	anthropogenic	
					2/27/2009	3:15 PM	8,000	exceeds DWS&SCR	14.24	anthropogenic	
					4/1/2009	10:30 AM	840	exceed PCR	13.51	anthropogenic	
					5/3/2009	5:55 PM	28,000	exceeds DWS&SCR	12.88	anthropogenic	
					5/29/2009						not taken area not accessible
					6/17/2009	10:40 AM	1,000	exceed PCR	10.45	anthropogenic	
					8/3/2009	5:10 PM	1,260	exceed PCR	13.92	anthropogenic	

EQ ID	Latitude	Longitude	Site ID	Site Description	Date sampled	TOC	mFC/ 100 ml	Impact of Fecal Coliforms*	OB	OB indications**	Comments
					8/31/2009	8:25 AM	120,000	exceeds DWS&SCR	13.39	anthropogenic	
Lafo-J3	29.644924601	-90.544777816	b-CC	Company Canal Bridge, Lockport	7/9/2008	9:38 AM	156	none	3.34	possible anthropogenic	
					7/16/2008	3:30 PM	200	none	3.45	possible anthropogenic	
					10/29/2008	5:51 PM	400	exceed PCR	8.78	probable anthropogenic	
					11/4/2008	7:48 AM	250	none	7.77	probable anthropogenic	
					12/11/2008	11:44 AM	540	exceed PCR	4.79	possible anthropogenic	
					2/8/2009	1:30 PM	60	none	2.43	none	Modified sample site 100 yds. towards B. Laf., in the Company Canal -Bridge Construction
					2/27/2009	3:31 PM	180	none	1.74	none	
					4/1/2009	10:45 AM	100	none	2.68	none	
					5/3/2009	6:10 PM	800	exceed PCR	5.64	probable anthropogenic	
					5/29/2009	9:25 AM	220	none	4.73	possible anthropogenic	
					6/17/2009	11:05 AM	140	none	3.51	possible anthropogenic	
					8/3/2009	5:25 PM	620	exceed PCR	4.73	possible anthropogenic	
					8/31/2009	8:40 AM	1,200	exceed PCR	3.34	possible anthropogenic	
Lafo-J4	29.646866621	-90.536784674	b-VS	Bridge at Vacherie Street	7/9/2008	9:20 AM	180	none	3.77	possible anthropogenic	
					7/16/2008	3:15 PM	300	none	3.45	possible anthropogenic	duck weed

EQ ID	Latitude	Longitude	Site ID	Site Description	Date sampled	TOC	mFC/ 100 ml	Impact of Fecal Coliforms*	OB	OB indications**	Comments
					10/29/2008	6:00 PM	700	exceed PCR	3.78	possible anthropogenic	
					11/4/2008	7:54 AM	750	exceed PCR	5.17	probable anthropogenic	
					12/11/2008	12:00 PM	1,260	exceed PCR	4.96	possible anthropogenic	
					2/8/2009	1:21 PM	20	none	2.84	none	
					2/27/2009	3:40 PM	20	none	2.95	none	
					4/1/2009	10:50 AM	340	None	3.12	possible anthropogenic	
					5/3/2009	6:15 PM	860	exceed PCR	4.45	possible anthropogenic	
					5/29/2009	9:30 AM	20	None	4.53	possible anthropogenic	
					6/17/2009	11:15 AM	160	None	3.08	none	
					8/3/2009	5:30 PM	140	None	3.87	possible anthropogenic	
					8/31/2009	8:48 AM	1,500	exceed PCR	2.45	none	
Lafo-J5	29.629916368	-90.530519205	C-HD	Culvert at Hyland Dr	8/14/2008	11:25 AM	3,000	exceeds DWS&SCR	29.94	anthropogenic	flowing to protection levee
					10/29/2008	6:17 PM	1,700	exceed PCR	17.83	anthropogenic	
					11/4/2008	8:12 AM	1,500	exceed PCR	22.15	anthropogenic	
					12/11/2008	12:31 PM	2,040	exceeds DWS&SCR	11.25	anthropogenic	
					2/8/2009	1:53 PM	40	None	12.61	anthropogenic	
					2/27/2009	4:05 PM	2,000	exceeds DWS&SCR	13.88	anthropogenic	
					4/1/2009	11:06 AM	4,000	exceeds DWS&SCR	14.45	anthropogenic	
					5/3/2009	6:55 PM	5,600	exceeds DWS&SCR	21.27	anthropogenic	
					5/29/2009	9:55 AM	1,480	exceed PCR	12.94	anthropogenic	

EQ ID	Latitude	Longitude	Site ID	Site Description	Date sampled	TOC	mFC/ 100 ml	Impact of Fecal Coliforms*	OB	OB indications**	Comments
					6/17/2009	11:50 AM	300	None	9.57	probable anthropogenic	
					8/3/2009	6:05 PM	8,000	exceeds DWS&SCR	20.41	anthropogenic	
					8/31/2009	9:15 AM	190,000	exceeds DWS&SCR	15.57	anthropogenic	
Lafo-J6	29.638823980	-90.516595481	C-Hwy 1-R & M	Culvert on Hwy1 between Romy & Mar St	8/14/2008	11:05 AM	2,200	exceeds DWS&SCR	9.12	probable anthropogenic	
					10/29/2008	6:10 PM					not enough water
					11/4/2008						not enough water
					12/11/2008	12:21 PM	1,800	exceed PCR	4.54	possible anthropogenic	
					2/8/2009						not enough water
					2/27/2009	3:50 PM	300	none	5.54	probable anthropogenic	
					4/1/2009	10:56 AM	400	exceed PCR	5.12	probable anthropogenic	
					5/3/2009						not enough water
					5/29/2009						not enough water
					6/17/2009						not enough water
					8/3/2009						not enough water
					8/31/2009						not enough water
Lafo-J6A	29.624809816	-90.534468123	40A-R	40A Canal- end of Romy St	2/8/2009	1:46 PM	20	none	28.49	anthropogenic	FC very low for OB reading
					2/27/2009	3:55 PM	1,000	exceed PCR	19.24	anthropogenic	
					4/1/2009	11:00 AM	1,280	exceed PCR	23.42	anthropogenic	

EQ ID	Latitude	Longitude	Site ID	Site Description	Date sampled	TOC	mFC/ 100 ml	Impact of Fecal Coliforms*	OB	OB indications**	Comments
					5/3/2009	6:45 PM	1,200	exceed PCR	25.60	anthropogenic	
					5/29/2009	9:45 AM	960	exceed PCR	15.04	anthropogenic	
					6/17/2009	11:40 AM	140	none	8.71	probable anthropogenic	
					8/3/2009	5:58 PM	40,000	exceeds DWS&SCR	14.56	anthropogenic	
					8/31/2009	9:05 AM	130,000	exceeds DWS&SCR	8.25	probable anthropogenic	
Lafo-J7	29.640279797	-90.518277395	C-Hwy1-FS	Culvert Hwy 1 at Franks Store	8/14/2008	11:55 AM	14,800	exceeds DWS&SCR	6.48	probable anthropogenic	
					10/29/2008	6:22 PM	1,700	exceed PCR	12.20	anthropogenic	
					11/4/2008						not enough water
					12/11/2008	12:12 PM	2,400	exceeds DWS&SCR	4.35	possible anthropogenic	
					2/8/2009	1:35 PM	2,200	exceeds DWS&SCR	4.88	possible anthropogenic	
					2/27/2009	3:45 PM	280,000	exceeds DWS&SCR	6.07	probable anthropogenic	
					4/1/2009	10:54 AM	40	none	5.17	probable anthropogenic	
					5/3/2009						not enough water
					5/29/2009						not enough water
					6/17/2009						not enough water
					8/3/2009	6:10 PM	100,000	exceeds DWS&SCR	9.41	probable anthropogenic	black/gray color water
					8/31/2009	8:55 AM	240,000	exceeds DWS&SCR	3.69	possible anthropogenic	
Lafo-J8	29.636525101	-90.513062462	b-BB	Bridge- Bollinger Belleview	7/9/2008	9:00 AM	800	exceed PCR	3.81	possible anthropogenic	

EQ ID	Latitude	Longitude	Site ID	Site Description	Date sampled	TOC	mFC/ 100 ml	Impact of Fecal Coliforms*	OB	OB indications**	Comments
					7/16/2008	3:00 PM	1,000	exceed PCR	3.45	possible anthropogenic	duck weed in sample
					10/29/2008						sample not taken -severe weather
					11/4/2008	8:36 AM	1,200	exceed PCR	6.42	probable anthropogenic	
					12/11/2008	12:58 PM	540	exceed PCR	3.68	possible anthropogenic	
					2/8/2009	2:12 PM	40	none	2.61	none	
					2/27/2009	4:25 PM	140	none	3.43	possible anthropogenic	
					4/1/2009	11:20 AM	560	exceed PCR	3.62	possible anthropogenic	
					5/3/2009	6:35 PM	460	exceed PCR	5.93	probable anthropogenic	
					5/29/2009	10:15 AM	300	none	3.71	possible anthropogenic	
					6/17/2009	12:15 PM	180	none	3.62	possible anthropogenic	
					8/3/2009	5:50 PM	160	none	4.85	possible anthropogenic	
					8/31/2009	9:35 AM	500	exceed PCR	3.54	possible anthropogenic	
Lafo-J9	29.592221058	-90.467253979	b-Valentine	Bridge at Valentine	7/9/2008	8:30 AM	2,182	exceeds DWS&SCR	4.31	possible anthropogenic	
					7/16/2008	2:45 PM	900	exceed PCR	4.09	possible anthropogenic	lilies
					10/29/2008	6:37 PM	500	exceed PCR	6.33	probable anthropogenic	
					11/4/2008	8:48 AM	1,000	exceed PCR			OB not taken
					12/11/2008	12:47 PM	900	exceed PCR	3.06	none	
					2/8/2009	2:05 PM	60	none	3.37	possible anthropogenic	

EQ ID	Latitude	Longitude	Site ID	Site Description	Date sampled	TOC	mFC/ 100 ml	Impact of Fecal Coliforms*	OB	OB indications**	Comments
					2/27/2009	4:20 PM	80	none	3.97	possible anthropogenic	
					4/1/2009	11:15 AM	160	none	3.58	possible anthropogenic	
					5/3/2009	6:30 PM	240	none	5.04	probable anthropogenic	
					5/29/2009	10:05 AM	160	none	3.70	possible anthropogenic	
					6/17/2009	12:05 PM	220	none	3.51	possible anthropogenic	
					8/3/2009	5:45 PM	540	exceed PCR	3.67	possible anthropogenic	
					8/31/2009	9:30 AM	1,800	exceed PCR	3.24	possible anthropogenic	

NOTE: FC counts are colony forming units (CFU) fecal coliforms (FC)/100ml on mFC media.

Optical Brightener (OB) Designations (Rough Indicator of Human Input with "0" OB as DI Water)
This arbitrary designation will probably be revised for a proposed continued study in B. Lafourche from Donaldsonville at the Mississippi River siphon to Labadieville where this current study had its first sampling site north of Lafourche Parish

*Fluorometer OB readings	Human Input Designation (arbitrary)
0.0 - 3.0	probably none
3.1 - 4.9	possible anthropogenic
5.0 - 9.9	probable anthropogenic
10.0 or >	anthropogenic

LDEQ 2008 DESIGNATED USE WATER QUALITY CRITERIA PARAMETERS (LDEQ 2009)
1) DWS -drinking water supply - cannot exceed 2,000 CFU fecal coliforms (FC) /100ml);
2) PCR -primary contact recreation - swimming; cannot exceed 400 CFU FC/100ml; (only highlighted those 1,000 or >)
3) SCR- secondary contact recreation - boating/fishing cannot exceed 2,000 CFU FC/100ml;
(Criteria for secondary contact recreation to apply during the non- primary recreational period of November 1 through April 3.)

3.1 Maps and Discussion of the 10 Cluster of Sites and New GIS Aerial Maps with Clusters and the sampling locations within the Clusters.

The pictures below are compilations of GIS database maps, digital photographs of the individual sites and some Microsoft Virtual Earth “Birdseye” images of the 54 sites within their 10 Clusters.

Figures 5 and 6 were divided into 10 Figures with close-up GIS map files of the sampling clusters.

Figures 7, 8, 9, 10, 11, 12, 13, 14, 15 and 16 show specified maps of each of the 10 sampling clusters in the required geodatabase map files. Additionally, each GIS Figure of a cluster map includes separate digital images to LDEQ specs of each sampling site in that cluster.

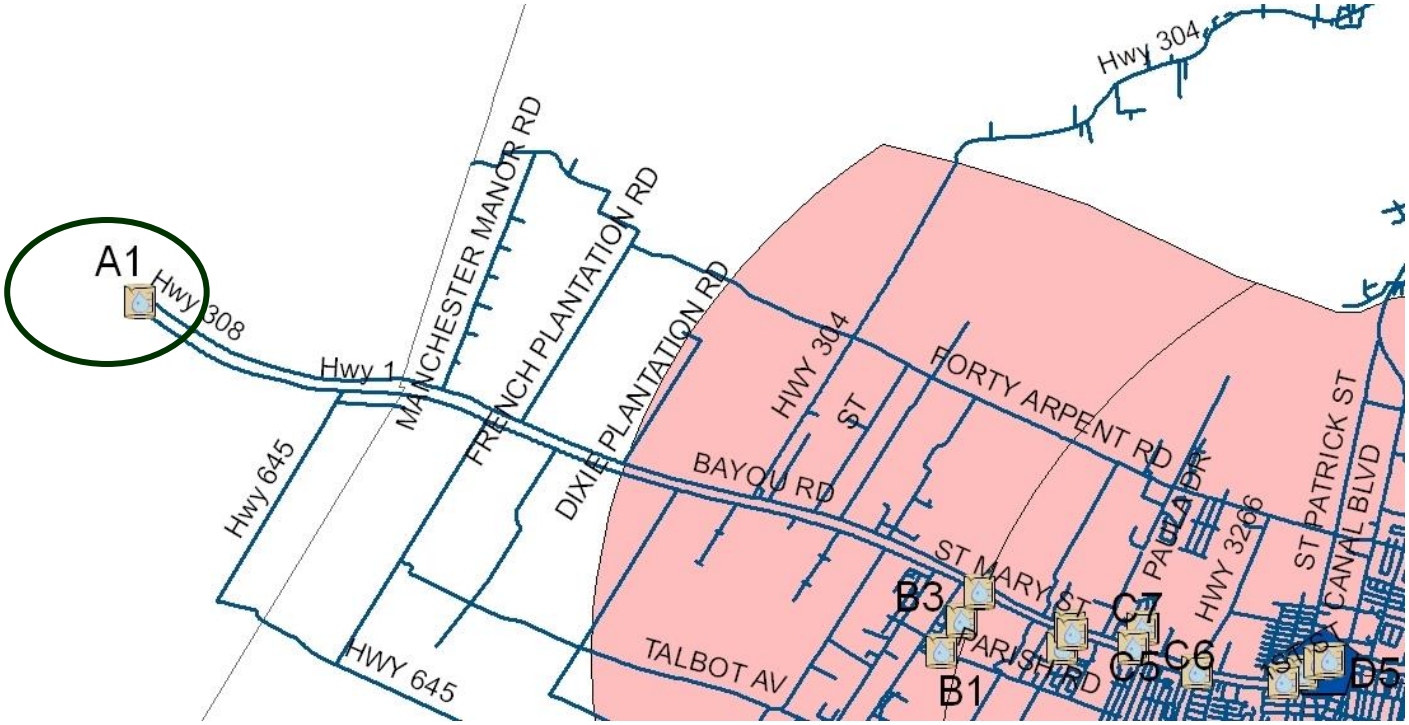


Figure 7 . The A Site Cluster – A1, Bayou Lafourche bridge at HWY 398 Labadieville

A1 – Bayou Lafourche Bridge at Hwy 398, Labadieville

Virtual Earth Image of Site A1 bridge

Cluster A is neither in Lafourche Parish nor in the Protection Area. We added this site to evaluate its impact to the Water Plant intake pumps downstream. You can see from the A Cluster section of Table 3 sampling results above that the bridge over Bayou Lafourche at LA Hwy 398 has only exceeded the drinking water source (DWS) and secondary contact recreation fecal coliform designated use standard of 2,000 FC cfu/100ml once during its 13 month sampling period. It has exceeded the swimming or primary contact recreation (PCR) designated FC standard of 200 FC cfu/100ml during 5 months of the sampling period. This sample is taken from the Bayou in the middle of the bridge, and the Bayou samples are greatly diluted compared with samples in drainage ditches and canals. The OB readings are low, probably because of the extreme dilution factor in the Bayou itself.

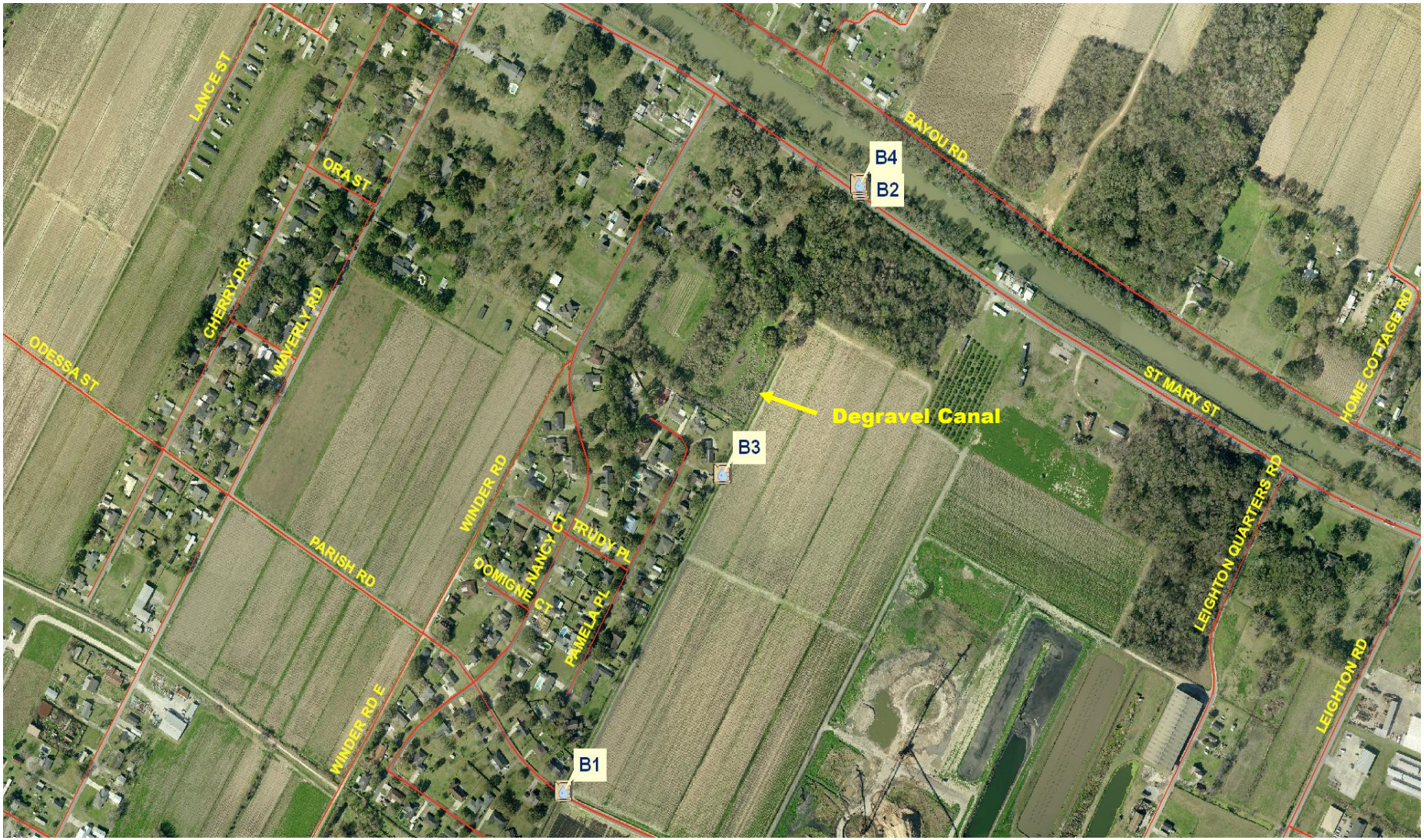
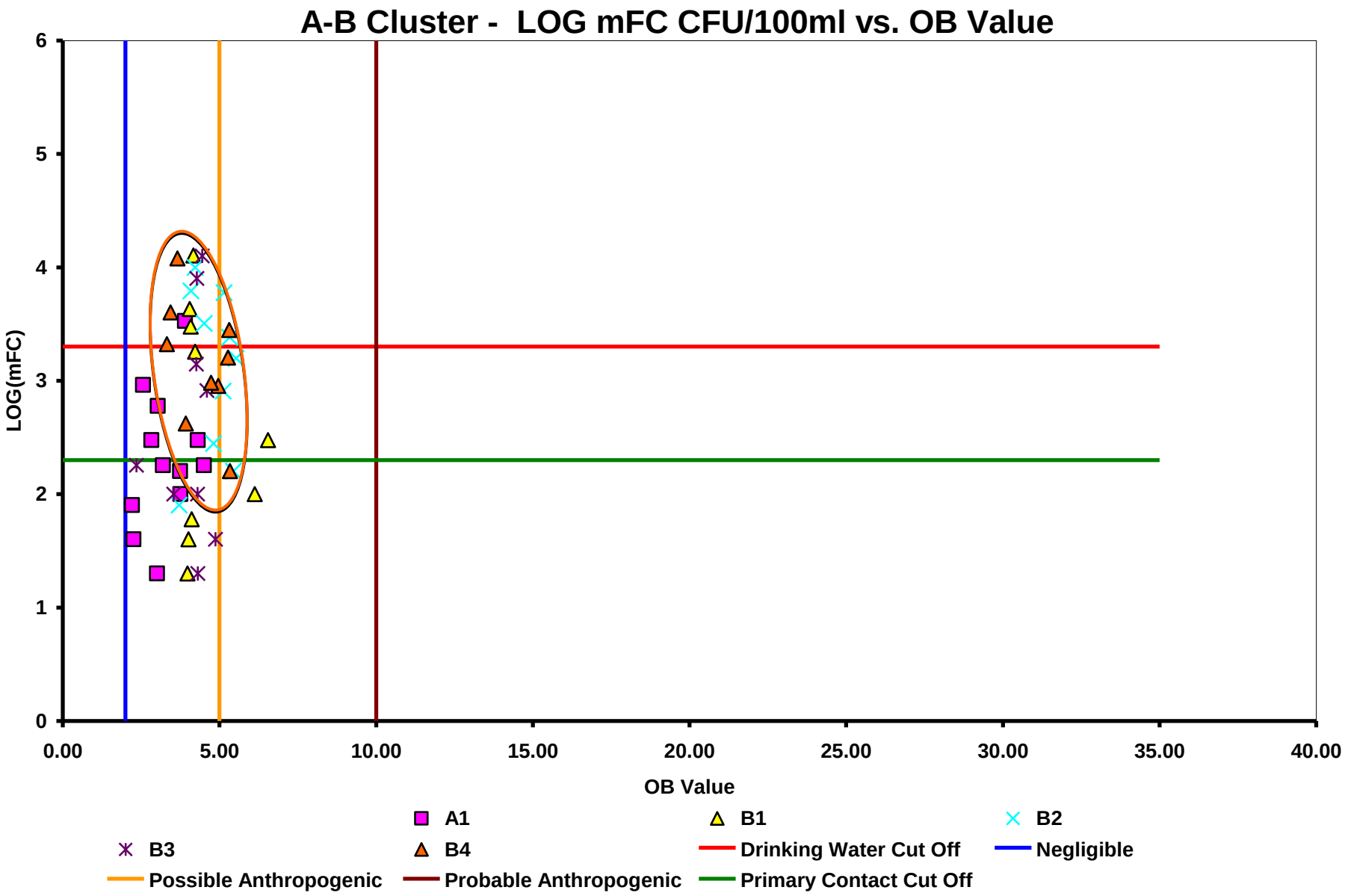


Figure 8 . The B Site Cluster – B1, B2, B3, B4


A-B Cluster - LOG mFC CFU/100ml vs. OB Value
LOG(mFC)
6
5
4
3
2
1
0
0.00
5.00
10.00
15.00
20.00
25.00
30.00
35.00
40.00
OB Value
A1
B1
B2
B3
B4
Drinking Water Cut Off
Negligible
Possible Anthropogenic
Probable Anthropogenic
Primary Contact Cut Off

B1 Degravel Canal at Parish Road

***B2** Degravel Canal at Hwy 1 (**"Hot Spot"**)*

B3 Degravel Canal mid-point to B. Lafourche

B4** Degravel Canal at B. Lafourche **("Hot Spot")

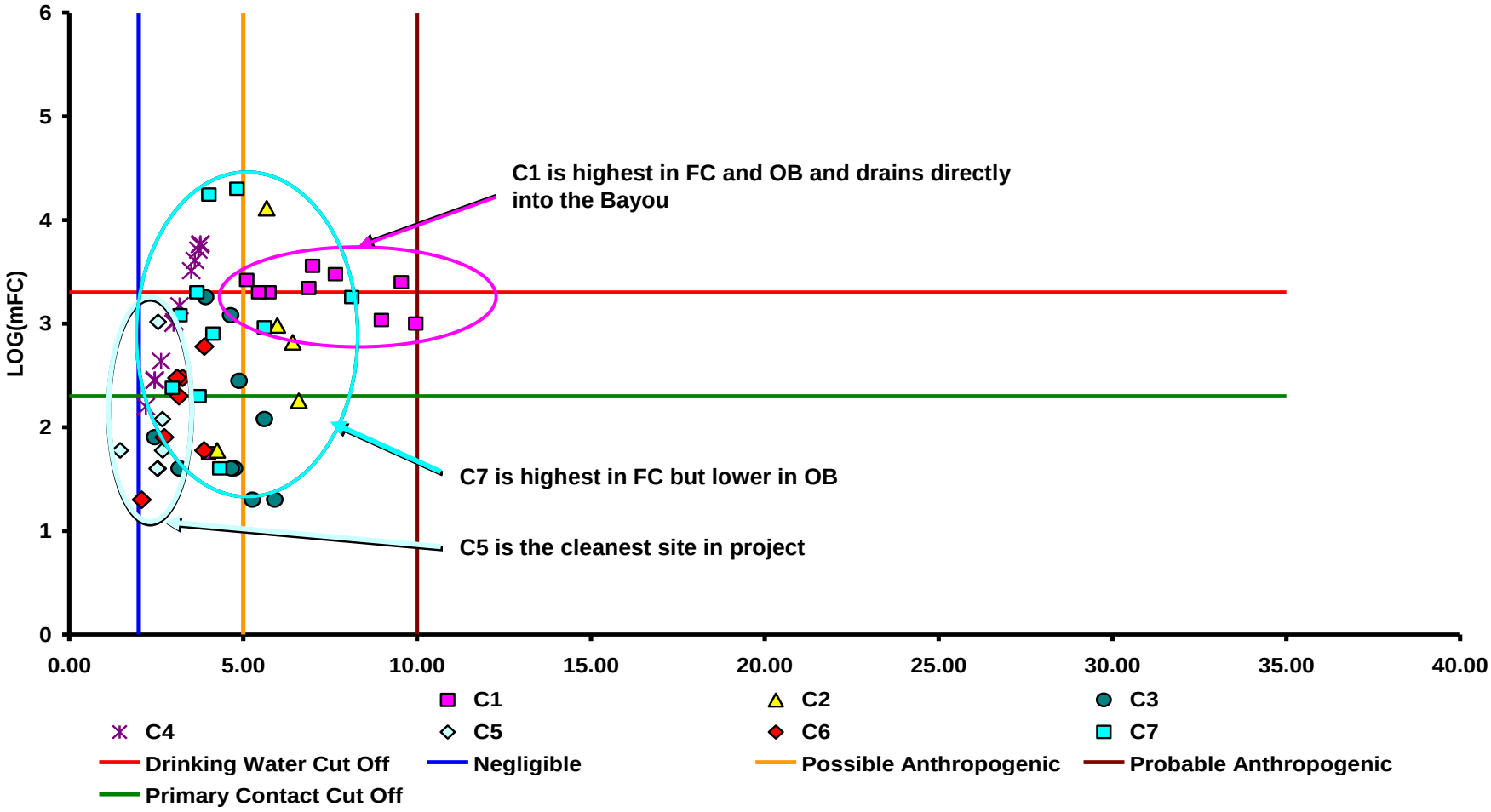
The B Cluster in north Thibodaux was selected early in the project because it drained two subdivisions from Waverly Road and Winder Road toward the Degravel Canal which drains directly into Bayou Lafourche. Table 5 above has the FC and OB results for this Cluster B and its 4 sampling sites (B1 – B4) on pp. 23-25. It was originally deemed that sites B2 and B4 would be the most significant in this cluster because B4 is the culvert from the Degravel Canal which drains directly into B. Lafourche. B4 exceeded the DWS designed use FC standard (2,000 FC cfu/100mL) five times in the 13 months of sampling. The sample on July 20, 2009 post major rain was 12,000 mF FC cfu/100ml. This makes this site B4 a significant source of FC directly to the Bayou. However, you can see from the scatter plot above and the map of the B cluster that despite the fact that this site has had consistently high FC counts, it has medium OB values, the highest being 7.01 with a 2,400 FC count. Although B3 in the actual canal has package plant pipes clearly visible draining directly into the canal, the canal has a thick population of water weeds and foliage that probably removes much of the nutrients before they reach the Bayou.

Site B2, which is the Degravel Canal right before it goes under Hwy 1 to the culvert draining into the Bayou at B4, exceeded the DWS FC designated levels 6 times in the 13 samplings (10,000 to 2,420 FC/100mL) and PCR 1 time (1,580 FC/100mL). The OB values were medium and none were 10 or greater, but this site drains under Hwy 1 directly to the Bayou and is designated as one of the **"hot spots"** listed in Section 3.2 in the Summary of Results.

Site B4 is the Degravel Canal where it drains directly into the Bayou Lafourche. It is a direct impact to the Bayou and is very high in FC, exceeding the DWS designated use standards 5 times (12,000 to 2,100 FC/100mL) and the PCR standards 4 times (1,600 to 420 FC/200mL). The OB readings were also generally high, with 5 readings above 5.0 (7.01 to 5.27). Although this site does go through a wooded area, it is definitely an anthropogenic source directly to the Bayou and is designated as one of the **"hot spots"** listed in Section 3.2 in the Summary of Results.

Figure 9 . The C Site Cluster – C1, C2, C3, C4, C5, C6, C7

C Cluster - LOG mFC CFU/100ml vs. OB Value



***C1 Abby Canal draining under Hwy 308 "Hot Spot"**

Abby Canal on Hwy 308 to B. Lafourche at LA 1385 bridge

Virtual Earth Image of C1 Abby Canal Draining Under Hwy 308 to B. Laf.

***Site C1** Abby Canal, which drains "The Abby" Subdivision, on Hwy 308 exceeded the DWS FC designated levels 7 times out of the 10 samplings (3,600 to 2,000 FC/100mL) and the PCR twice (1,000 to 1,080 FC/100mL) during the sampling period. This is a significant human source because the OBs for these samples were generally high (9.97 to 5.45) and are probably anthropogenic. The Abby Canal at C1 on Hwy 308 is directly across from B. Lafourche and sample C1 is taken in the Abby Canal right before it passes under Hwy 308 and empties directly into the B. Lafourche. ***C1 is a "Hot Spot"** in Section 3.2 Summary of Results **because it is significant source of FC to the Bayou** from a subdivision with many luxury homes.

C2 Hwy 3185 apartments behind Rouse's shopping center

C3 Hwy 3185 culvert at B. Lafourche 3185 bridge

C4 Hwy 3185 bridge downstream

C5 Lake in "The Lakes" subdivision

C6 The Lake drainage canal at control

C7 The Lake drainage canal to B. Lafourche under Hwy 308

Site C2 is a drainage ditch draining an apartment complex on LA Hwy 3185 behind the Rouse's supermarket on LA Hwy 1. During the sampling period it only exceeded the DWS FC standard one time (13,000 FC/100mL) and the PCR FC standard twice (960 to 660 FC/100mL). The OB values were not significantly high, but ranged from 6.60 to 5.68.

Site C3 is a culvert draining into Bayou Lafourche at the Hwy 3185 Bridge. It generally had a greasy orange effluent and was collecting drainage from both sides of Hwy 3185 which had a fast food hamburger restaurant and a gas station across the street from this site. The PCR FC standards were only exceeded twice in the sampling period (1,800 – 1,200 FC/100mL) and the OB values ranged from only 5.92 to 2.46. This is probably not a significant source of FC to the Bayou, but is a source of oil and grease contamination.

Site C4 was sampled from the middle of the Hwy 3185 Bridge over Bayou Lafourche on the downstream side of the bridge. This site exceeded the PCR FC standards 6 times (1,440 – 780 FC/100mL), but never exceeded the DWS FC standards during the sampling period.

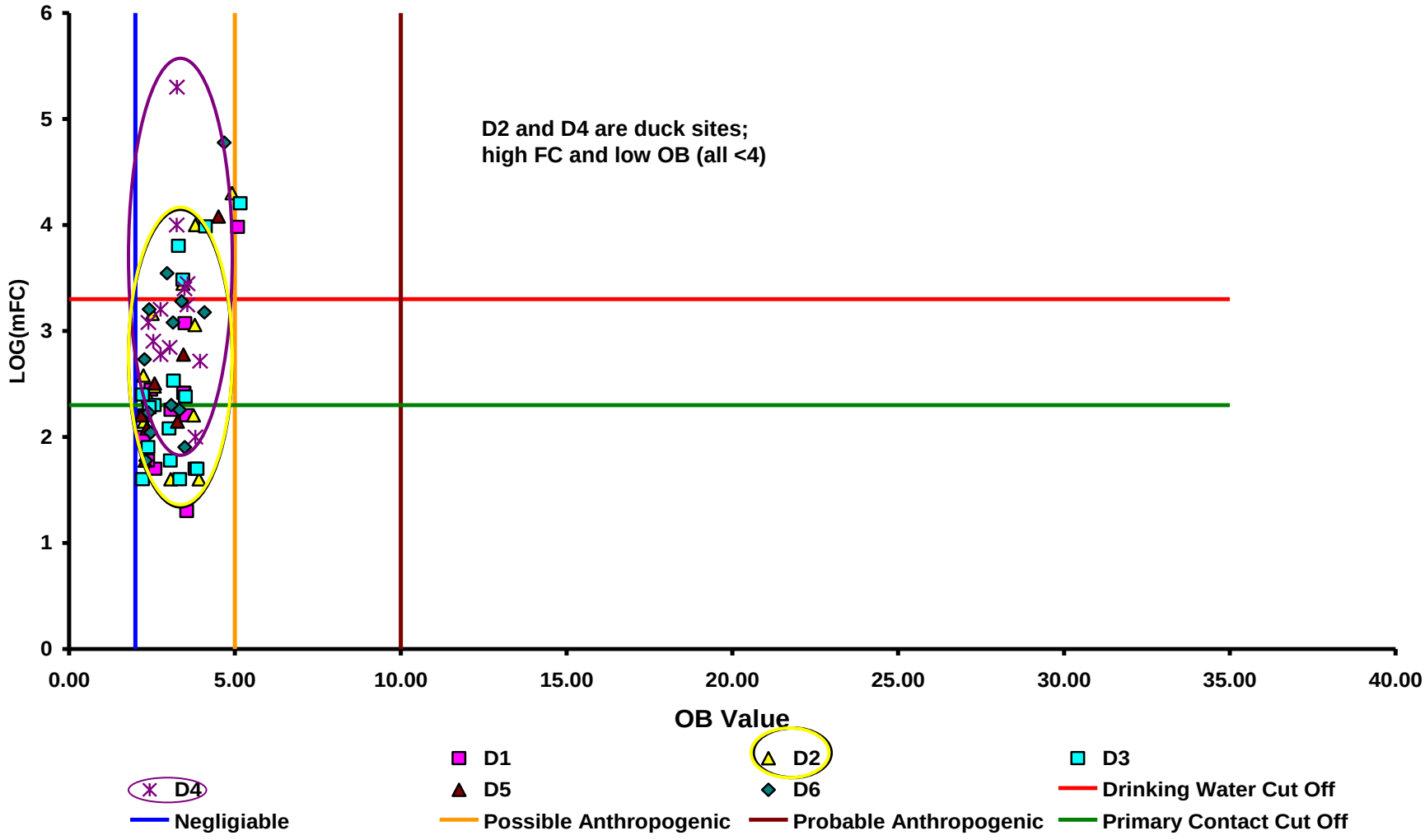
Site C5 was sampled from the lake in "The Lakes" subdivision. This site was the cleanest site of the 54 sites in the entire project. It is a brand new development right next to "The Abby" subdivision on Hwy 308 in north Thibodaux. It is a model of how a large development that drains toward the Bayou (at Site C6) can maintain a pristine drainage.

However, the end of "The Lakes" drainage canal from the control gate culvert at C6 drains through the woods and eventually passes under Hwy 308 and empties into Bayou Lafourche at site C7. The high FC counts at Site C7 (exceeded DWS FC standards 3 times; from 20,000 – 2,000 FC/100mL) are from Hwy 308 houses draining to ditches and culverts to the Lake's drainage canal at Hwy 308. There could also be wildlife in that wooded area because only 2 of the OB values were 5.0 or more (8.13 to 5.62) But there was an OB value of only 3.67 for the 2,000 FC/100 mL count.

C5, 6, 7 (Virtual Earth Image)
The Lake in "The Lakes" development and its drainage canal to B. Lafourche

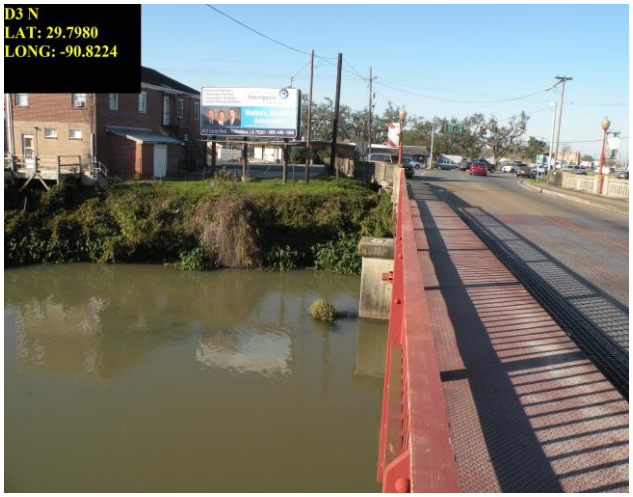
Figure 10. The D Site Cluster – D1, D2, D3, D4, D5, D6

D Cluster LOG mFC CFU/100ml vs. OB



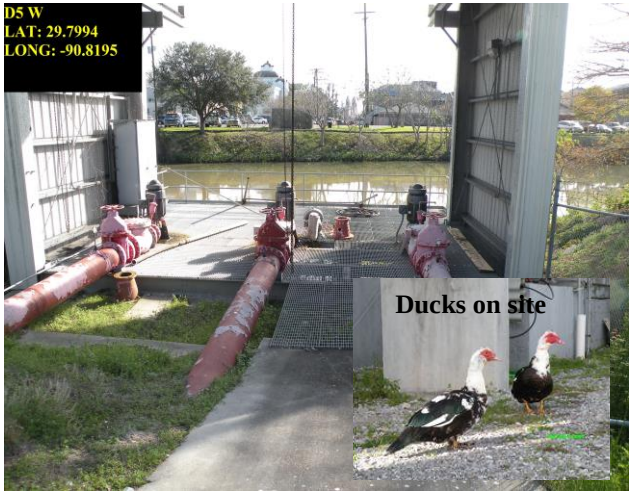
D1 Tiger Drive Bridge

D2 Jean Lafitte National Park and Library

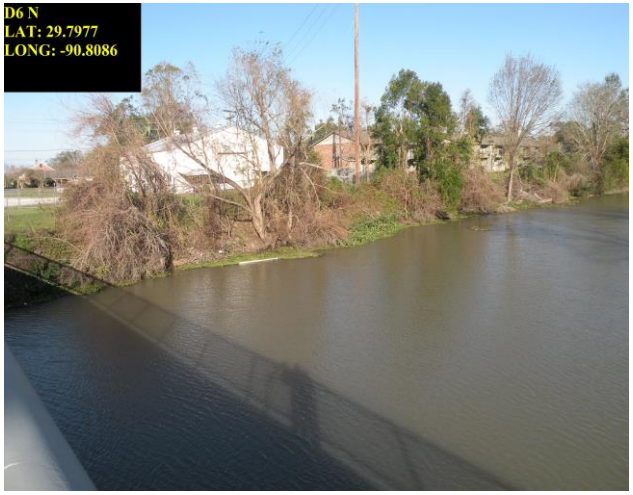


D3 B. Lafourche Bridge at Hwy 20

D4 Hwy 308 car wash adjacent to Thibodaux WP



D5 Thibodaux Water Plant Intake on Hwy 308



D6 B. Lafourche Pedestrian Bridge

Site D1 is taken from the middle of the Tiger Drive Bridge in Thibodaux. This bridge is upstream from the City of Thibodaux water plant pump intake. This site was very clean and only exceeded the DWS FC standard once (9,600 FC/100mL) and the PCR FC standard once (1,181 FC/100mL) during the sampling period.

The D cluster has two main animal (duck) sites, D2 on LA Hwy 1 and D4 on Hwy 308 from a culvert draining directly into Bayou Lafourche.

Site D2 on LA Hwy 1 is taken directly from the Bayou at the Jean Lafitte National Park and Library where a large number of ducks nest under the Bayouside Park and "Bayou Walk" or dock. The FC counts exceeded the DWS FC standard 3 times (20,000 to 2,800 FC/100mL) and the PCR FC standard 2 times (1,450 to 1140 FC/100mL) during the sampling period, but the OBs were all low (3.82 was the highest OB value) during the sampling period. This is typical of an animal site.

Site D4 is a culvert draining into B. Lafourche at a car wash site on Hwy 308 adjacent to the City of Thibodaux's Water Treatment Plant intake pump. The FC counts exceeded the DWS standard 4 times during the project (200,000 to 2,500 FC/100mL) and the PCR FC standard 6 times (1,760 to 440 FC/100mL). However, like Site D2, the OB values were very low (3.57 was the highest OB value for the entire sampling period). This site also has a large population of ducks and would be considered mainly an animal site, although the culvert includes storm drain runoff from the area which has both commercial and residential sites.

Site D3 is the Hwy 20 downtown bridge across Bayou Lafourche. It only exceeded the DWS standard 3 times during the project period and had only one extremely high FC count of 16,000/100 mL with a 5.16 OB reading. Because of its location within the city limits, with storm water culverts emptying directly into the Bayou, this site would have impact from the storm drain culverts from the City of Thibodaux, but there is no really high OB evidence of significant human input.

Site D5 is taken at the City of Thibodaux Water Plant Intake. With the exception of only 1 sample that had a FC count of 12,000/100 mL, all of the FC counts were extremely low, with only one other sample exceeding the PCR designated use standard. The OB readings at this site were all low (5.60 with the 12,000 FC count was the highest).

Site D6 is the pedestrian bridge over Bayou Lafourche in the City of Thibodaux downstream from the City water plant intake. It only exceeded the DWS designated use standard twice in the sampling period and no OB readings greater than 4.67 were found. However it did exceed the PCR standard 5 times in the sampling period and is often used for SCR and pirogue races for the University. It receives water drainage from storm drain culverts and the Bayou water from upstream, but is not a threat to the City water plant intake because it is downstream from the weir for the intake pump.

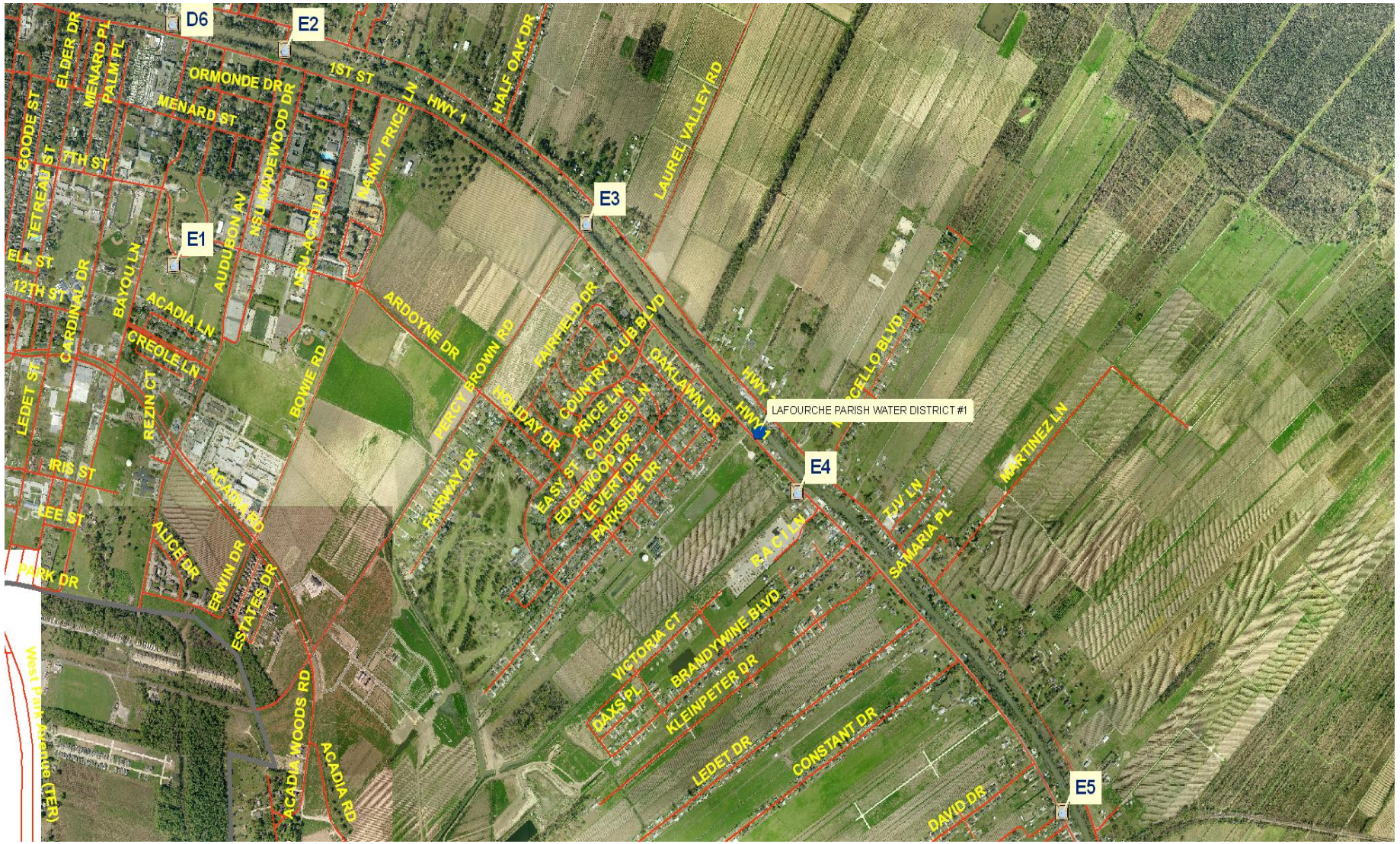
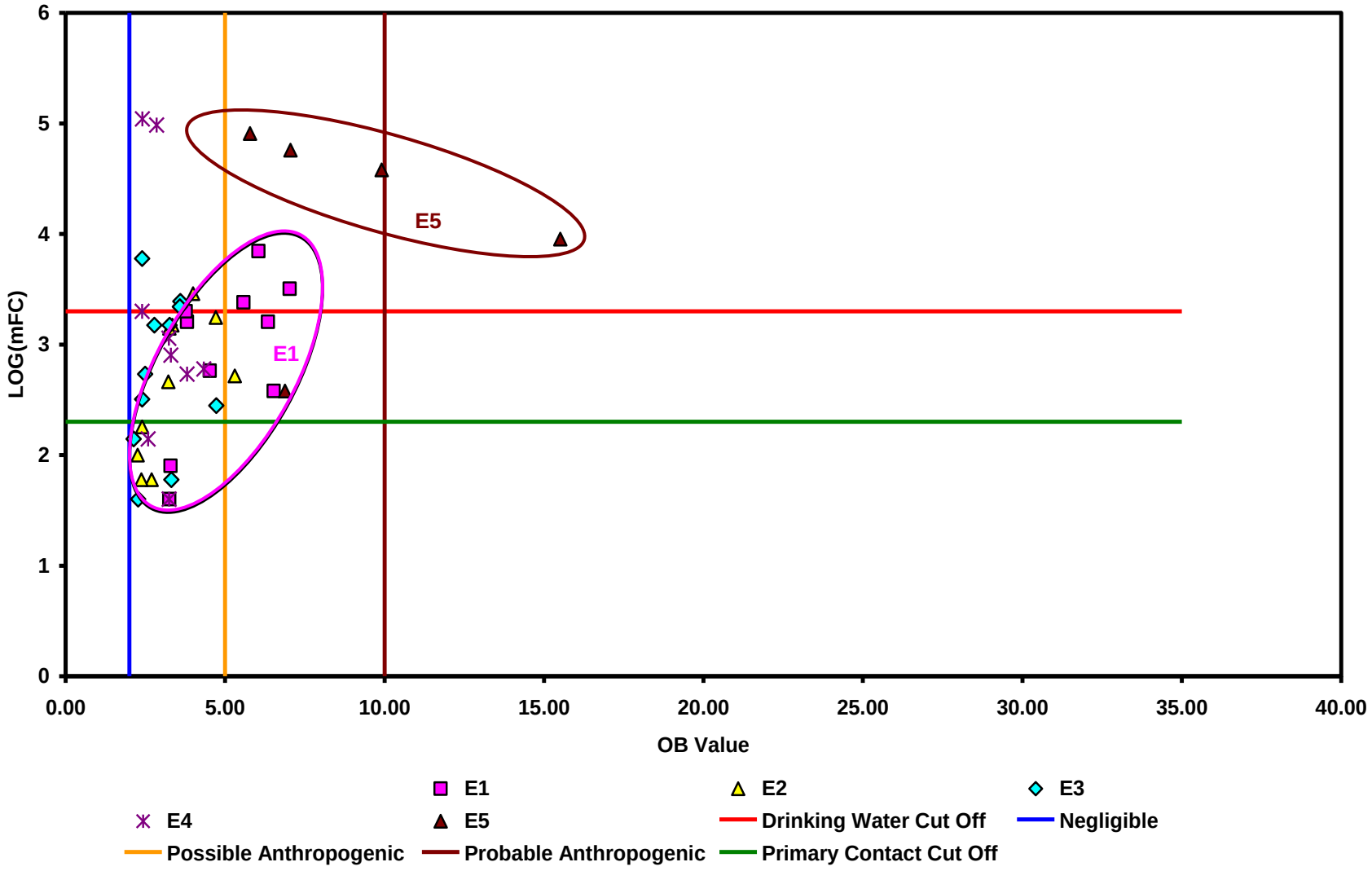


Figure 11. The E Site Cluster – E1, E2, E3, E4, E5


E Cluster - LOG mFC CFU/100ml vs. OB
LOG(mFC)
OB Value
0
1
2
3
4
5
6
0.00
5.00
10.00
15.00
20.00
25.00
30.00
35.00
40.00
E1
E5
E1
E2
E3
E4
E5
Drinking Water Cut Off
Negligible
Possible Anthropogenic
Probable Anthropogenic
Primary Contact Cut Off

E1 40 Arpent Canal origin at Peltier Park
(Drains south side of Thibodaux and opens into 40A Canal at the park.)

E2 B. Lafourche Bridge at Audubon Dr.

E3 B. Lafourche Bridge at Spur 648
(Percy Brown Road)

E4 Dugas Canal at Ronald Adams Construction Co. on Hwy 1 side (Branches off 40 A and connects to B. Laf. - see last image in this row)

***E5 1265 Hwy 1 culvert draining under Hwy 1 to B. Lafourche is a "Hot Spot"**

E4 Virtual Earth Image of Dugas Canal from 40 Arpent Canal

The E Cluster site (E1, E2, E3, E4, and E5) seen above in Figure 11 originates at E1 in Peltier Park at the origin of the 40 Arpent Canal. The entire south side of the City of Thibodaux's storm water drains underground into a very large culvert which surfaces into the 40 Arpent in the middle of Peltier Park. The FC counts were high and exceeded the DWS FC standard 5 times (7,000 to 2,000 FC/100mL) and the SCR FC standard 3 times (1,600 to 580 FC/100mL) during the project time period. There were only 5 OB values >5.00 (5.58 and 7.03). The 40 Arpent canal then drains back into an underground culvert under the Nicholls State University campus to surface again on Bowie Road, curve through the cane fields and around the back of the Bayou Country Club, and continue parallel to Bayou Lafourche all the way to below the Intracoastal Water Way until it merges into the marshes behind Golden Meadow, LA.

Site E2 is the Bayou Lafourche Bridge at Audubon Drive across from the Nicholls State University Campus. This site only exceeded the DWS FC standards once in the sampling period (2,880 FC/100mL); but exceeded the PCR standard 6 times (1,760 to 460 FC/100mL) in the same period. The OB values were all very low with only 1 reading >5.00 OB units (5.31). There are often ducks at the Nicholls wharf at the Bayouside, so these results of high FC and low OB readings are expected for this site.

Site E3 was taken from the middle of the bridge over the Bayou at Spur 648 (also known as the Percy Brown Road), which is across from Acadia Plantation. This site exceeded the PCR FC standard 4 times (1,500 to 540 FC/100mL) and the DWS FC standard 3 times (6,000 to 2,000 FC/100mL) during the sampling period; however none of the OB readings were 5.0 or higher.

Site E4 is the Dugas Canal near the Ronald Adams Construction Company on Hwy 1. Just beyond the Bayou Country Club, the Dugas Canal branches from the 40 Arpent Canal and connects directly to Bayou Lafourche. This Canal is gated before it passes under Hwy 1 (Site E4) and empties into the Bayou. This is to prevent the Bayou from backing up into the Canal and flooding the homes in the area. The gate does leak, but apparently prevents the 40 Arpent from directly draining large quantities of water into the Bayou. This is important because it empties into the Bayou just downstream from the Lafourche Parish Water District No. 1 North Plant intake pump which is tidal at this point. Site E4 exceeded the DWS FC standard 4 times (110,000 to 2,000) and the PCR FC standard 4 times (1,140 to 540 FC/100mL), but had no high OB readings in the sampling period.

***Site E5** is taken from a culvert on the Bayou side at 1265 LA Hwy 1 which empties directly into the Bayou and drains the front a very old and low end subdivision (some house trailers and old homes). Samples exceeded the DWS FC standard 4 times in the sampling period with extremely high FC counts (81,000 to 9,000 FC/100 mL, which was the lowest FC count at this site for the entire sampling period. The OB readings were also extremely high (15.51 to 5.78). **Site E5 is one of the "hot spots"** listed in Section 3.2 at the end of this Report.

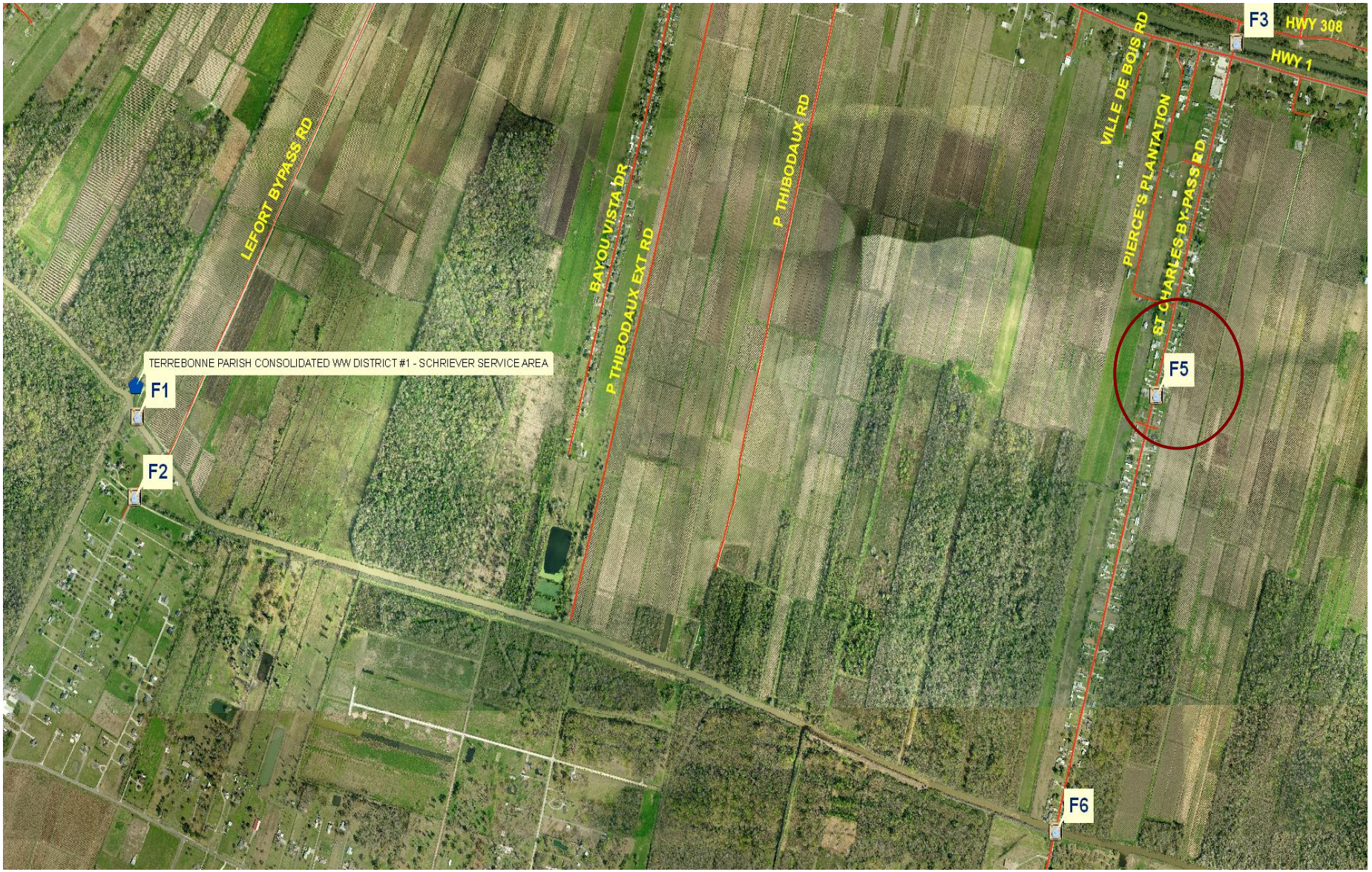
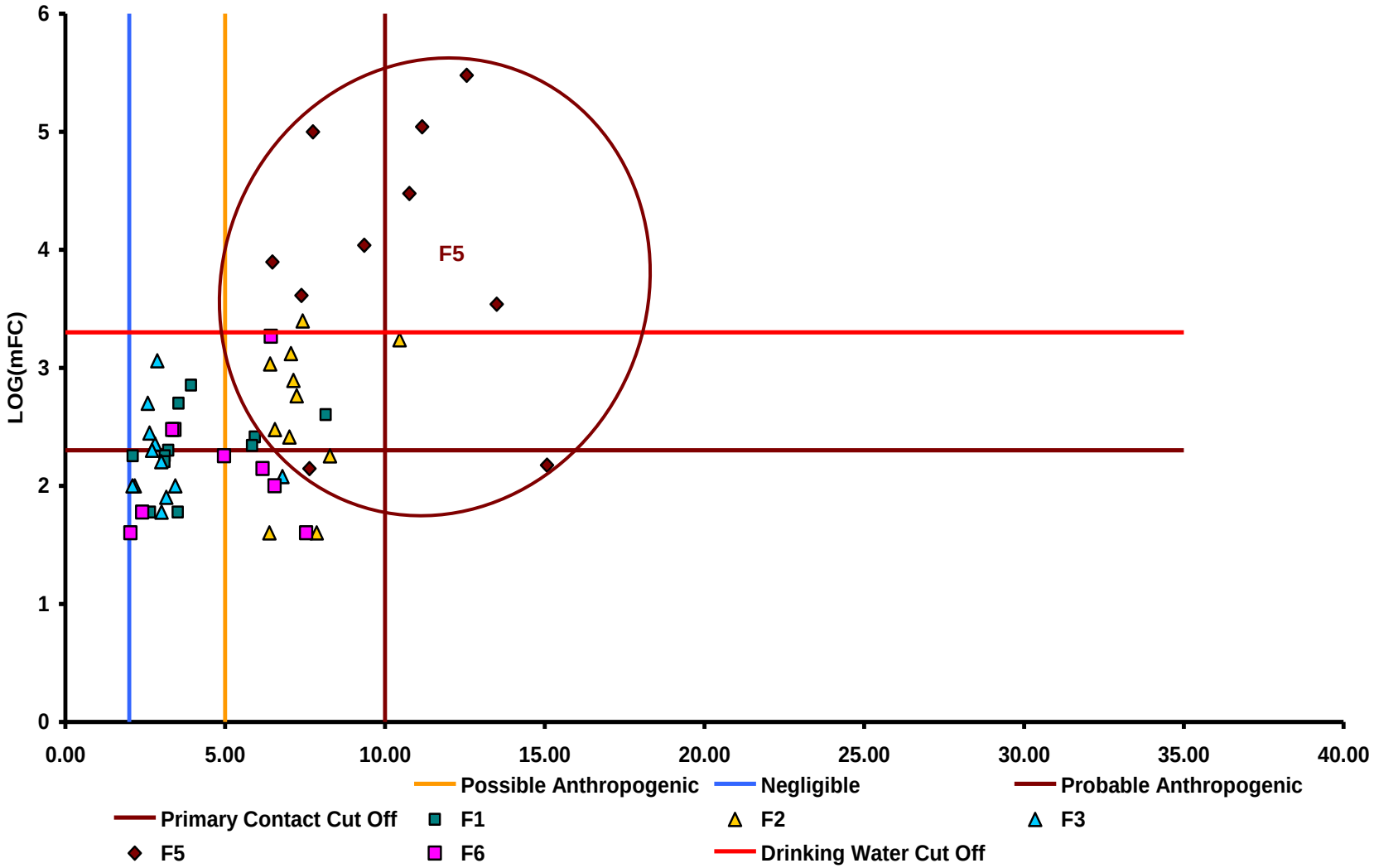
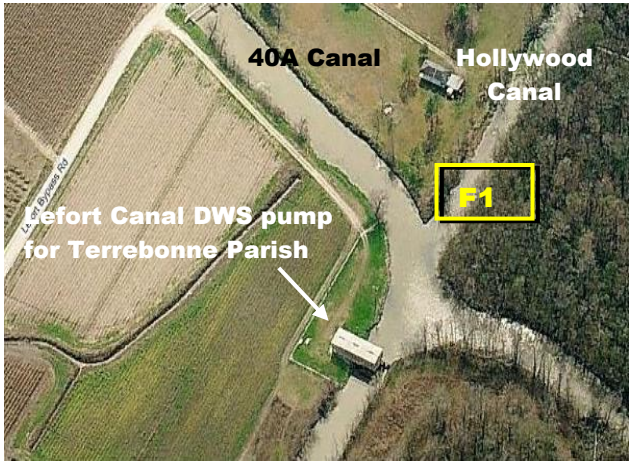


Figure 12. Cluster F, Sites F1, F2, F3, F5, and F6 (F4 eliminated)

F Cluster - LOG mFC CFU/100ml vs. OB



F1 40A at Lefort Canal (Terrebonne Parish DWS) (Turns into Hollywood Canal after crossing 40A)



Virtual Earth Image of Lefort Canal and 40A

F2 Pump station from drainage ditch on Lefort Rd to 40A Canal

F3 B. Lafourche Bridge at St. Charles

F5 321 St Charles Bypass
(F4 for ditch near Hwy 1 not located)

F6 Bridge 40 A on St. Charles Bypass Rd.

Site F1 is taken in the 40 Arpent Canal where it crosses the Lefort Canal where the Terrebonne Parish water treatment plant intake pump is located. This site only exceeded the PCR FC standard 5 times during the sampling period (1,730 to 400 FC/100mL), but no FC counts exceeded the DWS FC standard of <2,000 FC/100mL. The OB values ranged from 10.46 to 3.54 for these samples.

Site F2 is taken off the Lefort Road across the 40 Arpent Canal Bridge at a pump station that pumps drainage water from the homes on Lefort and Burma Roads into a canal that merges with the 40 Arpent Canal. Only 2 samples (3,000 and 2,500 FC/200mL) exceeded the DWS FC standard during the sampling period. The OB readings for these samples were 7.45 and 7.43 respectively and are designated as probably anthropogenic.

Site F3 was taken from the middle of the bridge over Bayou Lafourche from the St. Charles Bypass Road. No samples exceeded the DWS FC standard during the sampling period in the Bayou at that site, and only 3 samples exceeded the PCR FC standard during the sampling period (1,150 to 500 FC/100mL). OB readings were all low.

Site F4 was eliminated because there was no ditch found on the St Charles Bypass Road near LA Hwy 1.

Site F5 is on the St. Charles Bypass Road from a home package plant effluent pipe that drains directly into an open ditch in the front yard. When it has water, the FC counts exceeded the DWS FC standard 9 out of 11 sampling dates (300,000 to 3,460 FC/100mL), and the OB values were higher than any other F sites (15.07 to 6.48). This site does not impact B. Lafourche directly because it only drains back to the 40 Arpent Canal. However, that Canal does impact the Bayou through the Company Canal in Lockport.

Site F6 is taken in the middle of the bridge over the 40 Arpent Canal on the St. Charles Bypass Road. The 40 Arpent Canal was not high in FC at this bridge site. The DWS FC standard was only exceeded once in the sampling period (2,300 FC/100mL); and the PCR FC standard was only exceeded once (1,850 FC/100mL). The highest OB value in the sampling period was 7.54, but that FC count was only 40/100mL.

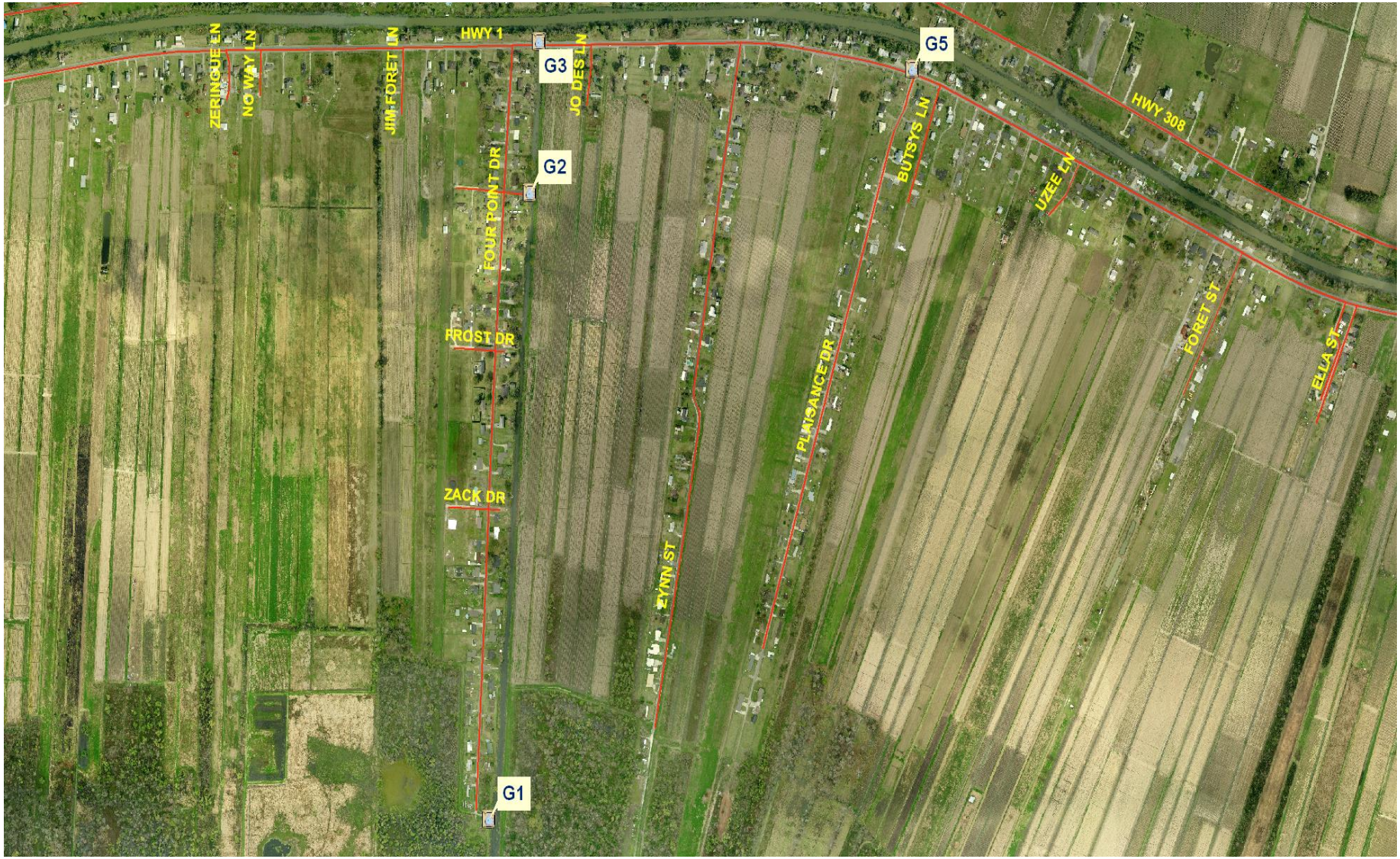
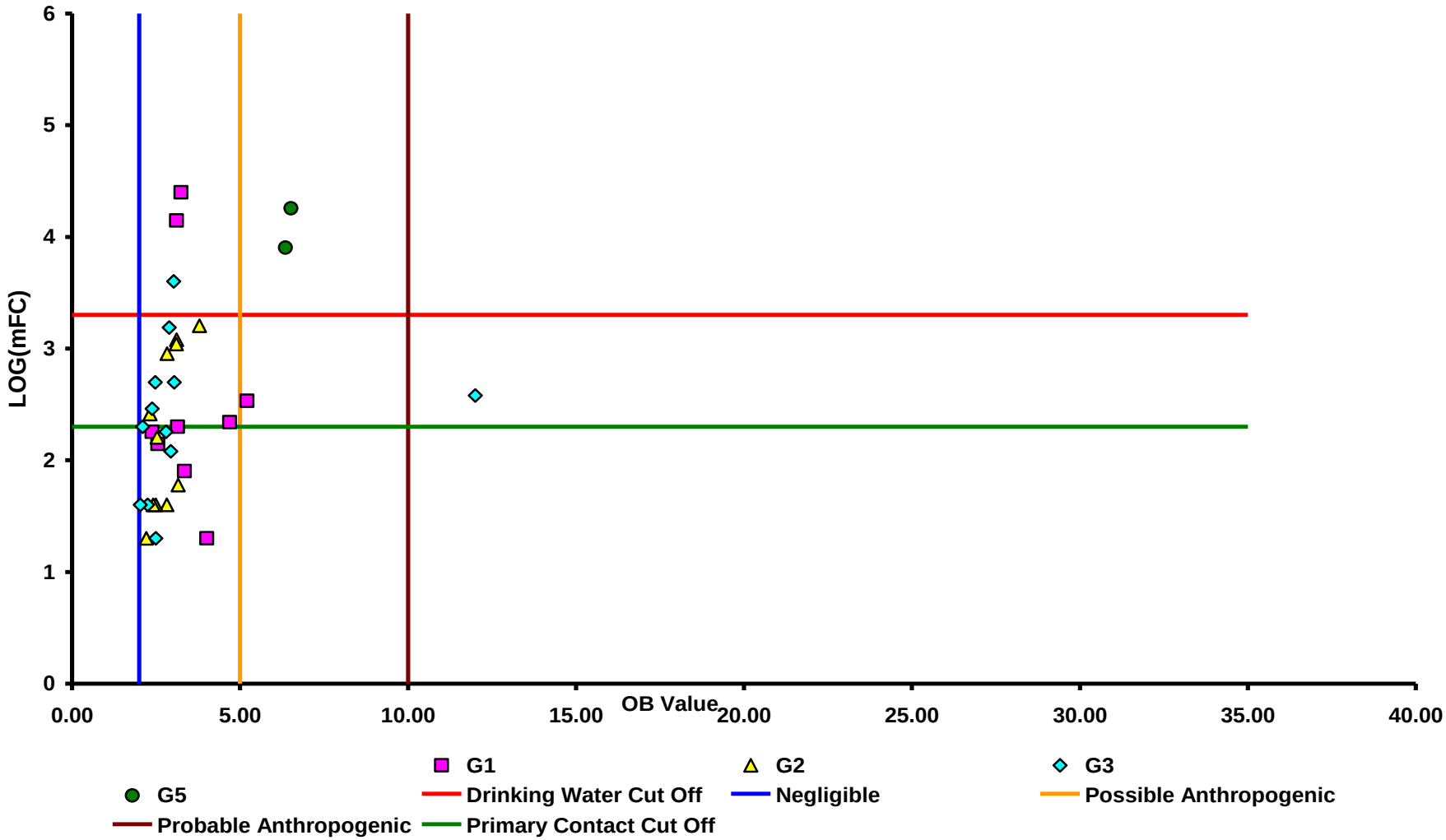


Figure 13. The G Site Cluster –G1, G2, G3, G5 (G4 eliminated; no culverts or ditches on Hwy 1)


G Cluster - LOG mFC CFU/100ml vs. OB Value
LOG(mFC)
OB Value
0
1
2
3
4
5
6
0.00
5.00
10.00
15.00
20.00
25.00
30.00
35.00
40.00
G1
G2
G3
G5
Drinking Water Cut Off
Negligible
Possible Anthropogenic
Probable Anthropogenic
Primary Contact Cut Off

G1 Theriot Canal gate on 40A side

G2 Theriot Canal gate on B. Lafourche side

G3 Bridge at Hwy 1 over Theriot Canal

G5 Culvert at Plaisance Dr., N. Raceland
(Culvert runs under LA Hwy1 to Bayou)

The G cluster is not in the designated LDEQ protection area for the project, but the Theriot Canal does connect the 40 A Canal with Bayou Lafourche. There is a gate in the Theriot Canal (which is the drainage ditch for the Four Point subdivision) to prevent Bayou Lafourche from backing up into the drainage ditch for the canal. This area is under pump to the 40 A Canal.

Site G1 was taken in the Theriot Canal on the 40 Arpent side of the Theriot Canal gate. It only exceed the DWS FC standard 2 times (25,000 and 14,000 FC/100mL) in the sampling period and also exceeded the PCR FC standard 1 times (980 FC/100mL) during the project period. The OB values were all less than 5.00.

Site G2 was taken in the Theriot Canal on the Bayou Lafourche side of the Theriot Canal gate. It only exceed the DWS FC standard 1 time (2,400 FC/100mL) in the sampling period and exceeded the PCR FC standard 4 times (1,600 to 900 FC/100mL) during the project period. The OB values were all less than 5.00.

Site G3 was taken in the middle of the Four Point Bridge over the Theriot Canal on LA Hwy 1. This site only had 1 sample that exceeded the DWS FC standard (4,000 FC/100mL), and 4 samples that exceeded the PCR FC standard (1,545 to 500 FC/100mL). The OB values were all < 5.00.

G4 was eliminated because no culverts were found on LA Hwy1 at the Bayouside from the Four Point Subdivision.

Site G5 is a culvert at Plaisance Dr. in north Raceland which does drain under LA Hwy 1 to Bayou Lafourche. However in 12 sampling trips it only had water twice, but the FC counts were very high when it did have drainage water (18,000 and 8,000 FC/100mL), and the OB values were >5.00 (6.52 and 6.35 respectively).

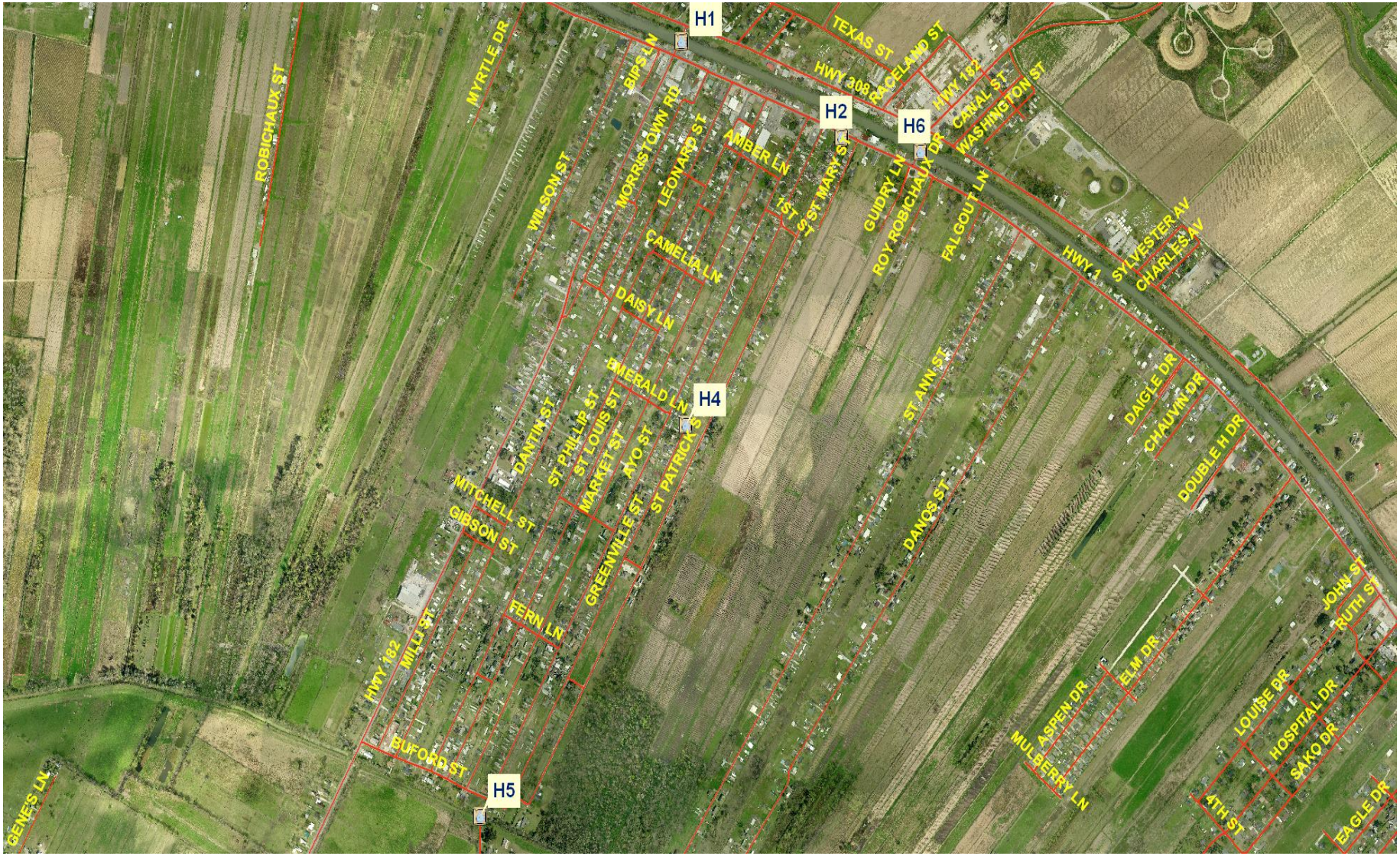
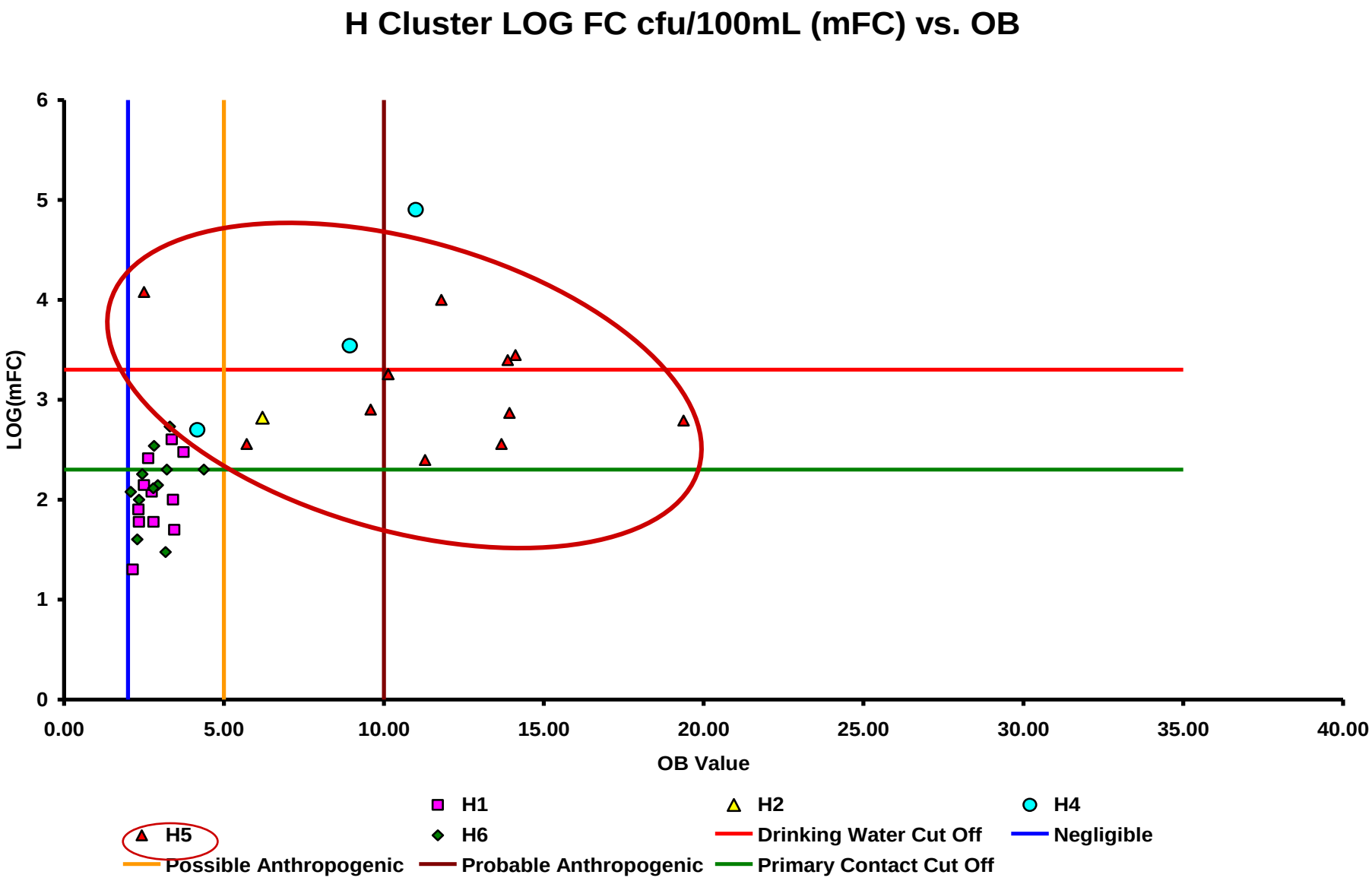
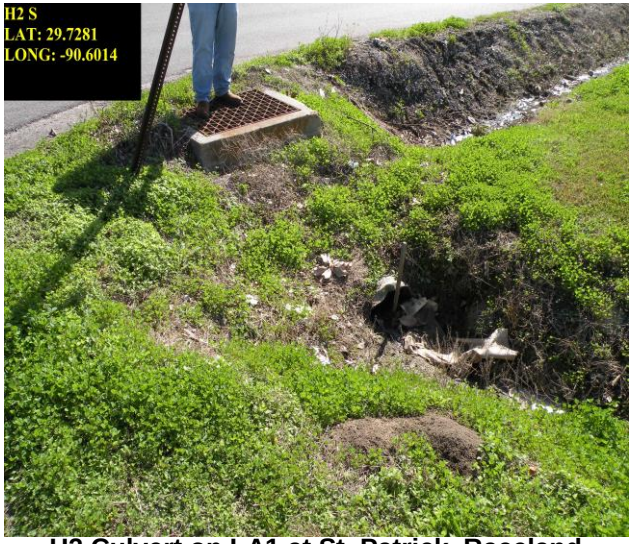


Figure 14. The H Site Cluster –H1, H2, H4, H5, H6 (H3 was eliminated because can't go on private property to find culvert to Bayou.)


H Cluster LOG FC cfu/100mL (mFC) vs. OB
LOG(mFC)
0
1
2
3
4
5
6
0.00
5.00
10.00
15.00
20.00
25.00
30.00
35.00
40.00
OB Value
H1
H2
H4
H5
H6
Drinking Water Cut Off
Negligible
Possible Anthropogenic
Probable Anthropogenic
Primary Contact Cut Off

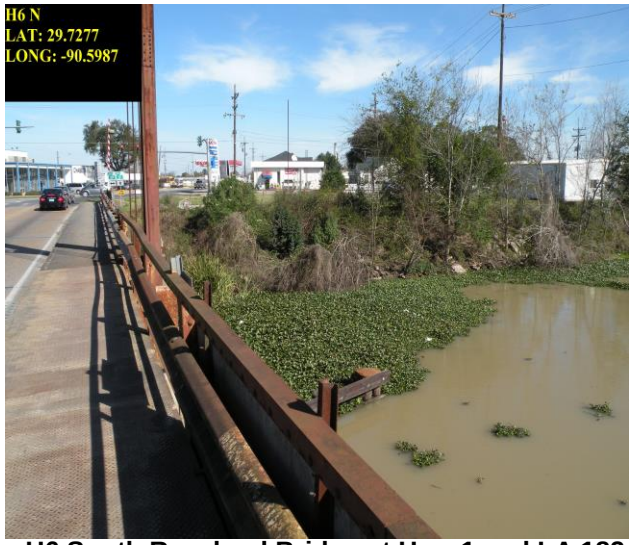
H1 North Raceland Bridge at Hwy 182/LA1



H2 Culvert on LA1 at St. Patrick, Raceland

H4 378 Greenville St. Raceland

*H5 Bridge over 40A at Ayo St., Raceland



H6 South Raceland Bridge at Hwy 1 and LA 182

H6 Virtual Earth Image

The H Cluster of sites includes 3 bridge sites and 2 sites in a very old low income subdivision in Raceland. The homes are old and many are house trailers. It is doubtful that these homes have modern sewage treatment package plants.

Site H1 was taken in the middle of Bayou Lafourche on the north bridge in Raceland at LA Hwy 182 and Hwy 1. Only 1 sample exceeded the DWS FC standard (2,000 FC/100mL) in the entire sampling period, and only 1 sample exceeded the PCR FC standard (400 FC/100mL). None of the OB readings during the entire sampling period was >5.00.

Site H2 was taken from a culvert on the corner of St. Patrick St. and LA Hwy 1 in Raceland. Only 1 sample could be taken during the sampling period because there was never any water in the culvert. This sample exceeded the PCR FC standard (660 FC/100mL with OB of 6.20). None exceeded the DWS FC standard of <2,000 FC/100mL.

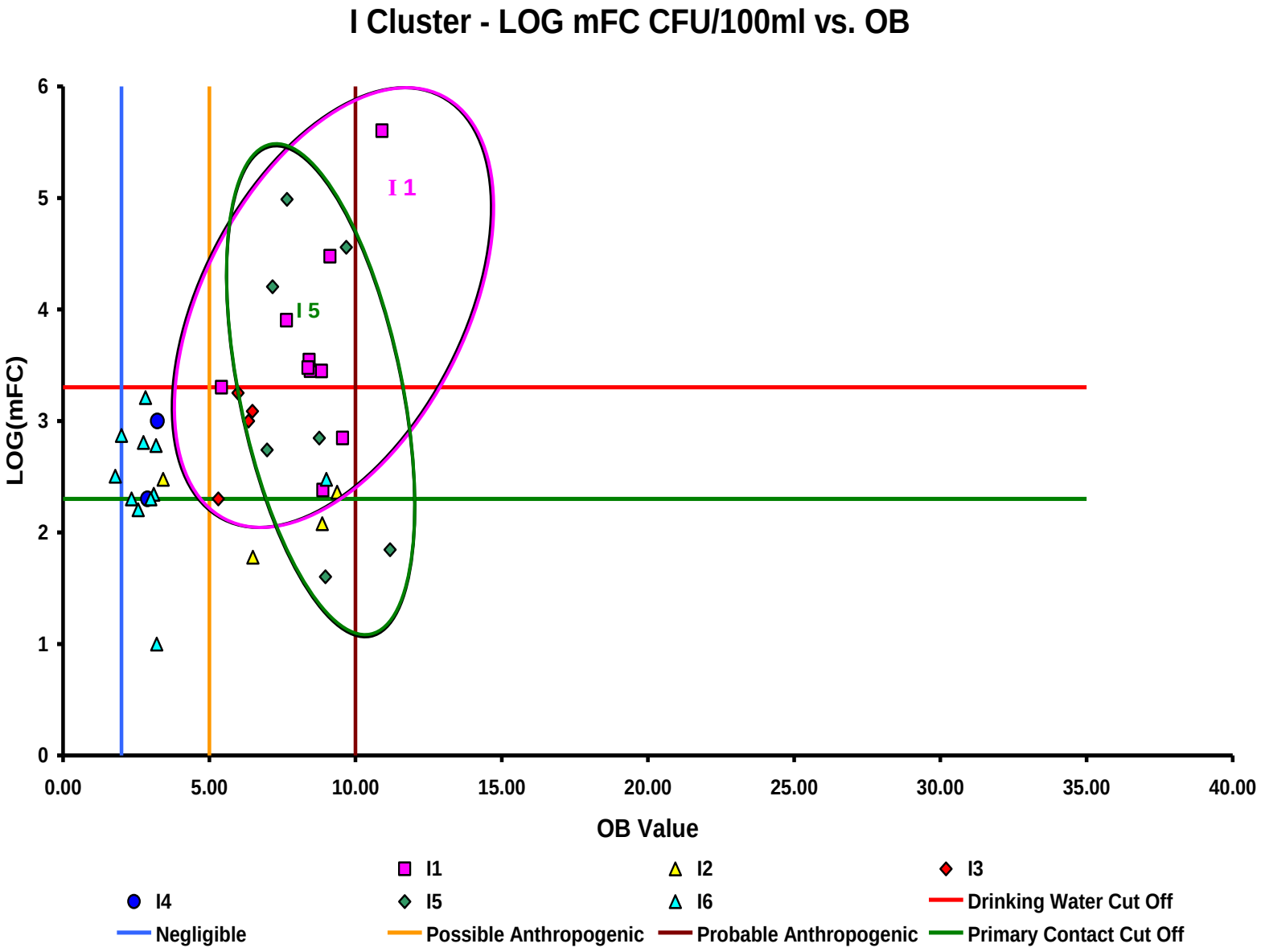
Site H3 was eliminated because we could not go on private property to try to find a culvert behind businesses and houses on the Bayouside.

Site H4 was taken in the drainage ditch in front of a home at 378 Greenville St., Raceland, LA. There was only enough water in the drainage ditch to get 3 samples during the project. Two of these exceeded the DWS FC standard (80,000 FC/100mL and 11.00 OB; and 3,480 FC/100mL with 8.94 OB. One sample exceeded the PCR FC standard (500 FC/100mL with OB 4/16). This ditch does not drain towards Bayou Lafourche. It drains to the back of the subdivision to the 40 Arpent Canal.

***Site H5 was designated as a "hot spot."** It was taken in the middle of the bridge over the 40 Arpent Canal at Ayo St. As mentioned above, this area is in a very low income neighborhood and the Canal is visibly polluted by solid wastes. See picture H5 above. The OB levels were extremely high (> 10.0) and of the 11 samples taken there, 5 of them exceeded the DWS FC designated use standard (18,000 to 2,500 FC/100mL), and 4 samples exceeded the PCR FC standard (1,800 to 620 FC/100mL). This is not a direct impact to the Bayou, but the 40 Arpent Canal does connect back to the Bayou several places and will move with the tide and climate.

Site H6 was taken in the middle of the south Raceland Bridge at LA Hwy 182 and Hwy 1. Only 1 sample exceeded the DWS FC standard (3,400 FC/100mL) and 1 sample exceeded the PCR FC standard (540 FC/100mL). The OB values were all <5.00, so no major anthropogenic input or it was diluted in the Bayou water.

Figure 15. The I Site Cluster – I1, I2, I3, I4, I5, I6


I Cluster - LOG mFC CFU/100ml vs. OB
LOG(mFC)
OB Value
I 1
I 5
0
1
2
3
4
5
6
0.00
5.00
10.00
15.00
20.00
25.00
30.00
35.00
40.00
I1
I2
I3
I4
I5
I6
Drinking Water Cut Off
Negligible
Possible Anthropogenic
Probable Anthropogenic
Primary Contact Cut Off

I2 Catch Basin on Hwy 1 at Acadia Road bayou side in gas station lot

I3 Catch Basin on Hwy 1 at Acadia Road Bank

Virtual Earth Image of I2, I3, and I4 at Hwy 1 and Acadia Road

I4 Culvert on Acadia Drive in Raceland

I5 Culvert at 4926 LA Hwy 1, Mathews

I6 Bridge at Hwy 654 to Gheens (in Mathews)

I1 -40A Canal at Sugarland Country Club

***Site I1 was designated as a "hot spot."** Samples were taken in the middle of the 40 Arpent Canal Bridge at the Sugarland Country Club in Raceland, LA. Of the 11 samples taken during the project period, 10 had FC levels that exceeded the DWS designated use levels (400,000 with OB of 10.91 to 2,800 with OB of 8.84). The OB levels for these 10 samples were all high. (See Table 5.) Only 1 sample exceeded the PCR FC standard (700 FC/100mL with OB 9.56). When collecting at this site, it was observed that containers used to spray the golf course were being washed out with detergent and drained into the 40 Arpent Canal there. It is not known if this is a common practice. Also, with the exception of the first 1 or 2 blocks in the subdivision that surrounds the St. Ann Hospital the rest of the subdivision drains back to the 40 Arpent Canal.

Site I2 was taken at a culvert in a gas station on Hwy 1 on the Bayou side across from Acadia Rd. in Raceland. Although none of the 4 samples that could be taken because there was water in the culvert did not even exceed the PCR FC standard, 3 of the OB values were >5.00 (9.37 to 6.49).

Site I3 was taken in a drainage culvert on LA Hwy1 at a Bank on Acadia Road, Raceland, LA. Of the only 4 samples that had enough water for sampling during the Project period, none exceeded the DWS FC standard, but 3 of the 4 samples exceeded the PCR FC standard (1,780 to 1,000 FC/100mL). All 4 of the OB values for the 4 samples were >5.00.

Site I4 was a drainage culvert in a covered ditch on Acadia Rd. in Raceland. Only 1 sample could be taken at this site during the Project period because of lack of water in the culvert. That sample exceeded the PCR FC standard (1,000 FC/100mL), but only had an OB reading of 3.23.

Site I5 was designated as "hot spot." It was taken in a culvert in an open ditch at 4926 in Mathews that drained all of the buildings along LA Hwy 1 in that area and it always had extremely high FC and OB levels when there was water in the culvert. Three of the 7 samples taken at this site exceeded the DWS FC standard (97,272 to 16,000 FC/100mL. Two of the samples exceeded the PCR FC standard (700 to 550 FC/100mL) All of the OB readings for the 7 samples were > 5.00 (11.18 to 6.98). There was no water in the culvert for 6 sampling periods. Package plant effluent pipes were seen draining directly into the ditch also. This drainage ditch probably drains into the Bayou, but it could not be tracked through private bayouside property.

Site I6 was taken in the middle of the Hwy 654 to Gheens Bridge over Bayou Lafourche. None of the samples at this site exceeded the DWS FC standard. Five out of 12 samples exceeded the PCR FC standard (1,621 to 600 FC/100mL). Only 1 of the 12 samples had an OB >5.00 (9.00).

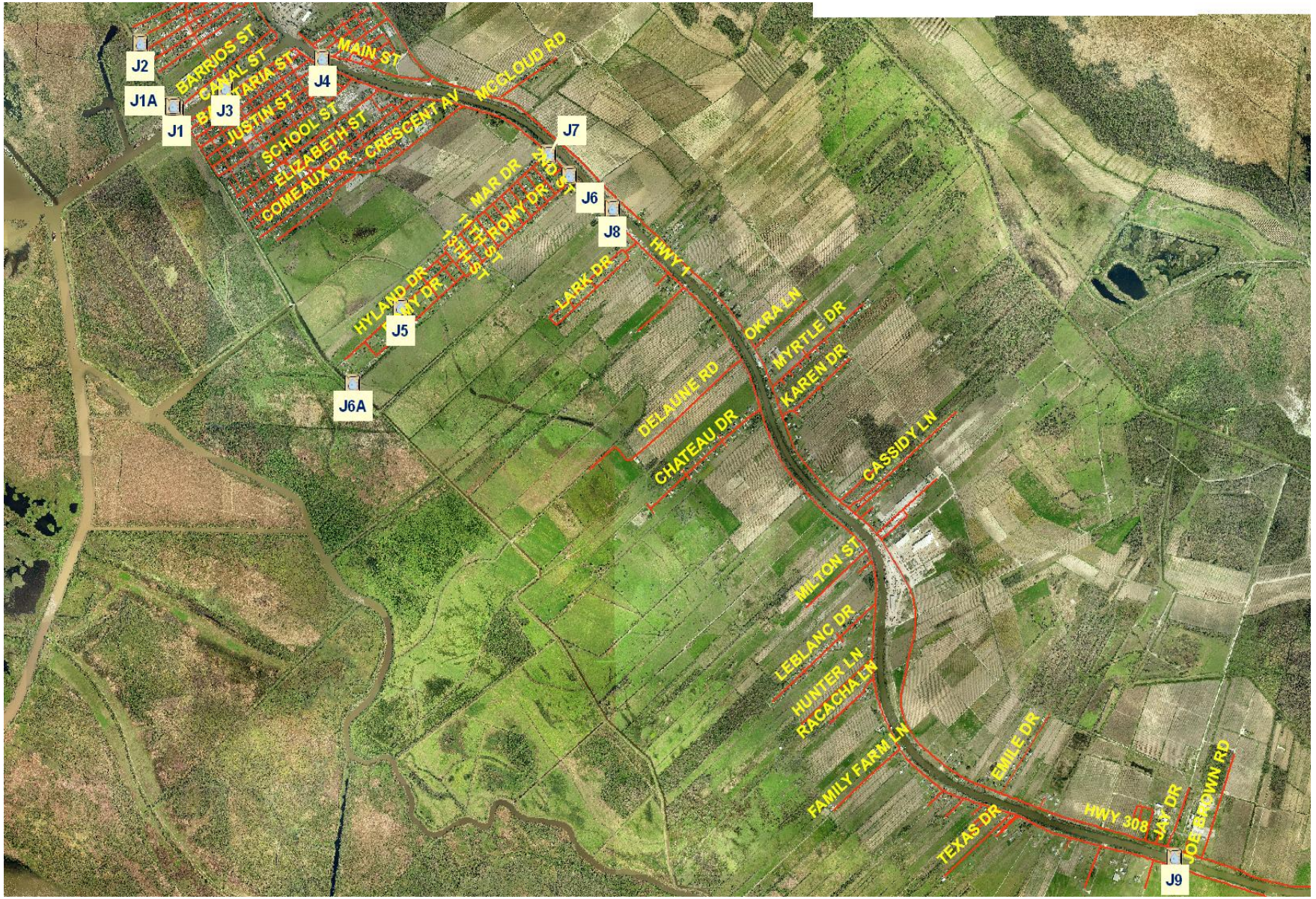
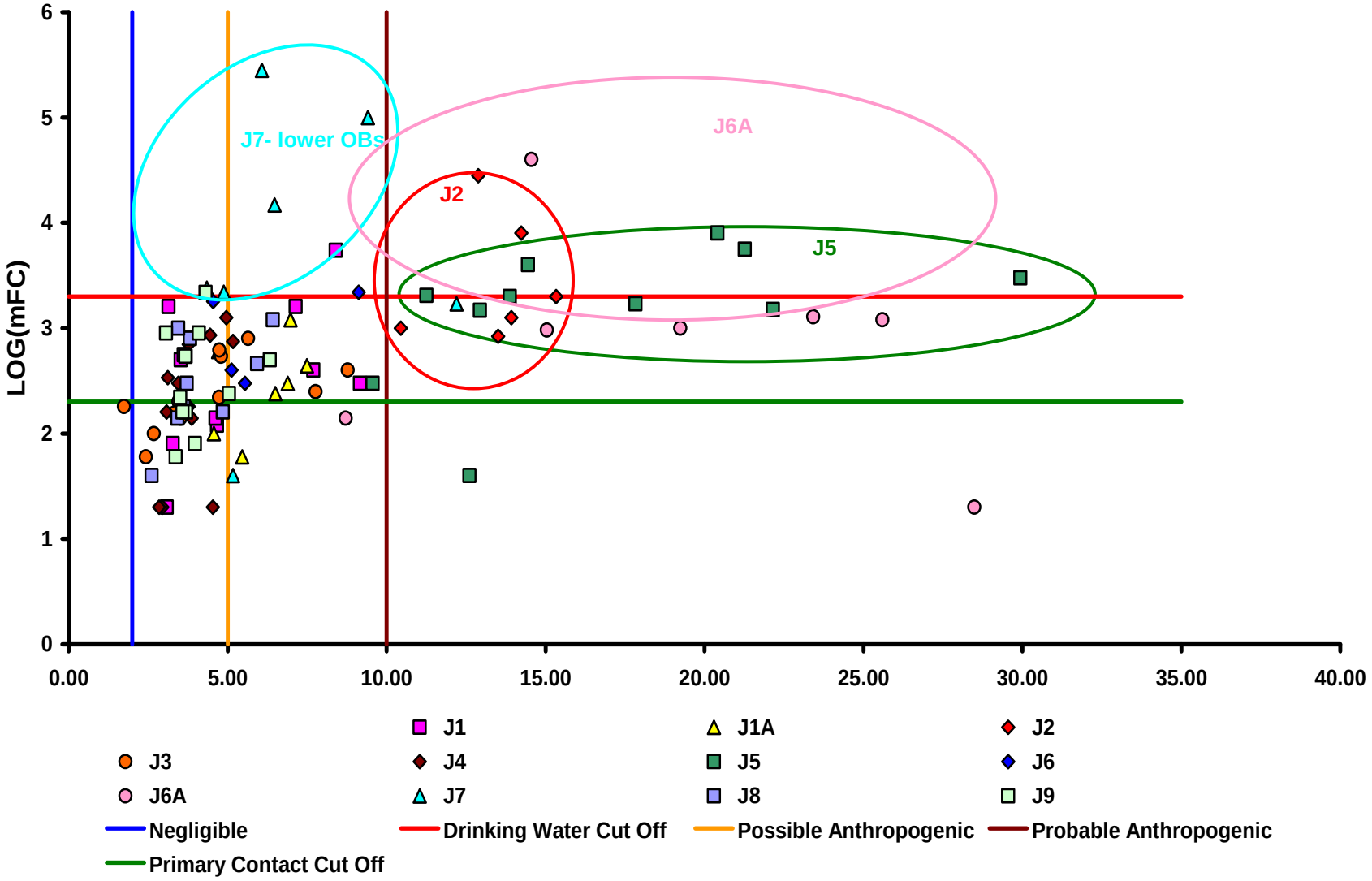


Figure 16. The J Site Cluster – J1, J1a, J2, J3, J4, J5, J6, J6a, J7, J8, J9


J Cluster - LOG mFC CFU/100ml vs. OB Value
LOG(mFC)
0
1
2
3
4
5
6
0.00
5.00
10.00
15.00
20.00
25.00
30.00
35.00
40.00
J7- lower OBs
J6A
J2
J5
J1
J1A
J2
J3
J4
J5
J6
J6A
J7
J8
J9
Negligible
Drinking Water Cut Off
Possible Anthropogenic
Probable Anthropogenic
Primary Contact Cut Off

Lockport Heights sites in the J Cluster (not incorporated in the City Sewage) Company Canal has direct impact to Bayou Lafourche and to the upstream Lafourche Parish Water District No. 1 Plant on Hwy 308 at Clotilda, LA

J1 40 A Canal pump to Company Canal, Lockport side

J1A 40A Canal pump to Company Canal on 40A side of pump

J1 & J1A - Virtual Earth Image of pump station at the 40 A Canal to the Company Canal, Lockport

Site J1 is in the 40 Arpent Canal pump station on the Company Canal south side in Lockport, LA. This site had only 2 FC samples in sampling period that exceeded the DWS FC standard (120,000 FC/100mL -OB only 3.83; and 5,500 FC/100mL – OB 8.40). However this site exceeded the PCR FC standards 8 times in the sampling period (1,600 to 400 FC/100mL – OB from 7.70 to 3.14).

Site J1A is in the 40A Canal on the north side of the pump before being pumped into the Company Canal. This site had only 1 sample that exceeded the DWS FC standard (6,000 with OB of 5.91). It only exceeded the PRC FC standard 3 times in the sampling period (1,200 to 440 FC/100mL). There is wildlife and some cattle in this area, so this is a mixed site. However in the photodecay study, the J1A site had the highest % reduction (12.96%) with an OB reading of only 5.91 using UV 365 nm photodecay for 5 minutes according to the method of Hartel et al. 2006 (See Table 6 .).

***J2 -Large cement ditch draining all of Lockport Heights which is not on city sewerage into the 40A canal "Hot Spot"**

J2- Virtual Earth Image of Lockport Heights drainage ditch into the 40 Arpent Canal

***Site J2 was designated as a "hot spot."** This site in the J cluster was one of the most consistently high sites in OBs and FCs and is very important because it drains the area of Lockport that is north of the Company Canal, and that area is not incorporated in the City sewage system. Site J2 exceeded the DWS FC standard 4 times in 6 sampling periods (120,000 FC/100mL and 13.39 OB to 2,000 FC/100mL and 15.33 OB). It also exceeded the PCR FC standard 3 times in 6 sampling periods (1,260 FC/100mL and 13.92 OB to 840 FC/100mL and 13.61 OB).

Site J2 is a very large cement ditch that drains all of Lockport Heights on the north side of Lockport. This large drainage ditch empties into the 40 Arpent Canal that is force pumped into the Company Canal. It is not far from where the Company Canal empties into Bayou Lafourche just south of the Lafourche Parish Water Plant intake on Hwy 308 at Clotilda. The 40 Arpent Canal originates in Peltier Park in Thibodaux where it drains the storm water from the south side of the City of Thibodaux and then flows under the Nicholls State University campus to emerge on Bowie Road on the south side of the campus. It winds through the sugarcane fields there and around the back of the Country Club. It flows all the way to the Intracoastal Water Way Canal (IWWC) in Larose and emerges on the other side of the IWWC to end in the marsh area behind Golden Meadow. The significance of the 40 A Canal is that several other canals transect from the 40 A Canal back to B. Lafourche and this is a source of the potential fecal coliforms from malfunctioning package plants from the dwellings from the roadside all the way to the 40 A Canal. The entire B. Lafourche drainage basin is tidal from the weir in downtown Thibodaux to the Gulf of Mexico, so drainage from the 40 A Canal can be pushed back into the Bayou in several areas. The most significant is the Company Canal in Lockport which spans B. Lafourche, the ICWW and ends at Bayou Terrebonne in Berg to the south and goes through Lake Salvador all the way into New Orleans to the

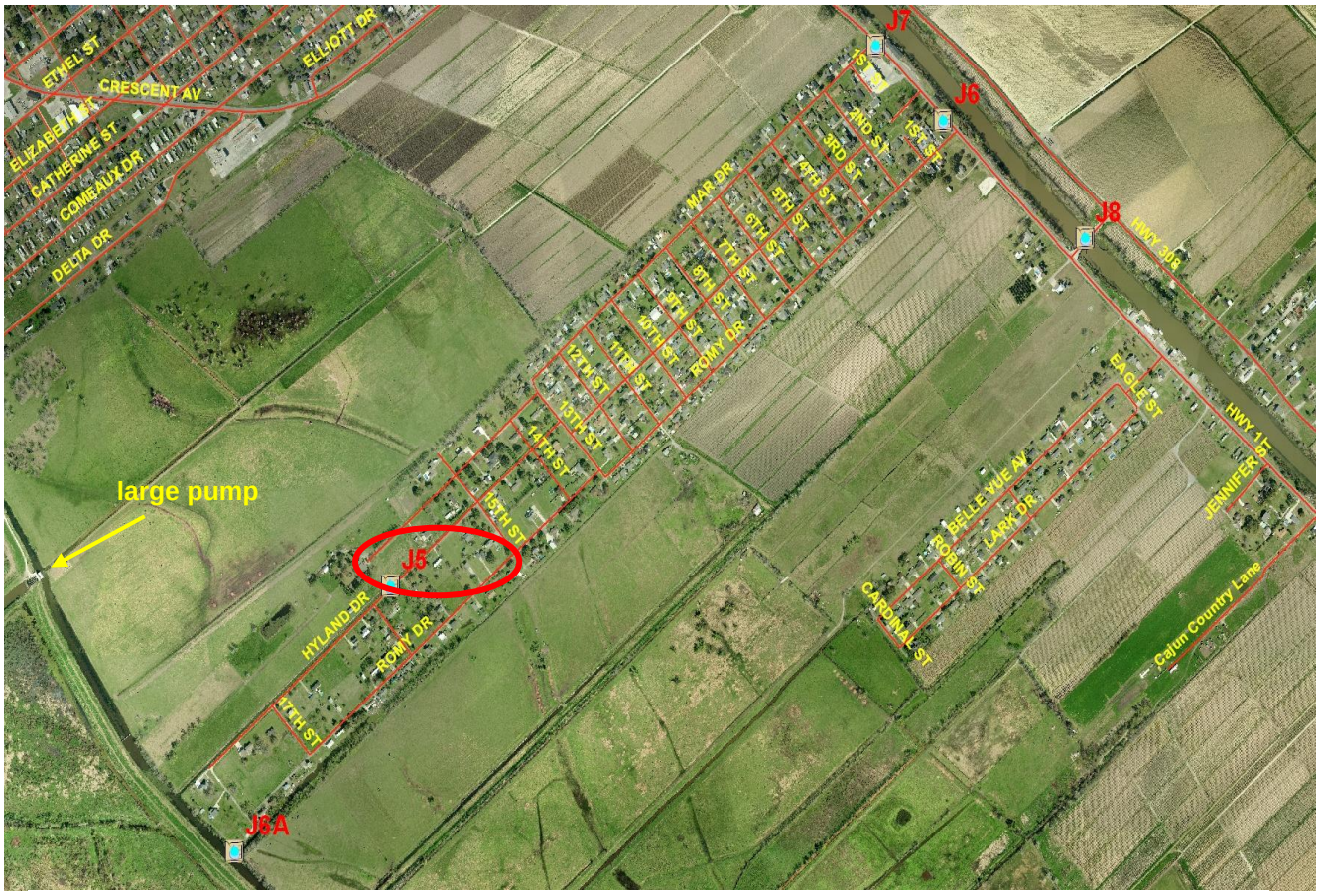
North. It also brings in salt water from the ICWW into B. Lafourche less than 2 miles downstream of the Lafourche Parish Water Treatment Plant intake pumps on Hwy 308 in Clotilda.

J3 -Bridge over Company Canal, Lockport

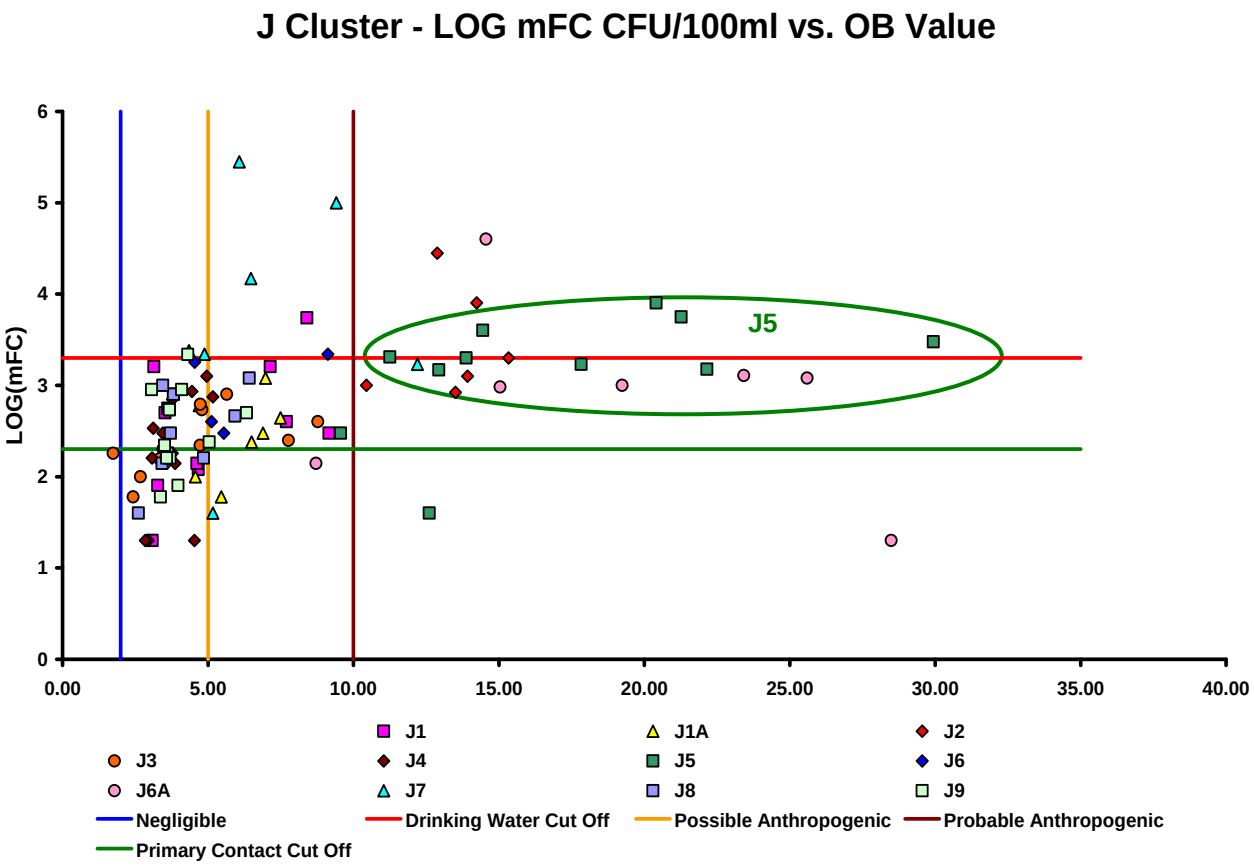
J4 -Bridge over B. Laf, at Vacherie St, Lkpt.

Site J3 was taken in the middle of the Company Canal Bridge in Lockport, LA. This site never exceeded the DWS FC standard in 13 samplings. It did exceed the PCR FC standard in 5 of the 13 sampling periods. These samples ranged from 1,200 FC/100mL (3.34 OB) to 400 FC/100mL (8.78 OB). This site is often used for boating and for water skiing, so it must meet the PCR FC designated us standard of <400 FC cfu/100mL in summer months. The 1,200 FC/100 ml sample was taken in August of 2009.

Site J4 was taken in the middle of the Vachrie St. Bridge over Bayou Lafourche in Lockport. Like Site J3, it never exceeded the DWS FC standard in 13 sampling dates. It did exceed the PRC FC standard in 5 of the 13 sampling periods. These samples ranged from 1,500 FC/100mL (2.45 OB) to 700 FC/100mL (3.78 OB). None of the OB readings for this site were > 5.00, so major human input is not indicated. This area is in the City Sewerage district, so the input is mainly storm water runoff.



J Cluster sites J5, J6, J6A, J7 and J8 in the Mar, Romy Subdivision south of Lockport, LA



***J5 Culvert under Hyland Drive drainage canal flows back toward the 40A Canal ("Hot Spot")**

J6 Culvert between Romy & Mar, Hwy 1, south Lockport

***Site J5 was designated as the number one "hot spot"** of all 54 sites in the project. Seven of 12 total samples exceeded the DWS FC standard with very high FC counts and double digit OB readings. The FC counts ranged from 190,000 FC/200mL (OB of 15.57) to 2,000 FC/100mL (OB of 14.45). The OB readings ranged from a high of 29.94 (3,000 FC/100mL) to 9.57 (300 FC/200mL).

This sample was taken from a large culvert that is one of the main drains for all but the first block of two of the Romy to Mar subdivision south of the City of Lockport. The sample was taken directly from the culvert so that it would not be diluted in the drainage canal and mixed with cattle runoff from the adjacent pasture. This is an old subdivision, but also has new large homes. However it was prone to flooding, so very large drainage ditches were constructed starting from about 13th St. in the middle of the subdivision and draining to the back 40 Arpent Canal. This subdivision is separated from the town of Lockport and adjacent developments by cattle pastures. These also drain back to the 40 Arpent Canal to the rear of the subdivision. This site is a human site.

Site J6 was taken at the culvert draining the ditch along LA Hwy 1. This culvert goes under Hwy 1 and drains directly into Bayou Lafourche on the other side of the Hwy. The first 2 or 3 blocks of the Romy – Mar subdivision drains mainly towards the front and to the culverts that drain under the highway into the Bayou. This is a very good site, but it drains very quickly and dries up, so on 12 sampling trips only 3 samples were collected because the culvert was dry the rest of the year. Of the 3 samples collected, only 2 exceeded the PCR FC standard with counts of 1,800 FC/100mL (4.54 OB) and 400 FC/100mL (5.12 OB). This site is human.

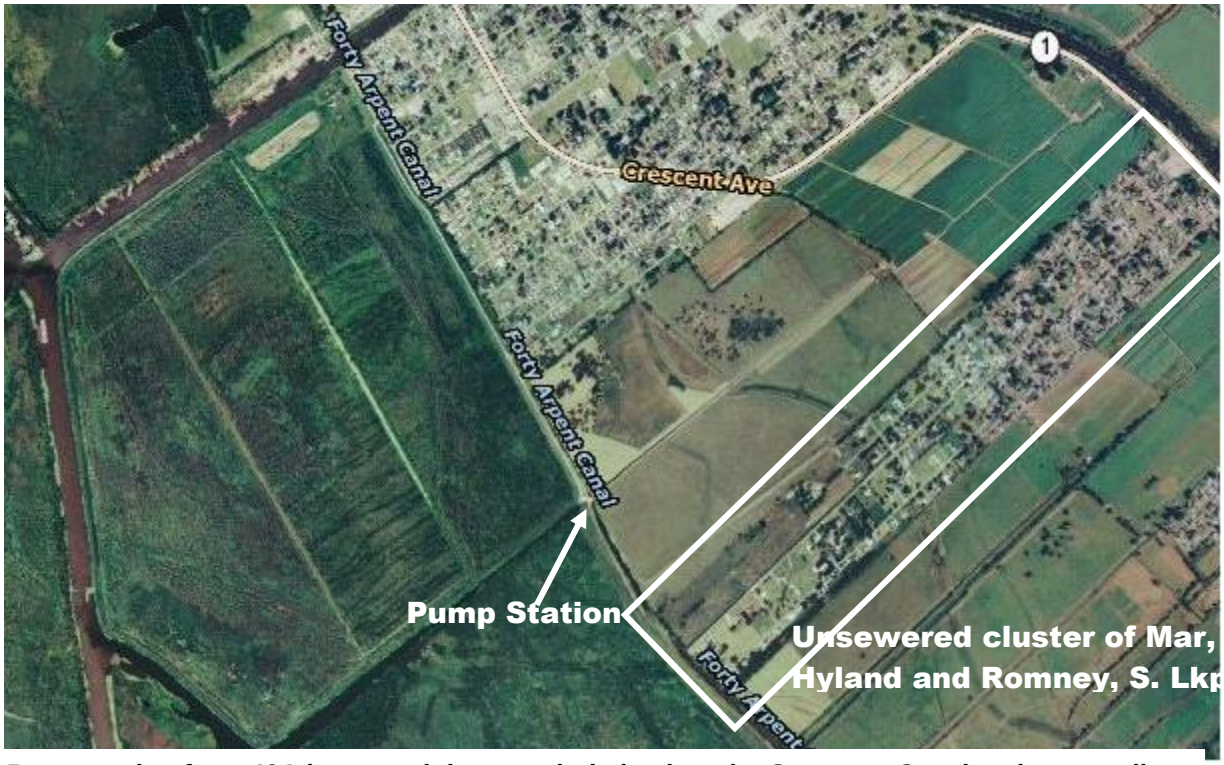
***Site J6A was designated as a "Hot Spot."** The sample was taken where the Romy St. drainage ditch empties into the 40 Arpent Canal at the rear of the subdivision. The 2 large drainage canals on Hyland and Romy drain into the 40 Arpent Canal. This is a mixed site because the pasture land adjacent to the subdivision on the Lockport north side has a very large pump that force drains all of the area into the 40 Arpent canal; and the drainage ditches on Romy and Mar are bounded by cattle pastures. Of the 7 samples taken at this site during the sampling period only 2 exceeded the DWS FC standard, but the counts were exceedingly high (130,000 FC/100ml with OB 8.25; and 40,000 FC/100mL with OB of 8.25). Four of the samples exceeded the PCR FC standard (1,280 with OB of 23.42 to 960 FC/100mL with OB of 15.04). This is a mixed human and animal site.

Site J5: Culvert effluent under Hyland Drive draining rear of old subdivision South of Lockport – boundary of the subdivision on south side and has pasture land in area. Large ditch drains to 40 Arpent Canal to rear.

***J6A 40A Canal at end of Romy, S. Lockport ("Hot Spot")**

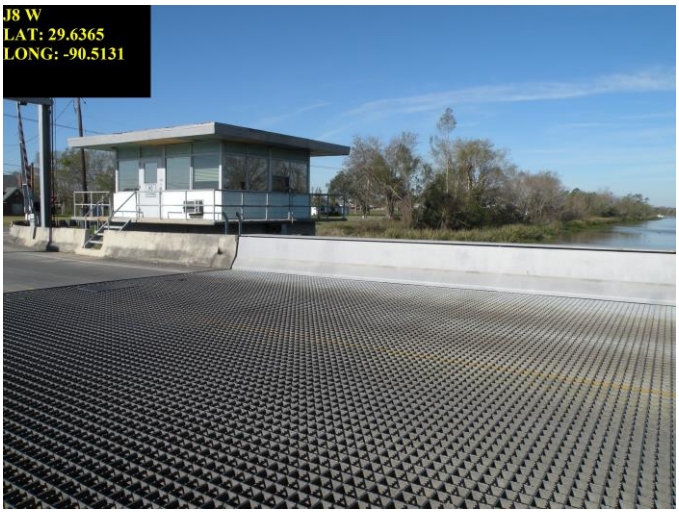
***J7 Culvert from Hwy 1 to B. Lafourche at Frank's Store parking lot, Lockport ("Hot Spot")**

Site J7 was designated a "hot spot." This sample site was at a culvert on LA Hwy 1 at the front of the Frank's Store parking lot. This culvert drained under LA Hwy 1 and drained directly into Bayou Lafourche. Of the 8 samples taken during the sampling period, 6 exceeded the DWS FC standard (280,000 FC/100mL with OB of 6.07 to 2,200 FC/100mL with OB of 4.88. The one sample that only exceeded the PCR FC standard had only 1,700 FC/100ml but with an OB of 12.20. This is a human site.

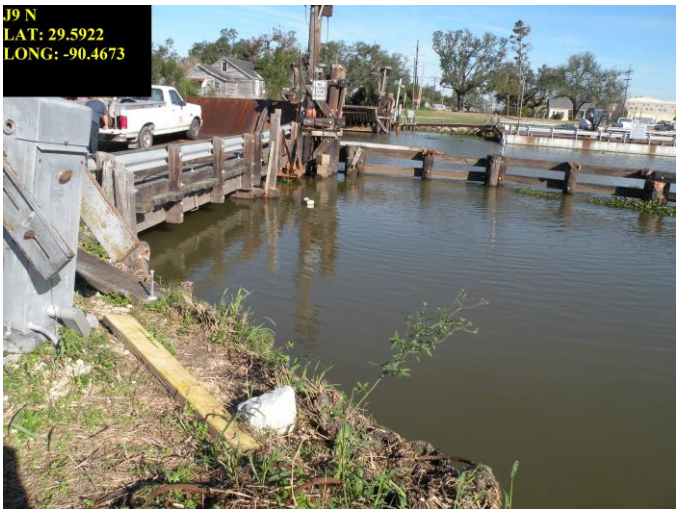


Pump station from 40A into canal that can drain back to the Company Canal and eventually to B. Lafourche south of the Mathews South Water District No. 1 Plant on Hwy 308.

This very large forced drainage pump in the 40 Arpent Canal drains all of the pasture land adjacent to the Mar – Romy subdivision south of Lockport, and any drainage from the subdivision also. This pump drains this entire area into a canal that connects back to the Lockport Company Canal, which can directly impact Bayou Lafourche.



J8 Bridge over B. Laf at Bollinger Belleview



J9 Bridge over B. Lafourche at Valentine

Site J8 was taken in the middle of the Bollinger Belleview Bridge over Bayou Lafourche south of the Mar-Romy subdivision. Of the 12 samplings during the collection year, none exceeded the DWS FC standard. However 7 of the 12 samples exceeded the PCR FC standard of 400 FC/100mL. These ranged from 1,200 FC/100mL with 6.42 OB to 460 FC/100mL with 5.93 OB. The Bayou is impacted at this site from the culverts draining into the Bayou from the Mar-Romy subdivision north of the Bridge. The Bayou has been used for water skiing in the summer months and will have to meet this designated use standard at that time. The July 2008 and August 2009 samples did not meet the PCR FC designated use standard.

Site J9 was taken in the middle of the Valentine Pontoon Bridge over Bayou Lafourche south of the Bollinger Belleview Bridge. This site was not in Protection Area 2, but it was added to help determine if sources this far south of Lockport and the Lafourche Parish Water Plant intake pump at Clotilda had a source of high human fecal coliforms. Of the 13 samples taken in the sampling year, only 1 sample exceeded the DWS FC standard (2,182 FC/100mL with OB of 4.31). However, 6 of the 13 samples exceeded the PCR FC standard. They ranged from 1,800 FC/100 mL with 3.24 OB to 500 FC/100mL with 6.33 OB). Only one OB reading was > 5.00, and it did not exceed the PCR designated standard. This site does not seem to be a major threat to the Lafourche Parish District 2 drinking water intake at Clotilda, LA.

It is obvious that the subdivision in the J Cluster (J1-J9) of sites below Lockport drains both toward Bayou Lafourche and back to the 40 arpent canal is the site cluster that is most significant for contributing human fecal coliform contamination into the drainage areas that can enter Bayou Lafourche potentially through the Company Canal depending on the weather and tides. This “J” cluster is seen in its maps above. The subdivision of Mar, Romy and Hyland streets partially drains to culverts along Hwy 1 and then the culverts drain under Hwy 1 into Bayou Lafourche. Large drainage canals on each side of this development start in the middle of the subdivision and drain that section back to the 40 Arpent Canal. However, the 40 Arpent Canal is connected by a smaller canal back to the Company Canal as seen in the picture of this site below. The Company Canal can drain back to Bayou Lafourche just below the Lafourche Main Water Plant intake at Clotilda on Hwy 308. See picture below.

Virtual Earth Image of the Company Canal and its Direct Impact on Bayou Lafourche and the Lafourche Parish Water District No. 1 at Clotilda

Overall, Bayou Lafourche is riverine from the Mississippi River pump in Donaldsonville to the weir in front of the City of Thibodaux Drinking Water Treatment Plant intake pump. From the weir to the Gulf of Mexico, the Bayou is tidal and its drainage and flow depends on many factors including rain, wind, tides and extreme weather such as hurricanes. The main drainage collection site for homes and businesses in this study area is the 40 Arpent Canal which originates in Peltier Park in Thibodaux and dissipates into the marsh land behind Golden Meadow, LA. Many areas are force drained by pumps to that Canal.

However, there are 3 main drainage canals that directly connect the collecting 40 Arpent Canal back to Bayou Lafourche. In sequence from north to south in the project sampling area these include:
1) The Dugas Canal near Ronald Adams Construction Company south of Thibodaux
2) The Lefort Canal with the Terrebonne Water Treatment Plant intake Pump at the 40 A Canal
3) The Theriot Canal at the Four Point Subdivision north of Raceland
4) *The Company Canal in Lockport (has the greatest potential impact to Bayou Lafourche)

Additionally all of the homes and businesses that are on the batture of Bayou Lafourche itself have sewage package plants that empty directly into the Bayou. Because of the large number of homes, businesses, and industry directly on the Bayou side, it would be an enormous undertaking to evaluate each one for potentially faulty package sewage treatment plants. Additionally, considering the age of many of the homes especially, a large number of them probably only have very old septic tank systems and have no large area for drain fields. These dwellings and businesses directly impact the Bayou on both sides, and would eventually have to be evaluated for remediation to realistically be able to reach the 45% reduction of fecal coliforms TMDL for Bayou Lafourche that has been designated by EPA (2004).

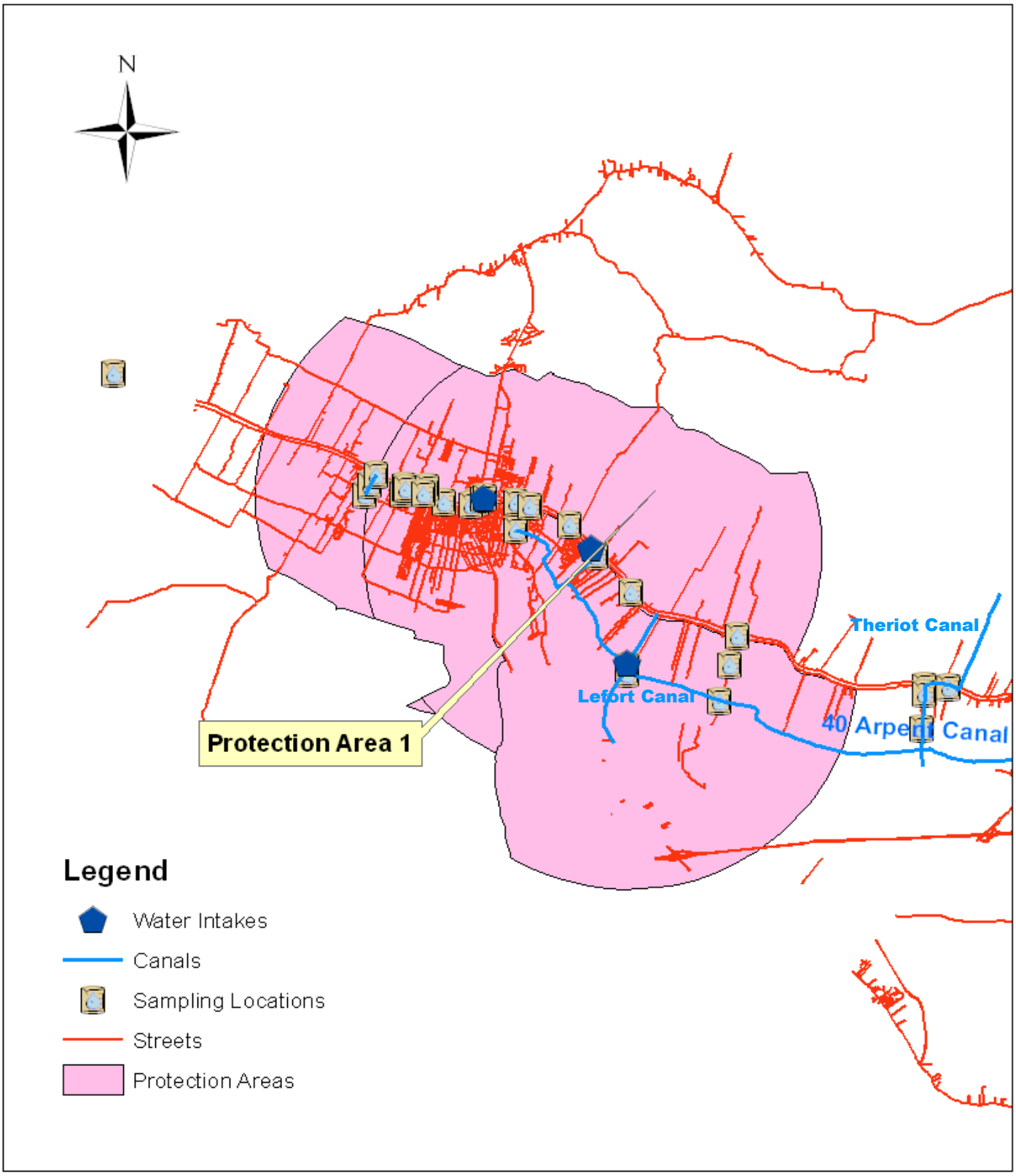


Figure 17. Protection area 1 canals

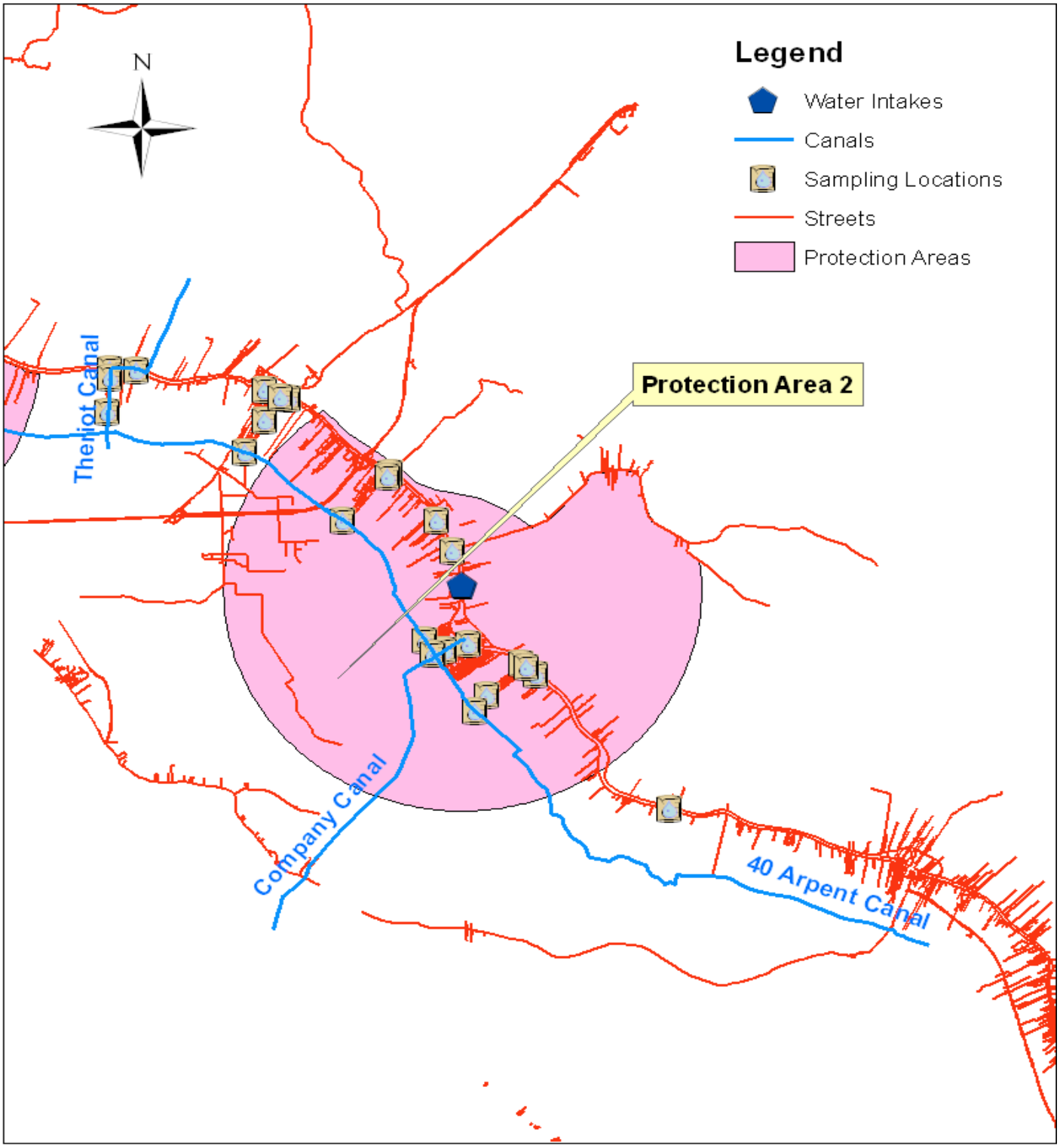


Figure 18. Protection area 2 canals

3.2 Summary of Results in the Goal to Identify the Sources of Fecal Coliforms to Bayou Lafourche from human sources.

The main "hot spots" of consistently high fecal coliforms and high OBs indicating anthropogenic sources and direct or indirect impact to Bayou Lafourche include:

See Table 5 and the Cluster scatter graphs to look at the actual levels of FC and OBs for these sites.

1)*J5 – Culvert draining from under Hyland Dr. south of Lockport
***(consistently highest FC and OBs - human input**)

2) *J2 – Drainage ditch for Lockport Heights that drains to 40 Arpent Canal and pumped into Company Canal. (**human input**)

3) J7 – Culvert at Hwy 1 Frank's Store at Mar Dr. – drains to B. Lafourche under Hwy 1.
(**from front of subdivision – human input and direct impact to B. Lafourche**)

4) E5 – Culvert draining front of old subdivision and houses along Bayou side directly to B. Lafourche on Hwy 1 Bayouside at 1265 LA1.
(Drains directly into B. Lafourche – human input)

5) C1 – Abby Canal draining under Hwy 308 into B. Lafourche
(Drains directly into B. Lafourche – human input)

6) J6A – 40 Arpent Canal at back of Hyland-Romy-Mar
(mixed animal and human input; drains back to Company Canal and to B. Lafourche)

7) B2 – Degravel Canal at LA Hwy 1 before passing under LA 1 to drain into B. Lafourche through B4. Six samples very high FC, but OBs not very high. Same profile as B4 –
(**human and animal mixed site, or OBs decay or absorbed in Degravel Canal)**

8) B4 – Degravel Canal at the Bayou side – **direct impact to B. Lafourche**
(Very high FC, but low OBs – may be mixed site with a lot of dilution in the Canal and in a wooded agricultural area on one side and a subdivision on the other)

9) H5 – Bridge over the 40 Arpent Canal at Ayo St. in Raceland
(Very high FC and OBs – mainly human input from the subdivision that drains into it, but also may have some animal input because the other side of the 40 Arpent Canal has some farming areas.)

10) I1 – Bridge over the 40 Arpent Canal at the Sugarland Country Club in Raceland
(Very high FC - 10/12 samples exceeded DWS; and high OBs – mainly human input)
Subdivision drains to 40 Arpent from front and golf course at Country Club on the back side of the Canal. Spray cans for the gulf course may be routinely washed out into the Canal.)

11) I5 – Culvert at 4962 Hwy 1 in Mathews that drains under Hwy1 directly into Bayou Lafourche
(Very high FC and OB – mainly human input from drainage ditch draining all the houses and businesses along Hwy 1 at the site)

Two of the sites had high FC levels and low OBs indicating that the FCs were mainly from animal sources. These two sites had a large number of ducks on site.

1) D2 – The Jean Lafitte National Park and Library dock and walk way on the Bayou side
This site had high FC counts that exceeded the DWS designated use standard of 2,000 FC cfu/100 mL and the OB levels were low. There are many semi-wild ducks that nest on the grounds and under the dock. **This is an animal input site.**

2) D4 – A culvert draining directly into the Bayou at a site adjacent to a car wash and the Thibodaux Water Plant Intake pump. There are also many semi-domestic "wild" ducks at this site also. This is an **animal input site**, but the culvert drains storm water from commercial and residential buildings in that area.

The cleanest site was the site with very low (non-detectable) FC levels and OB values that did not indicate any OB input.

1) C5 - The lake in "The Lakes" new luxury home development on LA Hwy 308 next to the Abby Road subdivision which is also mainly a luxury home site, yet is contributing high FC and OB to B. Lafourche in its main drainage canal.
The Lakes development has an oxidation pond which is apparently very effective. The lake is extremely pristine thus far.
This is the site with consistently low FCs and low OBs: (Best scenario – cleanest sites)

2) C6 - The drainage canal at the control gate of the lake in "The Lakes" development also has very low FC counts and OB values.

NOTE: Since it was not part of the QAPP or SOPs, the use of a handheld Turner fluorometer to get optical brightener readings was only for the purpose of obtaining a rough indicator of anthropogenic input. This study was not designed or funded at a level to include major photo inactivation studies on the significance of fluorometer OB readings at different sites. However, we did use the method of Hartel et al., 2006 to produce our Standard OB solution of 50mL/L 2X liquid Tide Detergent (Fresh Spring) and set the fluorometer to 100 fluorescent units. We did a small photo inactivation study on our J cluster because it consistently had the highest fecal coliform numbers and some of the sites within the J cluster had consistently high OB readings (10 or >). Hartel did photo inactivation studies with natural organic matter from the Suwannee River and the Nordic Reservoir using 5 minutes of inactivation with a 365 nm ultra violet (UV) Black-Ray. His highest % reduction using the handheld Turner fluorometer was 13.6%. We got comparable % reductions using this method with our J cluster. The three sites that had the highest levels of FCs and OBs had average (mean of duplicates) 12.9 % reduction (Lafo-J9A), 11.44 % reduction (Lafo-J2), and 10.69% reduction (Lafo-J5).

Overall, those sites that were deemed human sites by sanitary survey of sources generally had the higher OB readings (10 or more). Those sites that had animal impact with high FCs had generally low OB readings (under 4). Some sites had mixed input (Site Lafo-J6A).

For our proposed second study in Bayou Lafourche, we will have funding to evaluate the photodecay at all of the sites. We will have to consider the work of Gao et al. 2009, who just published a study recommending a different protocol than Hartel et al. 2006.

Table 6. below shows the results of some of the J cluster samples results from our preliminary study on photodecay of environmental water samples with fecal coliform input. However it is very important to remember that there is no standard method of quantitatively evaluating levels of OBs from anthropogenic sources because there are too many detergents with varying and unknown amounts of OBs. It was only used as a rough indicator as correlated to fecal coliform numbers.

Table 6. Preliminary Optical Brightener UV Degradation Study of the J Cluster site

Preliminary Optical Brightener UV Degradation Study (Sam Wise) OB STANDARD =50µL/L in DI of 2X Tide liquid Fresh Spring -originally set to 100 calibration (degraded) 5 min UV with BLACKRAY (336nm) on plate spreading wheel (polymethacrylate cuvettes)							
					% Reduction in OBs after 5 min. UV w Black Ray 336nm		
Sample ID	**PRE 1**	**PRE 2**	**POST 1**	**POST 2**	**1.00**	**2.00**	**AVG**
DI water control	0.00	0.00	0.00	0.00			
***OB STANDARD**	77.13	76.89	51.73	50.34	**32.93**	**34.53**	**33.73**
J1	3.829	3.794	3.52	3.506	8.07	7.59	7.83
J1A (South Lkpt Hght side of pump in 40A Canal	5.914	5.891	5.153	5.122	**12.87**	**13.05**	**12.96**
***J2 (Large cement ditch draining Lkpt. Heights)**	13.39	13.27	11.83	11.78	**11.65**	**11.23**	**11.44**
J3	3.343	3.282	3.084	3.071	7.75	6.43	7.09
J4	2.453	2.451	2.247	2.226	8.40	9.18	8.79
***J5 (Culvert at Hyland Dr)**	15.57	15.48	13.9	13.83	**10.73**	**10.66**	**10.69**
J6A (40A Canal- end of Romy St)	14.24	14.5	14.08	13.9	1.12	4.14	2.64
***J7 (Culvert Hwy 1 at Franks Store)**	8.25	8.25	8.211	7.407	**7.38**	**10.22**	**8.80**
J8	3.693	3.711	3.414	3.602	7.55	2.94	5.24
J9	3.544	3.617	3.311	3.481	6.57	3.76	5.15
G1	3.243	3.251	3.041	3.023	6.23	7.01	6.62
G2	3.116	3.221	3.001	2.981	3.69	7.45	5.60
G3	3.029	3.011	3.000	2.871	0.96	4.65	2.80
Method: Hartel et al., 2006							

*With the exception of J1A these sites were selected as having both high FC and OB before this OB photodecay preliminary study was done. The % reduction of OB readings before and after UV treatment are consistent with the work of Hartel et al. 2006.

NOTE: The only FC sample count for J1A that was above the DWS designated use standard (2,000 FC cfu/100 mL) was the sample used for this study. The FC cfu/100mL was 6,000, but the OB was only 5.91. Despite this medium range of OB levels, this sample showed the greatest % reduction after UV treatment, which indicated that it was contaminated with anthropogenic optical brighteners (OB).

Overall the project plan and method of using a combination of GIS cluster maps, digital images of each sampling site, virtual earth or MapQuest aerial views of sites, and a fluorometer to detect the possible presence of optical brighteners (OBs) as a rough indicator for human sewage or gray water input into the drainage systems to Bayou Lafourche in Lafourche Parish worked well. The summer months were expected to have the highest levels of FC's and we did observe that in some sites where there was a constant supply of water or rainfall. However, with the heat, there was also a drought and some of our sampling ditches and storm drains were dry in the sampling period.

Site fecal coliform results that are above the EPA/LDEQ (LDEQ 2008) designated use water quality parameters for fecal coliforms for primary contact recreation (PCR), secondary contact recreation (SCR)

and drinking water source (DWS) are highlighted in yellow. Sites with an OB reading of 5.00 or greater are also highlighted in yellow as probable anthropogenic or anthropogenic (10.00 or more OB).

Sites with both anthropogenic OB levels and FC levels that exceed the designated use levels for PCR (400 cfu/100ml), SCR (2,000 cfu/100ml) and DWS (2,000 cfu/100ml) (LDEQ 2008) will be targeted for possible BMP's or other remediation to eliminate release of poorly treated or untreated sewage into the drainage basin of Bayou Lafourche.

The QAPP and SOPs included detailed protocols for sampling and analysis of fecal coliforms according to the Standard Methods (APHA et al. 1998). Graduate students and P.I.s were trained by our QA/QC officer, Angela Corbin to use the SOPs and QAPP and to make certain that all documenting paper work was prepared each sampling trip.

Recommendations and Use of Project

The LDEQ can use the results of the potential sources of anthropogenic fecal or sewage input into the Bayou Lafourche drainage basin to better address the problem of meeting the EPA TMDL for Bayou Lafourche.

Possible solutions may be the implementation of Best Management Practices (BMP's) and the passage of local ordinances to address the faulty treatment systems.

The P.I. will assist the LDEQ officials in implementing these recommendations.

4.0 PUBLIC INVOLVEMENT AND COORDINATION

4.1 STATE AGENCIES

1) The Louisiana Department of Environmental Quality

Our main cooperating state agency was the Louisiana Department of Environmental Quality (LDEQ) and our Project Officers: Geologist Supervisor-AEPS, Howard Fielding; Project Manager, Jesse Means; and QA Representative, Micaela Coner. They provided us with maps, shapefiles of our protection areas and GPS coordinates for some potential drainage sources to B. Lafourche. They were also always available for support and help. Additionally, our Project Manager made quarterly visits and gave helpful information and input.

GPS coordinates for individual package plants (6,966 in Lafourche Parish), drinking water plant intake pumps, and (6 Drinking water plant intake pumps) were obtained from LDEQ.

After meeting with the LDEQ officials to obtain an overview of the proposed project and expected deliverables, the contractors began to meet with state, parish, local officials, and even private environmental company sources to gather as much existing information as possible to help in determining the best sampling locations within the protection areas.

2) The Louisiana Department of Health and Hospitals

The GPS coordinates for subdivision package plants (284) were obtained from the Louisiana Department of Health and Hospitals from Teda Boudreaux.

4.2 FEDERAL AGENCIES

The U.S. Environmental Protection Agency had to approve our Contract, QAPP and SOPs.

4.3 LOCAL GOVERNMENTS, INDUSTRY, ENVIRONMENTAL AND OTHER GROUPS, PUBLIC-AT-LARGE

The GPS coordinates for drainage pump stations (91) and high resolution image tiles were provided by Scott Leger with the South Central Planning Development Commission.

The P.I.'s met with David Poinceau and Steve Folse, former Public Works employees with the Lafourche Parish Government to get all information, maps, data, etc. that they had concerning the drainage in the Parish. We also got our recent post Hurricane Gustov new GIS aerial maps from Lafourche Parish.

The P.I.'S met with the City of Thibodaux Director of Public Works, Kermit Kraemer to discuss the city sewage boundaries, and storm sewer drainage into Bayou Lafourche within the city limits.

We also met with the Director of the Bayou Lafourche Fresh Water District, Archie Chaisson to get as much input as possible on possible sources of fecal coliforms to the Bayou.

GPS coordinates for all drainage culverts to the Bayou Lafourche study area were obtained from an environmental company report. (Note: Many of these culverts do not connect directly to open drainage ditches in subdivisions).

The P.I. taught a graduate workshop course, "Environmental Regulation, Law and Policy Workshop" in the Fall of 2008. The Environmental Issue for this Course was the Bayou Lafourche and the reintroduction of the Mississippi River. Invited speakers and participants were very helpful in providing a tremendous amount of information to the students that was very useful for this project. Speakers included:

1) Simone Maloz, Executive Director of "Restore or Retreat" (NPO)
   Title: "*Recognizing the Importance of Bayou Lafourche: Now and Then."*

2) Ted Falgout, Executive Director, Port Fourchon
   Title: *"Bayou Lafourche, a unique and significant corridor to the Gulf"*

3) Windell Curol, General Manager, South Lafourche Levee Board Association
   Title*: "Water Rights and Water Wrongs"*

4) Hugh Caffrey, President, Valentine Chemicals
   Title: "*Industrial Water Users of Bayou Lafourche"*

5) Kermit J. Kraemer, Jr., Director of Public Works, City of Thibodaux
   Title: *"MS4 Regulations in the City of Thibodaux"*

6) Archie Chaisson, Executive Director, Bayou Lafourche Fresh Water Division

7) Robert Routon, PE, Bayou Lafourche Reintroduction Project, Louisiana Department of Natural Resources

8) Susan Bergeron, Bayou Lafourche Program Coordinator for the Barataria Terrebone National Estuary Program

9) Michelle Robert, Chief Engineer, CH2MH, M.R. Project
Title: Reintroduction to Bayou Lafourche, Project Design

9) Dan Duplantis, Executive V.P. and General Manager Raceland Raw Sugar Corp
Activity: Class Trip to Raceland Sugar Mill

10) Jesse Means, Louisiana Department of Environmental Quality, Drinking Water Source Program and Non-Point Source Program.

4.4 OTHER SOURCES OF FUNDS

This contract did not require match, but Sam Wise, the P.I.'s graduate student did the monthly sampling and fecal coliform analysis. He also constructed all of the scatter graphs for this report. He was paid as a graduate Teaching Assistant and was trained by the P.I.'s to do this work according to the QAPP and the SOPs. The work will be used for a part of his graduate research to complete his M.S. degree.

5.0 ASPECTS OF THE PROJECT THAT DID NOT WORK WELL

The main problems we encountered were when we had to deal with the University shutdown for some time after Hurricane Gustov. It caused us to lose the month of September 2008 for sampling.

6.0 FUTURE ACTIVITY RECOMMENDATIONS

The P.I.'s have submitted another proposal to continue identifying the sources of fecal coliforms to the Bayou from Labadieville to Donaldsonville, LA. This proposed project will be a more comprehensive effort that is a continuation of the current project between Nicholls State University and the Louisiana Department of Environmental Quality (LDEQ) that will end September 30, 2009. This first project developed the approach and methods to identify "hot spots" of human contamination from faulty home sewage package plants in the LDEQ designated "protection areas" 1 and 2 of Bayou Lafourche from the Labadieville Bridge on Hwy 398 in Assumption Parish to the old Valentine Bridge below Lockport at the old Valentine Sugar Mill (closed) and the Valentine Chemical Plant.

This second proposed project will identify the input of fecal coliform human sewage indicators from single dwelling on-sight single home sewage package plant effluents to structures (culverts, ditches, canals) in Ascension and Assumption Parishes (from the siphon structure at the Mississippi River in Donaldsonville to the Lafourche Parish line) that can potentially drain into Bayou Lafourche and impair the microbial water quality standards for its designated uses – particularly drinking water source, and in some areas primary and secondary contact recreation, and the dissolved oxygen (D.O.) for a freshwater aquatic habitat.

The QAPP will include the protocols for maintaining and calibrating all equipment used in this proposed contract work. The research environmental and public health microbiological laboratory at Nicholls State University is in 208 Gouaux Hall and is fully equipped for fecal coliform and E. coli CFU/100ml membrane filtration or MPN/100 ml isolation and enumeration methods from the 20th Ed of Standard Methods for the Examination of Water and Wastewater, APHA, AWWA, WEF, 1998 for both 9222 D, Fecal Coliform membrane filter procedure and 9222G MF E. coli methods. Basic nutrients including nitrate using HACH NitraVer 5 (EPA standard method 8039), orthophosphate - HACH PhosVer 3 (EPA standard method 8048) and total organic carbon using HACH COD Reagent 0-15,000 ppm High Range+ (HR+) in a Hach COD Reactor Model 45600 will be included in the proposed analyses.

Equipment in the environmental and public health microbiology research laboratory includes autoclaves, fecal coliform waterbaths, incubators, pH meters, field equipment to take all physicochemical parameters

at the selected sites (pH, temperature, D.O., turbidity, salinity, and optical brighteners), a multiple filtration apparatus in the laboratory allowing 12 water samples to be filtered at the same time, and expertise in these microbiological methods.

The Department of Applied Sciences includes the only B.S. program in the State of Louisiana in Geomatics. Dr. Balaji Ramachandran has a Ph.D. in Geomatics and is a member of the scientific team in charge of all GIS and GPS equipment related deliverables.

The Nicholls State University research team developed a successful QAPP and SOPs for our Project 1 – Bayou Lafourche Fecal Coliform Sources from Labadieville to Valentine. Angela Corbin is the QAPP Research Team Leader and will be responsible for development of the QAPP and SOPs for this continuing second proposed project. Ms. Corbin has extensive experience with SOPs and QAPP design and implementation.

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