



**Texas State Soil and Water Conservation Board  
 Total Maximum Daily Load Program  
 FY 2009 Project 09-54**

TMDL PROJECT SUMMARY PAGE			
Title of Project	Assessment of Contact Recreation Use Impairments and Watershed Planning for Big Cypress Creek and Tributaries (Hart and Tankersley Creeks) [Short Title: Big Cypress Creek Bacteria Assessment]		
Project Goals/Objectives	To provide stakeholders and agencies with sufficient information to address bacteria impairments on Big Cypress Creek and tributaries (Hart and Tankersley Creeks) between Lake O' the Pines and Lake Bob Sandlin through verification of use attainment, revision of water quality standards and/or designated uses, or development of a WPP or TMDL by 1) facilitating public participation and coordinating stakeholder involvement in decision-making, 2) developing a comprehensive GIS inventory and conducting a watershed source survey, 3) collecting water quality monitoring data, and 4) collecting information on factors affecting attainment of recreational use.		
Project Tasks	1) Project Administration; 2) Public Participation and Stakeholder Coordination; 3) Quality Assurance; 4) Survey and Inventory Possible Bacteria Sources; 5) Surface Water Quality Monitoring; 6) Assess Attainability of Recreational Use		
Measures of Success	1) Decision-making for watershed planning activities, including data collection and analysis, is founded on local stakeholder input. 2) Data of known and acceptable quality are generated for surface water quality monitoring of the segments in the study area. 3) Degree of public participation is measured by attendance at meetings and workshops. 4) Sources of bacteria contributing to impairment are identified. 5) Factors affecting attainment of recreation use are assessed.		
Project Type	Implementation ( ); Education ( ); Planning (X); Assessment (X)		
Status of Waterbody on 2008 Texas Water Quality Inventory and 303(d) List	<u>Segment ID:</u> 0404 Big Cypress Creek below Lake Bob Sandlin 0404B Tankersley Creek 0404C Hart Creek	<u>Parameter:</u> bacteria bacteria bacteria	<u>Category:</u> 5a 5a 5a
Project Location (Statewide or Watershed and County)	Big Cypress Creek and Tributaries (Hart and Tankersley Creeks) between Lake O' the Pines and Lake Bob Sandlin in Titus, Camp, Upshur and Morris Counties		
Key Project Activities	Hire Staff ( ); Surface Water Quality Monitoring (X); Technical Assistance ( ); Education ( ); Implementation ( ); BMP Effectiveness Monitoring ( ); Demonstration ( ); Planning (X); Modeling ( ); Bacterial Source Tracking ( ); Other ( )		
NPS Management Program Elements	<ul style="list-style-type: none"> <li>• Element One (STG 1B; STG 1C; STG 1D; STG 3B; STG 3D)</li> <li>• Element Two</li> <li>• Element Five</li> </ul>		
Project Costs	\$ 320,100 (TSSWCB TMDL GR)		
Project Management	Northeast Texas Municipal Water District		
Project Period	June 1, 2009 –July 31, 2011		

## Part I – Applicant Information

Applicant							
Project Lead	Walt Sears						
Title	Executive Director						
Organization	Northeast Texas Municipal Water District						
E-mail Address	<a href="mailto:netmwd@aol.com">netmwd@aol.com</a>						
Street Address	PO Box 955						
City	Hughes Springs	County	Cass	State	Texas	Zip Code	75656
Telephone Number	(903) 639-7538			Fax Number	(903) 639-2208		

Project Partners	
Names	Roles & Responsibilities
Texas State Soil and Water Conservation Board (TSSWCB)	Provide state oversight and management of all project activities and ensure coordination of activities with related projects and TCEQ.
Northeast Texas Municipal Water District (NETMWD)	Coordinate and manage all work described in Tasks.
Texas AgriLife Research – Department of Biological and Agricultural Engineering (BAEN) (R. Karthikeyan)	Develop GIS inventory (Subtask 4.1) and perform LDC analysis (Subtask 5.6) and spatially explicit modeling (Subtask 4.3) through TSSWCB project 09-55.
Texas AgriLife Research – Department of Soil and Crop Sciences – Soil and Aquatic Microbiology Laboratory (SAML) (Terry Gentry)	Conduct Bacterial Source Tracking (Subtask 5.7) through TSSWCB project 09-55.
Texas AgriLife Extension Service – Department of Soil and Crop Sciences (Extension) (Mark McFarland)	Deliver TWSP workshop (Subtask 2.4) through TSSWCB project 07-09.
Texas A&M University – Spatial Sciences Laboratory (SSL)	Classify land use (Subtask 4.2) through TSSWCB project 08-52.
Texas A&M AgriLife – Texas Water Resources Institute (TWRI)	Coordinate all BAEN, SAML, and SSL activities with NETMWD through TSSWCB projects 08-52 and 09-55.
Sulphur-Cypress Soil and Water Conservation District and Upshur-Gregg Soil and Water Conservation District (SWCDs 419 & 417)	Collaborate as critical local stakeholders and play a lead role in communicating with other local stakeholders.

## Part II – Project Information

### Watershed Information

Watershed Name	Hydrologic Unit Code (8 Digit)	Segment ID	305(b) Category	Size (Acres)
Big Cypress Creek and Tributaries (Hart and Tankersley Creeks) between Lake O' the Pines and Lake Bob Sandlin	11140305	0404 0404B 0404C	5a 5a 5a	284,487

### Water Quality Impairment

Describe all known causes of water quality impairments from any of the following sources: 2008 Texas Water Quality Inventory and 303(d) List, or Other Documented Sources (i.e., Clean Rivers Program Basin Summary or Basin Highlights Reports).

#### 2008 TWQI & 303(d) List

- 0404 non-supporting recreation use for bacteria geomean and bacteria single sample, upper 18 miles; source unknown, industrial point source discharge
- 0404B non-supporting recreation use for bacteria geomean and bacteria single sample, lower 8 miles below Tankersley Lake; source unknown, unrestricted cattle access, septic systems, industrial point source discharge, natural sources
- 0404C non-supporting recreation use for bacteria geomean and bacteria single sample, entire waterbody; municipal point source discharges, industrial point source discharge

#### 2008 NETMWD Clean Rivers Program Basin Highlights Report

This segment [0404]...has the most intensive agricultural and urban development in the Cypress Creek Basin. Vegetation within this area ranges from areas cleared for agriculture to dense forests. The floodplain...is heavily wooded and contains widespread-forested wetlands. Nearby uplands are used for livestock grazing and hay production. Urban concentrations are highest in this segment... A majority of the intensive poultry operations within the Cypress Basin are located in this area.

#### 2005 NETMWD Clean Rivers Program Tankersley Creek Bacterial Source Tracking Special Study

...all stations except the two Tankersley Lake stations...and the uppermost stream station...exhibited geometric mean[s]...that exceed the...criterion. ...the highest *E. coli* abundances occur during and immediately after rainfall... However, ...substantial bacterial levels...[are] present at some locations when there was no recent surface runoff. The extensive shoreline development fringing Tankersley Lake has had little apparent impact on bacterial water quality there. The widespread and common exceedance of the criteria...throughout the lower reach of Tankersley Creek...represents at least a potential impairment of that use. These streams are too small for water skiing, boating and swimming, the channels tend to be deeply and sharply incised in the landscape, with large amounts of woody debris and turbid water; not attractive recreational qualities. ...a land use/cover map of the Tankersley Creek watershed, show[s]...the overwhelming dominance...by pastureland and the rural residential areas... Those areas...may be important sources of bacterial contamination from the high densities of livestock (e.g., horses, goats, fowl) observed there, and from on-site treatment facilities. Further characterization of...bacterial sources will require the use of specific source tracking methodologies. A *Bacteroides-Prevotella*, or other assay that distinguishes between human and other animal sources would be useful in this case...

#### 2003 NETMWD Clean Rivers Program Tankersley Creek Indicator Bacteria Special Study

Evaluation of the combined results...indicate that these bacteria are consistently present at levels above the single value criterion...within 1-2 days of significant local rainfall. Of the streams sampled..., only Big Cypress Creek could be considered large enough to support contact recreation, but accessibility is limited and the aesthetic aspects of this stream (steep banks, muddy water, abundant woody debris, snakes) do not make it particularly attractive for such uses. However, in spite of their small size and relatively unattractive character,

the suburban nature of Tankersley and Hart Creeks suggests that some level of exposure, especially among children, may be occurring. Although the spatial distribution and correlation of *E. coli* abundance with rainfall indicates an important non-point source component, dry and wet weather results considered together suggest that bacterial contamination may be resulting from continuing sources, particularly in Tankersley Creek, which exhibits the largest bacterial abundances observed...at all conditions. ...possible sources include overflowing septic systems, the dumping of animal waste into catchment basins, sanitary and combined sewer overflows, wastewater, illicit connections to the storm drain system, and sewage sludge disposal.

### Project Goals

To provide stakeholders and agencies with sufficient information to address bacteria impairments on Big Cypress Creek and tributaries (Hart and Tankersley Creeks) between Lake O' the Pines and Lake Bob Sandlin through verification of use attainment, revision of water quality standards and/or designated uses, or development of a WPP or TMDL by 1) facilitating public participation and coordinating stakeholder involvement in decision-making, 2) developing a comprehensive GIS inventory and conducting a watershed source survey, 3) collecting water quality monitoring data, and 4) collecting information on factors affecting attainment of recreational use.

### 2005 Texas Nonpoint Source Management Program References (Expand from Summary Page)

- Element 1 – Explicit short-term goals, objectives and strategies that protect surface water.
  - Short-Term Goal One – Data Collection and Assessment – Objective B – Ensure that monitoring procedures meet quality assurance requirements...
  - Short-Term Goal One – Data Collection and Assessment – Objective C – Conduct special studies to determine sources of NPS pollution and gain information to target TMDL activities and BMP implementation.
  - Short-Term Goal One – Data Collection and Assessment – Objective D – Develop...TMDLs, I-Plans and WPPs to maintain and restore water quality in waterbodies...impacted by NPS pollution.
  - Short-Term Goal Three – Education – Objective B – Administer programs to educate citizens about water quality and their potential role in causing NPS pollution.
  - Short-Term Goal Three – Education – Objective D – Conduct outreach...to facilitate broader participation and partnerships...[to] enable stakeholders...to participate in decision-making and provide a more complete understanding of water quality issues and how they relate to each citizen.
- Element 2 – Working partnerships...[with] appropriate state,...regional, and local entities, private sector groups, and federal agencies.
- Element 5 – The State...identifies waters...impaired by NPS pollution and...establishes a process to progressively address these...waters by conducting more detailed watershed assessments...

### Measures of Success

- Decision-making for watershed planning activities, including data collection and analysis, is founded on local stakeholder input.
- Data of known and acceptable quality are generated for surface water quality monitoring of the segments in the study area.
- Degree of public participation is measured by attendance at meetings and workshops.
- Sources of bacteria contributing to impairment are identified.
- Factors affecting attainment of recreation use are assessed.

## Project Narrative

### Problem/Need Statement

Big Cypress Creek (and its tributaries) are located in the Cypress Creek Basin. The headwaters of Big Cypress Creek originate in southeast Hopkins County. From there, Big Cypress Creek flows east into Lake Cypress Springs and then into Lake Bob Sandlin in Franklin County. After leaving Lake Bob Sandlin, Big Cypress Creek, which forms the county line between Titus and Camp Counties, flows southeast to Lake O' the Pines and then finally to Caddo Lake before entering Louisiana. The watershed is characterized by gently rolling wooded hills and broad, frequently flooded, densely vegetated stream bottoms. Post oak savannah is predominant in the western portion of the basin, while pineywoods are common in the eastern portion.

The Big Cypress Creek watershed, between Lake Bob Sandlin and Lake O' the Pines, encompasses approximately 445 square miles in Camp, Morris, Titus and Upshur Counties. In 1996, Big Cypress Creek (Segment 0404) was placed on the *Texas 303(d) List* for having bacteria levels that exceed water quality standards. In 2000, Tankersley Creek (Segment 0404B) was placed on the *303(d) List* for bacteria, and in 2006, Hart Creek (Segment 0404C) was placed on the *303(d) List* for bacteria. Other tributaries to Big Cypress Creek are not currently impaired for bacteria, but they are likely contributing some degree of bacteria loading to the impaired reaches of Big Cypress Creek.

While the focus of this project will be on bacterial water quality issues in Segments 0404, 0404B, and 0404C, this watershed is covered by *One Total Maximum Daily Load for Dissolved Oxygen in Lake O' the Pines (Segment 0403)*. The Segment 0404 watershed is the contributing watershed to Lake O' the Pines (Segment 0403) The TMDL was adopted by the TCEQ on April 12, 2006, approved by the TSSWCB on March 23, 2006 and approved by the EPA on June 7, 2006. The TMDL determined that low dissolved oxygen concentrations in the reservoir are due to high rates of photosynthesis and respiration in aquatic vegetation and that phosphorus is the limiting nutrient during the critical conditions. The TMDL determined that a 56% reduction in total phosphorus loading is needed to restore water quality. An Implementation Plan (I-Plan) was developed to reduce phosphorus loadings from the contributing watershed. Implementation strategies were identified for point source dischargers (total phosphorus effluent limits), animal feeding operations (BMPs to reduce runoff of sediment and nutrients from poultry litter application sites and dairies), forestry operations (BMPs to reduce runoff of sediment and nutrients), and other sources (on-site sewage facilities, boat sewage disposal, sites permitted for land application of domestic sewage sludge). On July 9, 2008, the TCEQ approved the *I-Plan for One TMDL for Dissolved Oxygen in Lake O' the Pines*. The TSSWCB approved the I-Plan on July 17, 2008. It is anticipated that many of the implementation strategies designed to reduce phosphorus loadings will also have a positive impact on reducing bacteria loadings to Big Cypress Creek.

Through the Lake O' the Pines TMDL process, watershed stakeholders have become extremely familiar with water quality rules and regulations, as well as, approaches to watershed planning. As such, local stakeholders have already expressed interest in taking an active role in addressing the bacteria impairments.

Land use in the watershed is predominantly cropland and pasture (about 48%) and forest (about 40%). During periods of rainfall, which averages approximately 46 inches annually, bacteria originating from aquatic birds and mammals, livestock, inadequately treated sewage, and/or failing septic systems may be washed into the streams and have the potential to impede recreational use of the waterbodies. Bacterial indicators, such as *E. coli*, may remain in the streams at levels exceeding established criteria and can be measured well after a rain event has occurred. These microorganisms are normally found in wastes of warm-blooded animals and are generally not harmful to human health, but may indicate the presence of pathogens that can cause disease.

Lake O' the Pines and other waterbodies in its watershed are extremely important to the surrounding region. Lake O' the Pines provides drinking water for 7 cities and towns, numerous rural water districts, and several steel manufacturing and electric generating companies. In addition, the City of Longview (population 70,000) will be using the lake as a drinking water source in the near future. The lake is an important resource to the timber industry and to agricultural enterprises such as the poultry industry, dairies, cow/calf operations, and for irrigation. Recreation and tourism are significant sources of income for residents of the watershed. Boating and fishing for trophy bass, catfish, and crappie lure large numbers of recreational users to the watershed each year.

The TCEQ and the TSSWCB established a joint, technical Task Force on Bacteria TMDLs in September 2006 charged with making recommendations on cost-effective and time-efficient bacteria TMDL development methodologies. The Task Force recommended the use of a three-tier approach that is designed to be scientifically credible and accountable to watershed stakeholders. The tiers move through increasingly aggressive levels of data collection and analysis in order to achieve stakeholder consensus on needed load reductions and strategies to achieve those reductions. In June 2007, the TCEQ and the TSSWCB adopted the principles and general process recommended by the Task Force and directed agency staff to incorporate the principles of the recommendations into an updated joint-agency TMDL guidance document.

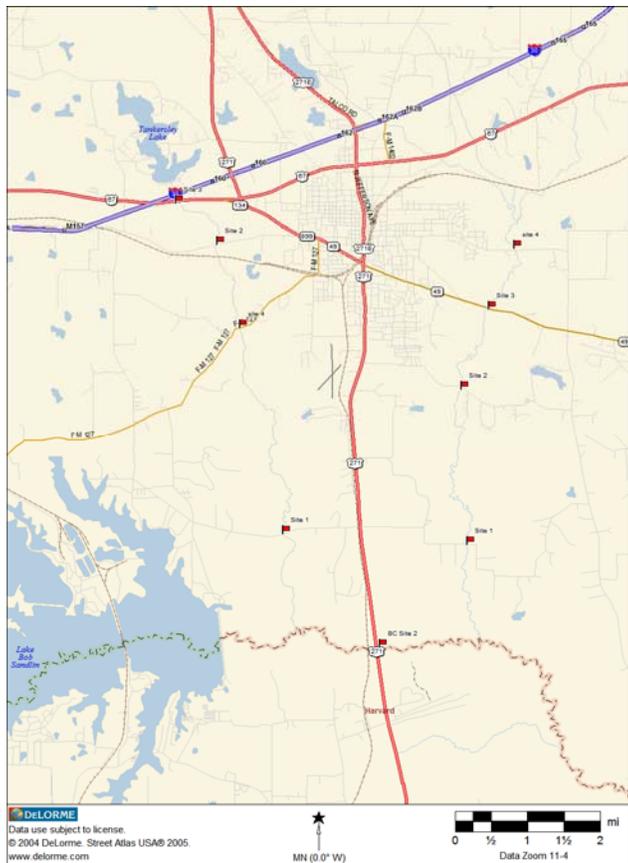
Major revisions to the Texas Surface Water Quality Standards are being drafted by TCEQ, including the establishment of numeric nutrient criteria for reservoirs and modifications to contact recreation use and bacteria criteria. As part of this process, TCEQ is developing procedures for conducting recreational Use Attainability Analyses (UAAs). In order for a new category of recreational use or a different bacteria water quality standard to be applied to a waterbody, a recreational UAA will need to be conducted. TCEQ and TSSWCB have collaborated on developing a list of priority waterbodies for collecting information needed for recreational UAAs. Segments in this project's study area are on that list.

In accordance with the *Memorandum of Agreement Between the TCEQ and the TSSWCB Regarding TMDLs, Implementation Plans, and Watershed Protection Plans*, the TSSWCB has agreed to take the lead role in addressing the bacteria impairments in the study area. Through this and associated projects, the TSSWCB and NETMWD will work with local stakeholders to progress through the data collection and analysis components of the first two tiers of the Task Force recommended three-tier approach. The goal is to remove the waterbodies in the study area from the *303(d) List*; however, the mechanism is not predetermined. At the end of this two-year assessment project, possible outcomes include: 1) waterbodies are achieving current water quality standards, 2) waterbodies are achieving revised water quality standards, based on TCEQ triennial review process, 3) adequate data exists to support a UAA to change water quality standards, 4) adequate data exists to develop a Watershed Protection Plan, or 5) adequate data exists to develop a TMDL and I-Plan for TCEQ adoption.

## Project Narrative

### General Project Description

NETMWD will facilitate public participation and coordinate stakeholder involvement to ensure that decision-making is founded on local input and that watershed planning activities are successful. NETMWD will provide logistical support for public meetings. At a minimum, public stakeholder meetings shall consist of an organizational/kick-off meeting, a source survey design meeting, a meeting presenting results from initial data analysis and the GIS inventory, a Texas Watershed Steward Program workshop, two project update meetings during the middle of the project, a meeting presenting data analysis results, and a meeting presenting final technical reports.



NETMWD will coordinate with Extension to host a Texas Watershed Steward Program workshop focused on the study area through TSSWCB project 07-09, *Statewide Implementation of the Texas Watershed Steward Program*. NETMWD will develop and disseminate educational materials to watershed stakeholders, including, but not limited to, flyers, brochures, letters, and news releases. NETMWD will include information about the project in the Clean Rivers Program Basin Summary Report and the Basin Highlights Report. NETMWD will contribute content matter to an internet webpage, to be hosted by TWRI, for the dissemination of project information.

NETMWD will develop a Quality Assurance Project Plan (QAPP) to ensure data of known and acceptable quality are generated and used in this project. The QAPP shall be consistent with the *TSSWCB Environmental Data Quality Management Plan* and various TCEQ guidelines for monitoring procedures and methods.

BAEN, through TSSWCB project 09-55 *Modeling Support and Bacterial Source Tracking for Big Cypress Creek Bacteria Assessment*, with assistance from NETMWD, will develop a comprehensive GIS inventory for the study area.

TSSWCB, in cooperation with SSL, will provide NETMWD a current land use classification, based on 2004-2006 imagery, for

the study area through TSSWCB project 08-52, *Classification of Current Land Use/Land Cover for Certain Watersheds Where TMDLs or WPPs Are In Development*.

NETMWD will design and conduct a watershed source survey that better characterizes the possible sources of bacteria loadings. Local stakeholders and technical experts will be consulted in the development of the source survey, which will represent warm and cool seasons and low and high flow conditions. Locations of possible bacteria sources identified during the source survey will be incorporated into the GIS inventory.

To provide sufficient water quality data to characterize bacteria loadings across the various flow regimes, NETMWD will conduct routine ambient monitoring at 14 sites once every two weeks. Currently, routine ambient monitoring is conducted quarterly at 2 stations by TCEQ (10308 and 13631). NETMWD will conduct effluent monitoring at the outfalls of 2 wastewater treatment facilities (WWTFs) once every two weeks in an effort to estimate possible contributions from wastewater discharges. NETMWD will conduct biased-flow monitoring under high flow (storm event influenced) conditions at the 14 stream sites and the 2 WWTFs during at least 8 storm events.

To determine bacteria load reductions needed to achieve water quality standards, BAEN in collaboration with NETMWD will conduct a Load Duration Curve (LDC) analysis of all historic and existing water quality monitoring data

from the study area through TSSWCB project 09-55. Then, using water quality monitoring data collected through this project, NETMWD will assist BAEN in refining the developed LDCs. To estimate loadings from various sources and to identify critical loading areas within the watersheds, BAEN in collaboration with NETMWD will then conduct watershed modeling for the study area through TSSWCB project 09-55. Utilizing information from the GIS inventory, watershed source survey, and water quality monitoring, and in combination with the LDCs, BAEN through TSSWCB project 09-55 and in collaboration with NETMWD will develop a spatially explicit or mass balance model, such as SELECT, for the study area.

NETMWD will collaborate with SAML, through TSSWCB project 09-55, to conduct bacterial source tracking (BST) in the study area to assess and identify different sources contributing to bacteria loadings. Library-independent BST utilizing the *Bacteroidales* PCR genetic test will be combined with limited library-dependent BST utilizing the ERIC-PCR and RP combination method. The Texas Known Source Library may need to be supplemented with known fecal samples from the study area. NETMWD will collect duplicate water samples from a subset of those collected through Task 5 and provide to SAML for BST. Additionally, NETMWD will collect known fecal samples, if needed.

NETMWD will collect information to be used to evaluate factors affecting attainment of recreational uses in the waterbodies in the study area. Methods used shall be consistent with the latest version of the TCEQ staff draft *Recreational Use-Attainability Analyses (RUAAs) – Procedures for a Comprehensive RUA and a Basic RUA Survey*. NETMWD shall conduct a thorough historical information review of the recreational uses of the waterbody back to November 28, 1975. NETMWD will conduct field surveys at selected sites during the period people would most likely be using the waterbody for contact recreation. Field surveys shall ascertain the suitability of the streams for contact recreation use and shall document the hydrological characteristics of the stream, such as width and depth of channel and substantial pools, flow/discharge, and bank access. NETMWD shall collect a digital photographic record of each selected site during the field surveys. To aid in documenting existing uses, NETMWD shall install, operate, and maintain motion-capture cameras at selected monitoring locations. In order to obtain information on existing and historical uses and stream characteristics, NETMWD shall conduct interviews of 1) users present during the field surveys, 2) streamside landowners along the field survey transects, 3) local residents, and 4) commercial providers of outdoor recreation goods and services.

Tasks, Objectives and Schedules			
Task 1	Project Administration		
Costs	\$ 12,000		
Objective	To effectively administer, coordinate, and monitor all work performed under this project including technical and financial supervision and preparation of status reports.		
Subtask 1.1	NETMWD will prepare electronic quarterly progress reports (QPRs) for submission to TSSWCB. QPRs shall document all activities performed within a quarter and shall be submitted by the 15 <sup>th</sup> of December, March, June and September. QPRs shall be posted on the project website and provided to all project partners.		
	Start Date	Month 1	Completion Date Month 26
Subtask 1.2	NETMWD will perform accounting functions for project funds and will submit appropriate Reimbursement Forms to TSSWCB at least quarterly.		
	Start Date	Month 1	Completion Date Month 26
Subtask 1.3	NETMWD will participate in coordination meetings or conference calls with TSSWCB, and any subcontractors or project partners as appropriate, at least quarterly to discuss project activities, project schedule, communication needs, deliverables and other requirements. Coordination with TSSWCB project 09-55, <i>Modeling Support and Bacterial Source Tracking for Big Cypress Creek Bacteria Assessment</i> , will be especially critical to achieve project goals.		
	Start Date	Month 1	Completion Date Month 26
Deliverables	<ul style="list-style-type: none"> <li>Quarterly Progress Reports in electronic format</li> <li>Reimbursement Forms, and necessary supporting documentation, in either electronic or hard copy format</li> </ul>		

Tasks, Objectives and Schedules			
Task 2	Public Participation and Stakeholder Coordination		
Costs	\$ 9,500		
Objective	To facilitate public participation and coordinate stakeholder involvement to ensure that decision-making is founded on local input and that watershed planning activities are successful.		
Subtask 2.1	NETMWD will facilitate public participation activities and coordinate stakeholder involvement in the project. NETMWD will develop and maintain a list of stakeholders likely to be affected by this project.		
	Start Date	Month 1	Completion Date Month 26
Subtask 2.2	NETMWD will provide logistical support for public meetings, including, but not limited to, securing meeting facilities, preparing/disseminating meeting notices and agendas, and preparing meeting summaries. At a minimum, public stakeholder meetings shall consist of an organizational/kick-off meeting (month 3), a source survey design meeting (subtask 4.4) (month 4), a meeting presenting results from initial LDCs and the GIS inventory (month 6), Texas Watershed Steward Program workshop (subtask 2.4) (month 9), two project update meetings (months 12 and 18), a meeting presenting data analysis results (month 21), and a meeting presenting final technical reports (month 24).		
	Start Date	Month 1	Completion Date Month 26
Subtask 2.3	NETMWD will attend and participate in other public meetings, such as city council meetings, county commissioners court meetings and SWCD meetings, in order to communicate project goals, activities and accomplishments to affected parties.		
	Start Date	Month 1	Completion Date Month 26
Subtask 2.4	NETMWD will coordinate with Extension to host a Texas Watershed Steward Program workshop focused on the study area through TSSWCB project 07-09, <i>Statewide Implementation of the Texas Watershed Steward Program</i> .		
	Start Date	Month 1	Completion Date Month 12
Subtask 2.5	NETMWD will develop and disseminate educational materials to watershed stakeholders, including, but not limited to, flyers, brochures, letters, and news releases. NETMWD will include information about the project in the Clean Rivers Program Basin Summary Report and the Basin Highlights Report. TWRI, through TSSWCB project 09-55, shall contribute content matter for educational materials as appropriate.		
	Start Date	Month 1	Completion Date Month 26
Subtask 2.6	NETMWD will contribute content matter to an internet webpage, to be hosted by TWRI through TSSWCB project 09-55 <i>Modeling Support and Bacterial Source Tracking for Big Cypress Creek Bacteria Assessment</i> , for the dissemination of project information.		
	Start Date	Month 1	Completion Date Month 26
Deliverables	<ul style="list-style-type: none"> <li>Stakeholder contact list, updated as appropriate</li> <li>Public meeting notices, agendas, materials, summaries and lists of attendees</li> <li>Educational materials, as developed and disseminated</li> <li>Content matter for project webpage</li> </ul>		

Tasks, Objectives and Schedules			
Task 3	Quality Assurance		
Costs	\$ 7,500		
Objective	To develop and implement data quality objectives (DQOs) and quality assurance/control (QA/QC) activities to ensure data of known and acceptable quality are generated through this project.		
Subtask 3.1	NETMWD will develop a QAPP for activities in Tasks 5 and 6 consistent with the most recent versions of <i>EPA Requirements for Quality Assurance Project Plans (QA/R-5)</i> and the <i>TSSWCB Environmental Data Quality Management Plan</i> .		
	Consistency with Title 30, Chapter 25 of the Texas Administrative Code, <i>Environmental Testing Laboratory Accreditation and Certification</i> , which describes Texas' approach to implementing the National Environmental Laboratory Accreditation Conference standards, shall be required.		
	All monitoring procedures and methods prescribed in the QAPP shall be consistent with the guidelines detailed in the <i>TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods for Water, Sediment, and Tissue (RG-415)</i> (October 2008) and <i>Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data (RG- 416)</i> (June 2007).		
Subtask 3.2	All procedures and methods for Task 6 prescribed in the QAPP shall be consistent with the guidelines detailed in the latest version of the TCEQ staff draft <i>Recreational Use-Attainability Analyses (RUAAs) – Procedures for a Comprehensive RUAA and a Basic RUAA Survey</i> .		
	Start Date	Month 1	Completion Date
Subtask 3.2	NETMWD will submit revisions and necessary amendments to the QAPP as needed.		
	Start Date	Month 3	Completion Date
Deliverables	<ul style="list-style-type: none"> <li>QAPP for Tasks 5 and 6 approved by TSSWCB in both electronic and hard copy formats</li> <li>Approved revisions and amendments to QAPP</li> </ul>		

Tasks, Objectives and Schedules			
Task 4	Survey and Inventory Possible Bacteria Sources		
Costs	\$ 22,000		
Objective	To develop a comprehensive GIS inventory for the study area and to assess the possible sources of bacteria loadings by conducting a watershed source survey.		
Subtask 4.1	NETMWD will assist BAEN, through TSSWCB project 09-55 <i>Modeling Support and Bacterial Source Tracking for Big Cypress Creek Bacteria Assessment</i> , in developing a comprehensive GIS inventory for the study area. Data should include the most recent information available on land use, elevation, soils, stream networks, reservoirs, roads, public parklands, municipalities and satellite imagery or aerial photography. Locations of SWQM stations, USGS gages, public access points to the waterbodies, floodwater-retarding structures, wetlands, TPDES permittees (including WWTFs, CAFOs and MS4s), and subdivisions should also be included. Sites permitted for land application of sewage sludge and septage should be included. Locations of possible bacteria sources, identified in Subtask 4.5, should be incorporated. The cumulative impact of TSSWCB-certified WQMPs on the management of agricultural and silvicultural lands should be documented.		
	Start Date	Month 1	Completion Date Month 3
Subtask 4.2	TSSWCB, in coordination with SSL, will provide NETMWD a current land use classification for the study area through TSSWCB project 08-52, <i>Classification of Current Land Use/Land Cover for Certain Watersheds Where TMDLs or WPPs Are In Development</i> .		
	Start Date	Month 1	Completion Date Month 3
Subtask 4.3	NETMWD will cooperate with BAEN to conduct watershed modeling for the study area through TSSWCB project 09-55. Utilizing information from the GIS inventory (Subtask 4.1), the source survey (Subtask 4.5) and water quality monitoring (Task 5), a spatially explicit or mass balance model, such as SELECT, will be developed for the study area to estimate loadings from various sources and to identify critical loading areas within the watersheds.		
	Start Date	Month 7	Completion Date Month 21
Subtask 4.4	NETMWD will facilitate a meeting of local stakeholders and technical experts to design a source survey (also known as a sanitary survey) that better characterizes the possible sources of bacteria loadings. The source survey should be developed so that it represents warm and cool seasons and low and high flow conditions. The source survey should evaluate sources like WWTFs, central sewage collection systems, OSSFs, and MS4s. TPDES compliance issues should be examined. Wildlife, livestock and non-domestic animal populations should be examined.		
	Technical experts should include at least one representative, as appropriate to their jurisdiction and interest, from Texas Parks and Wildlife Department, Texas Department of Agriculture, Texas Commission on Environmental Quality, Texas AgriLife Extension Service, Texas Forest Service, U.S. Geological Survey, U.S. Fish and Wildlife Service, USDA Natural Resources Conservation Service, USDA Agricultural Research Service, U.S. Army Corps of Engineers, and affected municipalities, counties and SWCDs.		
Subtask 4.5	NETMWD will conduct the source survey in the study area as designed in Subtask 4.4.		
	Start Date	Month 4	Completion Date Month 15
Deliverables	<ul style="list-style-type: none"> <li>Technical Report describing results from the source survey</li> </ul>		

Tasks, Objectives and Schedules			
Task 5	Surface Water Quality Monitoring		
Costs	\$ 160,000		
Objective	To provide sufficient water quality data to characterize bacteria loadings across the various flow regimes at a number of locations throughout the study area.		
Subtask 5.1	NETMWD will conduct routine ambient monitoring at 14 sites once every two weeks, collecting field, flow and bacteria parameter groups. The QAPP, as detailed in Task 3, will precisely identify sites. Six of these sites shall be the same as those in Subtask 5.4. The sampling period extends over 22 months. Total number of sample events scheduled for collection through this subtask is 642. Currently, routine ambient monitoring is conducted quarterly at 2 stations by TCEQ (10308 and 13631). NETMWD will avoid duplicative routine ambient monitoring at sites 10308 and 13631.		
	Start Date	Month 2	Completion Date Month 24
Subtask 5.2	NETMWD will conduct routine effluent monitoring at 2 WWTFs once every two weeks, collecting field, flow and bacteria parameter groups. The QAPP, as detailed in Task 3, will precisely identify sites. The sampling period extends over 22 months. Total number of sample events scheduled for collection through this subtask is 94.		
	Coordination between TPDES permittees and the TCEQ Regional Office will be required. Neither NETMWD nor TSSWCB shall submit WWTF data to TCEQ for use in permit compliance and enforcement; rather, WWTF data will only be used to estimate bacteria loadings from wastewater discharges and to assist TPDES permittees in improving management and operations.		
Subtask 5.3	NETMWD will conduct biased-flow monitoring under high flow (storm event influenced) conditions at the 14 stream sites (Subtask 5.1) and the 2 WWTFs (Subtask 5.2) during at least 8 storm events collecting field, flow and bacteria parameter groups (grab samples). The sampling period extends over 22 months. Total number of sample events budgeted for collection through this subtask is 128.		
	Start Date	Month 2	Completion Date Month 24
Subtask 5.4	NETMWD will establish, and maintain, continuous flow monitoring gages at 6 sites (1 per tributary). These sites shall be located as close to the confluence with Big Cypress Creek as is feasible. Continuous sampling extends over 22 months.		
	Start Date	Month 2	Completion Date Month 24
Subtask 5.5	NETMWD will transfer monitoring data from activities in Task 5 to TSSWCB for inclusion in the TCEQ SWQMIS at least quarterly. Data will be transferred in the correct format using the TCEQ file structure, along with a completed Data Summary, as described in the most recent version of <i>TCEQ Surface Water Quality Monitoring Data Management Reference Guide</i> . NETMWD will submit Station Location Requests as needed to obtain TCEQ station numbers for new monitoring sites. NETMWD will input monitoring regime, as detailed in the QAPP, into the TCEQ CMS. Data Correction Request Forms will be submitted to TSSWCB whenever errors are discovered in data already reported.		
	Start Date	Month 2	Completion Date Month 24
Subtask 5.6	NETMWD will cooperate with BAEN, through TSSWCB project 09-55, to 1) conduct an LDC analysis of all historic and existing water quality monitoring data from the study area, and 2) refine those LDCs using water quality monitoring data collected through this project (Subtasks 5.1-5.4).		
	Start Date	Month 2	Completion Date Month 21

Subtask 5.7	<p>NETMWD will collaborate with SAML, through TSSWCB project 09-55, to conduct bacterial source tracking (BST) in the study area to assess and identify different sources contributing to bacteria loadings. Library-independent BST utilizing the <i>Bacteroidales</i> PCR genetic test will be combined with limited library-dependent BST utilizing the ERIC-PCR and RP combination method.</p> <p>NETMWD will collect duplicate water samples from a subset of those collected through Subtasks 5.1-5.3 and deliver those samples to SAML for BST. This BST subset shall be precisely described in the 09-55 QAPP. NETMWD will work with SAML to ensure sample collection activities employ adequate QA/QC mechanisms for BST as described in the 09-55 QAPP.</p> <p>The Texas Known Source Library may need to be supplemented with known fecal samples from the study area. If needed, NETMWD will collect known fecal samples as identified by SAML from sources such as livestock, wildlife, and domestic sewage and septage.</p>			
	Start Date	Month 2	Completion Date	Month 24
Deliverables	<ul style="list-style-type: none"> <li>• Station Location Request Forms (as needed) in electronic format</li> <li>• Monitoring data files and Data Summary in electronic format</li> <li>• Data Correction Request Forms (as needed) in electronic format</li> <li>• Technical Report characterizing trends and variability in historical water quality monitoring data</li> <li>• Technical Report characterizing trends and variability in collected water quality monitoring data</li> </ul>			

Tasks, Objectives and Schedules			
Task 6	Assess Attainability of Recreational Use		
Costs	\$ 69,000		
Objective	To collect information that can be used to evaluate factors affecting attainment of recreational use in Big Cypress Creek and tributaries (Hart and Tankersley Creeks).		
Subtask 6.1	Utilizing information from Task 4 (comprehensive GIS inventory and current land use classification) and other relevant information, NETMWD will identify sites for RUAA data collection. Proposed sites should be located in areas where the waterbody is accessible to the public and has the highest potential for recreational use (primary contact). The sites should be well-spaced and, in general, distributed such that there are 3 sites for every 5 miles of stream. Sites shall be identified for the impaired reach of Big Cypress Creek and the entirety of Hart and Tankersley Creeks. Proposed sites shall at least include those from Subtask 5.1 (only those locations on Big Cypress, Hart, and Tankersley Creeks). The QAPP, as detailed in Task 3, will precisely identify selected sites. NETMWD will submit Station Location Requests as needed to obtain TCEQ station numbers for new monitoring sites.		
	Start Date	Month 3	Completion Date Month 26
Subtask 6.2	NETMWD shall conduct a thorough historical information review of the recreational uses of the waterbody back to November 28, 1975. Historical resources that should be examined include, but are not limited to, photographic evidence, local newspapers, museum collections, published reports, historical society records, and long-term landowners/residents. Texas Parks and Wildlife Department and commercial providers of outdoor recreation goods and services should be consulted for historical information.		
	Start Date	Month 3	Completion Date Month 14
Subtask 6.3	NETMWD will conduct 2 field surveys at each selected site (Subtask 6.1). Surveys shall be conducted during a normal warm season (air temperature $\geq 70^{\circ}\text{F}$ ) during baseflow conditions. Baseflow conditions are sustained or typical dry, warm-weather flows between rainfall events, excluding unusual antecedent conditions of drought or wet weather. The surveys should be performed during the period people would most likely be using the waterbody for contact recreation, typically March to October (e.g., spring break, summer, holidays, weekends).		
	<p>To ascertain the suitability of the streams for contact recreation use, field surveys shall document hydrological characteristics of the stream, such as width and depth of channel and substantial pools, flow/discharge, air/stream temperature, bank access, and stream substrate. Information to be collected shall at least satisfy those questions found on the Field Data Sheet from the latest version of the TCEQ staff draft <i>Recreational Use-Attainability Analyses (RUAA) – Procedures for a Comprehensive RUAA and a Basic RUAA Survey</i>.</p> <p>NETMWD shall document and describe antecedent (prior to fieldwork) rainfall conditions (approximately 30 days) at each selected site.</p>		
Start Date	Month 3	Completion Date	Month 26
Subtask 6.4	NETMWD shall collect a digital photographic record of each selected site during the field surveys. Photographs shall include upstream, left and right bank, and downstream views. Any evidence of observed uses or indications of human use shall be photographed. Photographs should clearly depict the entire channel and each transect measured.		
	To aid in documenting existing uses, NETMWD shall install, operate, and maintain motion-capture cameras at selected monitoring locations from Subtask 5.1 (only those locations on Big Cypress, Hart, and Tankersley Creeks).		
Start Date	Month 3	Completion Date	Month 14

Subtask 6.5	<p>In order to obtain information on existing and historical uses and stream characteristics, NETMWD shall conduct interviews of 1) users present during the field surveys, 2) streamside landowners along the field survey transects, 3) local residents, and 4) commercial providers of outdoor recreation goods and services. Survey instrument shall include at least those questions found on the Interview Form from the latest version of the TCEQ staff draft <i>Recreational Use-Attainability Analyses (RUAAs) – Procedures for a Comprehensive RUAA and a Basic RUAA Survey</i>.</p>		
	Start Date	Month 3	Completion Date Month 26
Deliverables	<ul style="list-style-type: none"> <li>• Station Location Request Forms (as needed) in electronic format</li> <li>• Contact Information Form from the latest version of the TCEQ staff draft <i>Recreational Use-Attainability Analyses (RUAAs) – Procedures for a Comprehensive RUAA and a Basic RUAA Survey</i></li> <li>• Field Data Sheets and Data Summary in electronic format</li> <li>• Digital photographic record, cataloged in an appropriate manner</li> <li>• Interview Forms and Data Summary in electronic format</li> <li>• Technical Report summarizing historical information review, field surveys, and user interviews; Technical Report shall at least include those contents described for a Comprehensive RUAA in the latest version of the TCEQ staff draft <i>Recreational Use-Attainability Analyses (RUAAs) – Procedures for a Comprehensive RUAA and a Basic RUAA Survey</i></li> </ul>		

**Part III – Financial Information**

<b>Budget Summary</b>	
<b>Category</b>	<b>Costs</b>
Personnel	\$ 45,000
Fringe Benefits	\$ 13,500
Travel	\$ 7,500
Equipment	\$ 10,000
Supplies	\$ 2,000
Contractual	\$ 242,100
Construction	\$ 0
Other	\$ 0
Total Direct Costs	\$ 320,100
Indirect Costs (≤15%)	\$ 0
<b>Total Project Costs</b>	<b>\$ 320,100</b>

<b>Budget Justification</b>		
<b>Category</b>	<b>Costs</b>	<b>Justification</b>
Personnel	\$ 45,000	Field Technician (50% time for 22 month sampling period) to collect field, flow, and bacteria grab samples. Public outreach coordinator (25% time for project period) to coordinate and facilitate public stakeholder meetings.
Fringe Benefits	\$ 13,500	30% of personnel cost to cover insurance for the project period
Travel	\$ 7,500	Travel cost to collect field samples and delivery to lab
Equipment	\$ 10,000	Equipment includes: 14 staff gauge plates, HOBO barometric pressure kit, YSI replacement sensors for field data collection, YSI 650-03 MDS Controller, and 3 Moultree IR digital trail cameras including necessary hardware.
Supplies	\$ 2,000	Supplies for project administration
Contractual	\$ 242,100	Detailed contractor budget justification below for Water Monitoring Solutions, Inc. (\$197,100) and Ana-Lab Corp. (\$45,000)
Construction	\$ 0	N/A
Other	\$ 0	N/A
Indirect	\$ 0	N/A
SOURCE	TSSWCB will provide \$320,100 in non-federal funds sourced from state appropriations (FY2009 General Revenue) through a TMDL Program Grant to the Northeast Texas Municipal Water District.	

<b>Contractual Budget Justification – Water Monitoring Solutions, Inc.</b>		
<b>Category</b>	<b>Total Amount</b>	<b>Justification</b>
Personnel	\$ 134,500	Labor costs associated with project management/tracking, making flow measurements, developing rating curves, performing site surveys, attending meetings/conference calls, providing data analysis and technical reporting services. Project staff (at various % times) will include a project manager, aquatic scientists, field technicians, hydrologist, and administrative assistants.
Fringe Benefits	\$ 33,200	~20% of personnel cost to cover insurance for the project period
Travel	\$ 18,500	Hotel, meals, and mileage costs to install meters, make flow measurements, perform site surveys, conduct interviews, attend meetings, etc.
Equipment	\$ 6,700	Costs to rent Doppler equipment for performing stream surveys and making flow measurements
Supplies	\$ 1,400	Cost for miscellaneous hardware, ropes, ice, etc.
Contractual	\$ 0	N/A
Construction	\$ 2,800	Cost of materials for installation of staff plates and continuous level gages at stream stations
Other	\$ 0	N/A
Indirect	\$ 0	N/A

<b>Contractual Budget Justification – Ana-Lab Corp.</b>		
<b>Category</b>	<b>Total Amount</b>	<b>Justification</b>
Personnel	\$ 0	N/A
Fringe Benefits	\$ 0	N/A
Travel	\$ 0	N/A
Equipment	\$ 0	N/A
Supplies	\$ 0	N/A
Contractual	\$ 45,000	Lab cost for 864 E. coli samples @ \$21.00 per sample and 350 BST samples @ \$75.00 per sample (method 1603)
Construction	\$ 0	N/A
Other	\$ 0	N/A
Indirect	\$ 0	N/A