# Appendix H to the Cypress Creek Basin Planning Agency / Clean Rivers Program FY 2002/2003 QAPP

# Tankersley Creek Indicator Bacteria Special Study Upper Big Cypress Creek Watershed

Prepared by the Cypress Creek Basin Planning Agency

In Cooperation with
the Texas Natural Resource Conservation Commission
(TNRCC)

Effective Period: September 2002 through August 2003

Questions concerning this QAPP should be directed to:

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## SS-A1 APPROVAL PAGE

The following signatures are required for the special study:

Walt Sears, Jr., Northeast Texas Municipal Water District
General Manager Date:

Paul Price, Cypress Creek Basin Planning Agency
Project Manager Date:

Peggy Jones, Cypress Creek Basin Planning Agency
Quality Assurance Officer Date:

David Thomas, Cypress Creek Basin Planning Agency
Technical Coordinator Date:

Patricia Wise, TNRCC CRP Project Manager Date:

Bernard Ray, TNRCC CRP Lead Quality Assurance Specialist Date:

Laurie Curra, CRP Project Quality Assurance Specialist Date:

Andrew Sullivan, Technical Specialist, TMDL Team Date:

Michele Blair, Technical Specialist, SWQM Team Date:

Note: The Cypress Creek Basin Planning Agency will secure written documentation from each participant attesting to their awareness of and commitment to requirements contained in this quality assurance project plan appendix. The Cypress Creek Basin Planning Agency will maintain this documentation as part of the project's quality assurance records. (See attached example letter to document adherence).

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LIST OF ACRONYMS

| | |
|---|---|
| **CLI** | **Caddo Lake Institute** |
| **COC** | **Chain-of Custody** |
| **CRP** | **Clean Rivers Program** |
| **DMP** | **Data Management Plan** |
| **DQO** | **Data Quality Objective** |
| **NETMWD** | **Northeast Texas Municipal Water District** |
| **PPA** | **Paul Price Associates, Inc.** |
| **QA** | **Quality Assurance** |
| **QAM** | **Quality Assurance Manual** |
| **QAO** | **Quality Assurance Officer** |
| **QAPP** | **Quality Assurance Project Plan** |
| **QAS** | **Quality Assurance Specialist** |
| **QMP** | **Quality Management Plan** |
| **RBP** | **Rapid Bioassessment Protocol** |
| **RWA** | **Receiving Water Assessment** |
| **SOP** | **Standard Operating Procedure** |
| **SWQM** | **Surface Water Quality Monitoring** |
| **TMDL** | **Total Maximum Daily Load** |
| **TNRCC** | **Texas Natural Resource Conservation Commission** |
| **TSWQS** | **Texas Surface Water Quality Standards** |
| **VOA** | **Volatile Organic Analytes** |
| **WMT** | **Watershed Management Team** |

## SS-A3 DISTRIBUTION LIST

As described in Section A3 of the Cypress Creek Basin Fiscal Year 2002-2003 QAPP.

## SS-A4 PROJECT/TASK ORGANIZATION

**TNRCC**

Linda Brookins, CRP Program Manager, as described in Section A4 of the Cypress Creek Basin Fiscal Year 2002-2003 QAPP.

Bernard Ray, CRP Lead Quality Assurance Specialist, as described in Section A4 of the Cypress Creek Basin Fiscal Year 2002-2003 QAPP.

Patricia Wise, CRP Project Manager, as described in Section A4 of the Cypress Creek Basin Fiscal Year 2002-2003 QAPP.

Eric Reese, CRP Data Manager, as described in Section A4 of the Cypress Creek Basin Fiscal Year 2002-2003 QAPP.

Laurie Curra, CRP Project Quality Assurance Specialist, as described in Section A4 of the Cypress Creek Basin Fiscal Year 2002-2003 QAPP.

**Cypress Creek Basin Planning Agency**
**Northeast Texas Municipal Water District**

Walt Sears, Jr., General Manager, as described in Section A4 of the Cypress Creek Basin Fiscal Year 2002-2003 QAPP.

Howard Pafford, Water Quality Specialist, Sampling Coordinator. Mr. Pafford will provide field sample support and will assist in maintaining proper documentation of sampling events, sample preservation, sample shipment to Dr. Roy Darville, and field procedures at the six designated special study stations.

**Paul Price Associates, Inc.**

Paul Price, Cypress Creek Basin Project Manager, as described in Section A4 of the Cypress Creek Basin Fiscal Year 2002-2003 QAPP.

Peggy Jones, Cypress Creek Basin Data Manager and Quality Assurance Officer, as described in Section A4 of the Cypress Creek Basin Fiscal Year 2002-2003 QAPP.

David Thomas, Cypress Creek Basin Technical Coordinator, as described in Section A4 of the Cypress Creek Basin Fiscal Year 2002-2003 QAPP.

Dr. Roy Darville, East Texas Baptist University/Caddo Lake Institute, Laboratory Coordinator/Analyst. Dr. Darville's responsibility will involve fecal and E. coli sample preparation, analysis, quality assurance and quality control.

Figure SS-A4
Project Organization Chart
Cypress Creek Basin
Clean Rivers Program

## SS-A5 PROBLEM DEFINITION

Tankersley Creek (Segment 0404b) is an unclassified freshwater stream in the Cypress Creek Basin that extends 8 miles from its confluence with Big Cypress Creek to the upstream perennial portion of the stream northwest of Mount Pleasant in Titus County, Texas (Figure SS-1). Tankersley Creek was listed on the TNRCC's 2000 Clean Water Act Section Draft 303(d) List of Texas water bodies that do not meet or are not expected to meet applicable water quality standards. The 303(d) list is a requirement of the Federal Clean Water Act, Section 303(d) and 40 Code of Federal Regulations (CFR), Section 130.7.

Tankersley Creek (Segment 0404b) was listed with the following segment summary: "Bacteria levels sometimes exceed the criterion established to assure the safety of contact recreation (L/NS) (L – low priority; NS – not supporting designated use)." There was insufficient bacteriological data available for the 2002 assessment to evaluate changes in water quality. No information was available for this segment to include in the Cypress Creek Basin Task 5a Review of the FY2002 TNRCC 305(b) Water Quality Assessment Report submitted to TNRCC on 15 February 2002. An "all station query" was conducted on 29 August 2002 to inventory the most current accessible fecal coliform/*E. coli* sample results collected on Tankersley Creek by station that has been entered into the TNRCC Regulatory Activity and Compliance System (TRACS). As of 23 August 2002, the most current fecal coliform and *E. coli* values contained in TRACS was a single sample for each species taken by TNRCC during FY2001 from Tankersley Creek at FM 3417 on 21 December 2000. Therefore, Tankersley Creek will remain on the 2002 303(d) list of impaired waterbodies until sufficient data are available to assess.

Indicator bacteria samples taken from Tankersley Creek at FM 899 in Mount Pleasant (TNRCC Station 10264) in the upper 3 miles of the watershed and from two stations in the lower 5 miles of this drainage at FM 127 southwest of Mount Pleasant (TNRCC Station 10263) and from FM 3417 south of Mount Pleasant (TNRCC Station 10261) sometimes show that fecal coliform levels exceed the criterion established to assure the safety of contact recreation.

The Texas Natural Resource Conservation Commission (TNRCC) and local Cypress Creek Basin stakeholders have suggested that some additional investigation to: confirm or challenge those results, build a comparable *E. coli* database, and to obtain information on the origin and occurrence of these two indicator bacteria species. Additional study recommendations have included a wider geographical coverage for future sampling, or investigation of the relationship between runoff events and bacteria levels. An additional consideration is the need to document the comparability of the fecal coliform results that resulted in the Tankersley Creek 303 (d) listing with the *E. coli* sampling that will be the water quality standard in the future.

Fecal coliform data from the Tankersley Creek crossings at FM 899 and at FM 3417 show the tendency of bacteria levels to rise and fall together, with higher concentrations at the downstream station (FM 3417). These results are not very helpful in locating specific sources of bacteria, seeming to indicate widely distributed, probably non point sources. Additional analysis of the existing data may be helpful in examining the role of runoff in stream bacterial levels, and will be included in the special study report

that will conclude this proposed work.

## SS-A6 PROJECT/TASK DESCRIPTION

The Tankersley Creek bacteria study described here has been developed to address the concerns and issues mentioned in the preceding section (SS-A5). The three primary goals of this study are 1) to confirm, or challenge, the results of previous monitoring of indicator bacteria in Tankersley Creek, 2) to establish parallel fecal coliform and E. coli data sets at stations formerly sampled only for fecal coliform, and 3) to develop additional information on the origin and distribution of indicator bacteria in this portion of the Cypress Creek Basin. Goals 1 and 2 will be addressed by continued quarterly (routine) sampling at TNRCC Stations 10264 and 10261 on Tankersley Creek for both fecal coliform bacteria and E. coli. Goal 3 will be addressed using the Tankersley Creek stations, by additional quarterly sampling for E. coli at stations located on Big Cypress Creek and Hart Creek, which drains the eastern side of Mount Pleasant, and by initiation of a wet weather sampling program at all stations to document the levels of this bacterial species during and following rainfall/runoff events. Bacterial data collected under a variety of documented climatic conditions will be evaluated with respect to the dominant land uses and facilities most likely to be E. coli sources within the watersheds of each of the stations occupied to identify the most probable source areas, and assess the degree to which the recreational value of those watercourses is affected by bacterial loading.

*E. coli* samples will be collected from six locations: Tankersley Creek at FM 889 (TNRCC Station 10264), Tankersley Creek at FM 3417 (TNRCC Station 10261), Hart Creek at State Highway (SH) 49 (TNRCC Station 10272), Hart Creek at SE 12 (TNRCC Station 10266), Big Cypress at SH11 (TNRCC Station 10308), and Big Cypress Creek at a point below the Lake Bob Sandlin dam and upstream of the Tankersley Creek confluence (TNRCC Station 10311) (Figure SS-1). . Fecal coliform samples will also be collected from the two Tankersley Creek locations (TNRCC stations 10261 and 10264). Anticipated schedule for completing the work on time is from September 1, 2002 to June 30, 2003.

All samples will be collected from stormwater runoff resulting from a storm event that is greater than 0.1 inches in magnitude, at a rate of delivery of 0.25 inches/hour or more and occurs at least 72 hours from the previously measurable (greater than 0.1 inch of rainfall) storm event (Pers. comm. G. Ward, 24 April 2002). Runoff event samples will be collected in response to a rise in water level detected by the existing ISCO Model 4230 wet weather monitoring stream flow meter now in place on Hart Creek at SE 12. The existing modem-telephone line installation has been retained to notify sample collection personnel. Rainfall events will be monitored by three automated tipping-bucket gages that will be placed at secure locations in the Hart, Tankersley and Big Cypress Creek watersheds. The gages electronically record the rainfall that occurs over a set time period. All gages will be visited after each event to upload data and service the equipment as stated in the manufacturers instructions. The rainfall amounts will then be recorded from each affected area on the field datasheet (See Appendix 1) during a given rainfall/runoff event. The electronic rainfall records will be kept for analysis, archived and available to the TNRCC upon request.

Person(s) who will be collecting samples will be identified well ahead of time, so that they can familiarize

themselves with the procedures that are involved in properly obtaining stormwater bacteria samples. Samplers will need to react quickly once a qualifying storm event occurs. Arrangements will be made for personnel to be available for storm events that may occur outside of normal business hours. A grab sample must be obtained immediately after runoff reaches the collection station.
It is anticipated that up to four runoff events will be monitored during the FY2003 contract year. Based on 4 wet weather events, a total of 72 *E. coli* samples will be collected and a total of 24 fecal coliform samples will be taken. Manual sample collection at all six station locations will be initiated immediately by Northeast Texas Municipal Water District (NETMWD) and Franklin County Water District (FCWD) personnel upon receiving the water level alarm and delivered to Dr. Roy Darville at his laboratory at East Texas Baptist University (ETBU) for analysis within six hours after collection. A laboratory quality control sample for the purpose of performing bacteriological duplicates will be collected for each 10 samples collected. This sample is not an additional sample but a special designation for an existing sample. A 100 ml sample will be collected at random and split into two equal sample test volumes of 50 ml and diluted with 50 ml of sterile DDI water to a 100 ml total volume. Sample dilution for *E. coli* will follow guidelines as outlined in the "*E.coli Colilert® Quanti-tray® 2002 Method Standard Operating Procedure (Revised 9/28/01) and "Laboratory Quality Asurance Guidance for Colilert®/Enterolert® Analysis Under the Clean Rivers Program (Revised 10/4/01)* provided by the TNRCC. Fecal coliform analysis will be conducted as described in the 1999 TNRCC *Surface Water Quality Monitoring Procedures Manual.* Each laboratory duplicate container will be clearly identified as a laboratory quality control sample.

To evaluate the role of initial surface runoff as a transporter of *E. coli* in the study watersheds, follow up sampling will be conducted approximately 24 hours after the collection of the initial sample, and again at an interval of approximately one week (7 days) from initial sample collection to document the changes in bacterial levels following a runoff event. The collection schedule will be maintained regardless of storm duration or the occurrence of multiple storm events to assess the relative importance of initial runoff versus subsequent surface flushing and drainage from tributaries, surface impoundments, and bank storage.

At each sample location, a temporary staff gage will be positioned and a cross section recorded during the initial setup phase. Water level (ft.) on the staff gage and an estimated flow ($ft^3/s$) will be recorded each time the station is visited and/or a sample is collected. An attempt will be made to establish a correlation between significant precipitation and the rise of the hydrograph. Additional field information, such as flow severity and days since last significant rainfall, will be recorded at each station during each sampling event.

In addition to the storm runoff sampling, bacterial samples would also be collected during the quarterly FY2003 sampling period to continue the established seasonal sampling that tend to be collected during periods of lower stream flow. Based on 4 quarterly events, a total of 24 *E. coli* samples will be collected and a total of 8 fecal coliform samples will be taken. Stream flow measurements consisting of physical stream channel dimensions of width and depth, during quarterly sampling the total flow (discharge), and staff gage readings will be determined. Instantaneous field parameters of water temperature, dissolved oxygen, conductivity, pH, and Secchi depth would also be recorded.

Currently, land use and permitted discharger information is available on Geographic Information System (GIS) files for the entire Cypress Creek Basin. A description of the various existing land uses surrounding the Tankersley watershed will be prepared based on this existing data layer. In addition, land uses occurring in the general special study area (i.e., agricultural operations, developed water resources, forestry, industrial/commercial, pastureland, recreational, urban development, and undeveloped land) will be identified. Permitted outfall areas will also be identified based on existing database information provided by TNRCC. Paul Price Associates, Inc. will prepare the draft and final report for the Tankersley Creek Indicator Bacteria Special Study. The reports will summarize the data collected and make recommendations concerning standards attainment and continuation of monitoring bacterial trends.

## SS-A7 QUALITY OBJECTIVES AND CRITERIA FOR MEASUREMENT DATA

Tankersley Creek has failed to meet water quality standards for contact recreation due to elevated fecal coliform densities taken from three monitoring stations. The key objective of the Tankersley Creek Indicator Bacteria Special Study – Upper Big Cypress Creek Watershed is to provide and incorporate new information on fecal coliform conditions into the existing database for the reassessment of Tankersley Creek during the next 305b/303d listing process. Two additional objectives of the study involve the establishment of comparable fecal coliform and *E. coli* data sets sampled quarterly at locations previously sampled just for fecal coliform and the documentation of supplementary ambient and wet weather information on the source and distribution of indicator bacteria in the upper Big Cypress Creek Watershed. Sampling efforts will be conducted to determine the presence and concentration of bacterial contaminants at six water sources.

The measurement performance criteria to support the project objectives are specified in Table SS-1.

**Table SS-1 - Data Quality Objectives for Measurement Data**

| PARAMETER | UNITS | MATRIX | METHOD | STORET | AWRL | PRECISION of laboratory duplicates RPD | ACCURACY of calibration control stds. AWRLS (% Rec.) | ACCURACY of lab matrix spikes (% Rec.) | LABORATOEY PERFORMING ANALYSIS |
|---|---|---|---|---|---|---|---|---|---|
| **Field Parameters** | | | | | | | | | |
| pH - Field | pH(s.u.) | Water | EPA 150.1 and TNRCC SOP | 00400 | NA* | NA | NA | NA | CRP Sampling Staff |
| Dissolved Oxygen (D.O.) | mg/L | Water | EPA 360.1 and TNRCC SOP | 00300 | NA* | NA | NA | NA | CRP Sampling Staff |
| Conductivity | uS/cm | Water | EPA 120.1 and TNRCC SOP | 00094 | NA* | NA | NA | NA | CRP Sampling Staff |
| Water Temperature | Degrees Centigrade | Water | EPA 170.1 and TNRCC SOP | 00010 | NA* | NA | NA | NA | CRP Sampling Staff |
| Secchi Depth | meters | Water | TNRCC SOP | 00078 | NA* | NA | NA | NA | CRP Sampling Staff |
| Days since last significant rainfall | days | Water | TNRCC SOP | 72053 | NA* | NA | NA | NA | CRP Sampling Staff |
| Flow | cfs | Water | TNRCC SOP | 00061 | NA* | NA | NA | NA | CRP Sampling Staff |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Flow Estimate | cfs | Water | TNRCC SOP | 74069 | NA* | NA | NA | NA | CRP Sampling Staff |
| Flow measurement method | 1- Gage<br>2-electric<br>3-mechanical<br>4-weir/flume | Water | TNRCC SOP | 89835 | NA* | NA | NA | NA | CRP Sampling Staff |
| Flow severity | 1-no flow,<br>2-low,<br>3-normal,<br>4-flood,<br>5-high,<br>6-dry | Water | TNRCC SOP | 01351 | NA* | NA | NA | NA | CRP Sampling Staff |
| Rainfall – 1 day | inches | Water | TNRCC SOP | 82553 | NA* | NA | NA | NA | CRP Sampling Staff |
| Rainfall – 7 days | inches | Water | TNRCC SOP | 82554 | NA* | NA | NA | NA | CRP Sampling Staff |
| **Bacteriological Parameters** | | | | | | | | | |
| E. coli, IDEXX Colilert | mpn/100mL | Water | SM 9223-B | 31699 | 1.0 | 1 ** | NA | NA | ETBU |
| Fecal coliform | org/100mL | Water | SM 9222-D | 31616 | 1.0 | 1 ** | NA | NA | ETBU |

* Reporting to be consistent with SWQM guidance and based on measurement capability

References for Table SS-2:

TNRCC SOP - TNRCC Surface Water Quality Monitoring Procedures Manual, June, 1999 or subsequent editions.

** Based on range statistic as described in Standard Methods, 20th Edition, Section 9020-B, Quality Assurance/Quality Control-Intralaboratory Quality Control Guidelines.

American Public Health Association (APHA), American Water Works Association (AWWA), and Water Environment Federation (WEF), "Standard Methods for the Examination of Water and Wastewater," 20th Edition,1999.

## Precision

As described in Section A7 on Page 24 of the Cypress Creek Basin Fiscal Year 2002-2003 QAPP.

## Accuracy

As described in Section A7 on Page 25 of the Cypress Creek Basin Fiscal Year 2002-2003 QAPP.

## Representativeness

The purpose of this indicator bacteria special study is to evaluate temporal and spatial variability in concentration of fecal coliform and *E. coli* bacteria over a variety of weather conditions. Bacteria levels are believed to rise in wet weather as a result of factors such as land surface flushing by storm water runoff and sewage overflows. Sharply elevated bacterial concentrations in initial runoff samples are believed to be representative of easily mobilized materials in or adjacent to the watercourse. Persistence of high bacterial concentrations in subsequent samples is representative of continued release from a primary or secondary source, for example septic tank or barnyard drainages (primary), or dewatering of tributary and floodplain pools (secondary). Sample locations were selected to provide information on the relative importance of urban/rural sources and the presence of central wastewater collection and treatment facilities.

## Comparability

As described in Section A7 on Page 25 of the Cypress Creek Basin Fiscal Year 2002-2003 QAPP.

**Completeness**

As described in Section A7 on Page 25 of the Cypress Creek Basin Fiscal Year 2002-2003 QAPP.

## SS-A8 SPECIAL TRAINING/CERTIFICATION

Dr. Roy Darville of East Texas Baptist University and the Caddo Lake Institute has conducted fecal coliform laboratory work over the past 25 years and for the Clean Rivers Program for the last 4 years. Dr. Darville attended the TNRCC Clean Rivers Program IDEXX Colilert/Enterolert Training session on 2 October 2001 at the City of Houston Health and Human Services Laboratory. The agenda included an introduction to methods, an overview of standard operating procedures, discussion and demonstrations by City of Houston staff, quality control and practice time in the laboratory that included sample dilution, sample preparation, sample enumeration, MPN calculation and the computation of Quality Control results.

## SS-A9 DOCUMENTATION AND RECORDS

As described in Section A9 on Page 27 of the Cypress Creek Basin Fiscal Year 2002-2003 QAPP.

## SS-B1 SAMPLING PROCESS DESIGN

The data collection design is summarized in tables SS-2 and SS-3 (Sampling Sites and Monitoring Frequencies) and Figure SS-1 (Sample Site Maps).

Table SS-2
Fiscal Year 2003 Proposed Special Study Stations for the Cypress Creek Basin.
Runoff Event Samples

| Segment | Station ID | Site Description | Prog. Code | SC1/SC2 | *E. coli* Bacteria | Fecal Coliform Bacteria | Rainfall * | Flow Severity/ Estimate^ |
|---|---|---|---|---|---|---|---|---|
| 0404 | 10264 | Tankersley Creek at FM 899 | SS | NT/CL | 12 | 12 | 12 | 12 |
| 0404 | 10261 | Tankersley Creek at FM 3417 | SS | NT/CL | 12 | 12 | 12 | 12 |
| 0404 | 10266 | Hart Creek at SE 12 | SS | NT/CL | 12 | | 12 | 12 |
| 0404 | 10272 | Hart Creek at SH 49 | SS | NT/CL | 12 | | 12 | 12 |
| 0404 | 10311 | Big Cypress Creek below Lake Bob Sandlin | SS | NT/CL | 12 | | 12 | 12 |
| 0404 | 10308 | Big Cypress Creek at Hwy. 11 | SS | NT/CL | 12 | | 12 | 12 |

*Days since last significant rainfall

^Estimates of flow will be made during the event and 24-hr sampling sequence and if feasible, instantaneous flow measurements will be taken concurrent with the 7-day sample.

Table SS-3
Fiscal Year 2003 Proposed Special Study Stations for the Cypress Creek Basin.
Quarterly Event Samples

| Segment | Station ID | Site Description | Prog. Code | SC1/SC2 | E. coli Bacteria | Fecal Coliform Bacteria | Rainfall * | Flow Severity | Field ** | Instant. Flow |
|---|---|---|---|---|---|---|---|---|---|---|
| 0404 | 10264 | Tankersley Creek at FM 899 | SS | NT/CL | 4 | 4 | 4 | 4 | 4 | 4 |
| 0404 | 10261 | Tankersley Creek at FM 3417 | SS | NT/CL | 4 | 4 | 4 | 4 | 4 | 4 |
| 0404 | 10266 | Hart Creek at SE 12 | SS | NT/CL | 4 | | 4 | 4 | 4 | 4 |
| 0404 | 10272 | Hart Creek at SH 49 | SS | NT/CL | 4 | | 4 | 4 | 4 | 4 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 0404 | 10311 | Big Cypress Creek below Lake Bob Sandlin | SS | NT/CL | 4 | | 4 | 4 | 4 | 4 |
| 0404 | 10308 | Big Cypress Creek at Hwy. 11 | SS | NT/CL | 4 | | 4 | 4 | 4 | 4 |

*Days since last significant rainfall

**Field = Water temperature, dissolved oxygen, conductivity, pH, Secchi depth, and observations

Figure SS-1
Cypress Creek Basin-Clean Rivers Program
FY2002
Special Study Sampling Sites

**Sample Design Rationale and Site Selection Criteria**

The sample design rationale is based on the intent of the study to characterize the spatial and temporal bacteriological presence under a variety of flow regimes in the upper reaches of the Big Cypress Creek watershed (Segments 0404, 0404b, and 0404c) by the collection of *E. coli* and fecal coliform samples. To this end, 6 stations have been selected based on accessibility, the intent to assess the geographic extent of elevated bacterial concentrations, the intent to investigate the relationship between runoff events and bacteria levels and the intent to collect seasonal samples on a quarterly basis during periods of lower stream flow.

## SS-B2 SAMPLING METHODS

**Field Sampling Procedures**

The special study will follow the guidelines and policies set forth in the *CRP Program Guidance & Reference Guide FY 2002-2003* (and Appendices). Sampling methods will be consistent with the procedures outlined in the *TNRCC Surface Water Quality Monitoring Procedures Manual* (June 1999 or subsequent editions. Methods for measuring field parameters are detailed in Chapter 2 of the June 1999 *TNRCC Surface Water Quality Monitoring Procedures Manual*, and procedures for fecal coliform sampling and analysis are presented in Chapter 3. The procedures for *Escherichia coli* sampling and analysis will follow the *Laboratory Quality Assurance Guidance for Colilert®/Enterolert® Analysis Under the Clean Rivers* Program (Revised 10/4/01) as adapted from Section 9020 B of *Standard Methods for the Examination of Water and Wastewater*, 20th Edition.

**Sample volume, container types, minimum sample volume, preservation requirements, and holding time requirements.**

Sample volume, container types, minimum sample volume, preservation requirements, and holding requirements are presented in Table SS-4. Refrigeration will be the sample preservation technique used because it has no detrimental effect on the sample composition and does not interfere with most analytical methods. Preservation requires the sample to be quickly chilled to a temperature of 4°C. This technique is used at the beginning of collection in the field, and is continued during transportation, and while the sample is transferred to the laboratory. The samples will be placed in a pre-cooled ice chest. The holding time is the maximum amount of time that samples may be held before initiation of analysis and still be considered valid. Samples exceeding the 6-hour holding time will be considered suspect and

any resulting data used only with appropriate cautionary language.

**Table SS-4. Sample Storage, Preservation, and Handling Requirements**

| Parameter | Matrix | Container | Preservation | Sample Volume | Holding Time |
|---|---|---|---|---|---|
| Fecal Coliform | Water | Styrene | Sodium thiosulfate Cool to 4°C | 100 ml | 6 hours |
| *Escherichia coli* | Water | Styrene | Sodium thiosulfate Cool to 4°C | 100 ml | 6 hours |

**Sample Containers**

East Texas Baptist University will provide the sample containers necessary for sample collection. A sterile, styrene 100 ml Colilert sample bottle purchased from IDEXX will be provided for *E. coli* and fecal coliform analysis.

**Processes to Prevent Contamination**

Care must be taken to assure that the containers in which samples are to be collected are clean (sterile) and pose no threat of contamination to the bacteria samples.

The presterilized Colilert plastic bottle has a clear seal over its cap and contains sodium thiosulfate ($Na_2S_2O_3$). Any sample bottle whose seal is broken will be discarded. For sampling purposes, the seal and cap will be removed being careful not to touch the inside of the cap or bottle. During the sampling process, the collector should stand downstream of the collection area avoiding contact to the inside of the plastic bottle.

**Documentation of Field Sampling Activities**

Field sampling activities will be documented on a field data sheet as presented in Appendix 1. During all visits, documentation of field sampling activities will follow the protocol as described in Section B2 of the Cypress Creek Basin Fiscal Year 2002-2003 QAPP.

**Recording Data**

As described in Section B2 on Page 32 of the Cypress Creek Basin Fiscal Year 2002-2003 QAPP.

**Failures in Sampling Methods Requirements and/or Deviations from Sample Design and Corrective Action**

As described in Section B2 on Page 32 of the Cypress Creek Basin Fiscal Year 2002-2003 QAPP.

## SS-B3 SAMPLING HANDLING AND CUSTODY PROCEDURES

**Chain-of -Custody**

Chain-of-custody forms (identical to that shown in Appendix 1) will be used to document sample collection and transportation to the ETBU laboratory for analysis. The chain-of-custody record will identify the contents of each sample cooler and maintain the custodial integrity of the samples. Until the samples are transported to the laboratory, the custody of the samples will be the responsibility of the sampler.

**Sample Labeling**

All samples collected will be labeled with an indelible marker in a clear and precise way for proper identification in the field and for tracking in the laboratory. The samples will have unique numbers or other identifiers. At a minimum, the sample labels will contain the station identification number, sample collector's name, date and time of collection, and analytical parameter. Bottles will be labeled prior to sample collection.

**Sample Handling**

For samples to remain representative of the event in which they were collected, they must be handled in a proper manner. The field collector will avoid touching the inside of the container to prevent contamination and keeping the sample free from uncharacteristic floating debris.

Unused Colilert sample bottles, provided by ETBU, will be stored and in the possession of the field collectors prior to each sample collection event. The Cypress Creek Basin Sampling Coordinator will notify the Laboratory Coordinator/Analyst immediately when circumstances provide advance expectation of a rainfall sampling event. An automated, battery operated water level gage system consisting of a bubbler type flow meter currently resides at the Hart Creek SE 12 bridge crossing. Runoff event samples will be collected in response to a rise in water level detected by the water level sensor that will prompt the telemetry equipment (modem-telephone line) to alert local, trained personnel of an impending sample event.

At each creek location, E. coli samples will be taken by holding the sample bottle near the base and dipping it, neck downward, below the water surface. Turn the bottle until it points slightly upward and is directed toward the current. In shallow waters, particular care will be taken to sample the water without touching any solids. Fecal coliform sample collection from the two Tankersley Creek locations will also follow the aforementioned methodology. Bottles will be capped tightly and placed immediately on wet ice until delivery to the laboratory.

The labeled sample bottles and a chain-of-custody form (presented in Appendix 1) will be hand-delivered to the ETBU laboratory to begin sample preparation. The ETBU custodian will examine all arriving samples for proper documentation and will also determine whether the samples have met the holding time constraints or whether new samples should be collected. The ETBU custodian will accept delivery by signing the final portion of the chain-of-custody form and retain the original copy. The ETBU

custodian will log and monitor the progress of the samples through the analysis stage.

**Failures in Chain-of-Custody and Corrective Action**

As described in Section B3 on Page 35 of the Cypress Creek Basin Fiscal Year 2002-2003 QAPP.

## SS-B4 ANALYTICAL METHODS

As described in Section B4 on Page 36 of the Cypress Creek Basin Fiscal Year 2002-2003 QAPP.

**Standards Traceability**

As described in Section B4 on Page 36 of the Cypress Creek Basin Fiscal Year 2002-2003 QAPP.

**Analytical Method Modification**

As described in Section B4 on Page 36 of the Cypress Creek Basin Fiscal Year 2002-2003 QAPP.

**Failures or Deviations in Analytical Method Requirements and Corrective Actions**

As described in Section B4 on Page 36 of the Cypress Creek Basin Fiscal Year 2002-2003 QAPP.

## SS-B5 QUALITY CONTROL

**Sampling Quality Control Requirements and Acceptability Criteria**

As described in Section B5 on Page 37 of the Cypress Creek Basin Fiscal Year 2002-2003 QAPP.

**Laboratory Measurement Quality Control Requirements and Acceptability Criteria**

As described in Section B5 on Page 38 of the Cypress Creek Basin Fiscal Year 2002-2003 QAPP.

**Failures in Field and Laboratory Quality Control and Corrective Action**

As described in Section B5 on Page 40 of the Cypress Creek Basin Fiscal Year 2002-2003 QAPP.

## SS-B6 INSTRUMENT/EQUIPMENT TESTING, INSPECTION AND MAINTENANCE

As described in Section B6 of the Cypress Creek Basin Fiscal Year 2002-2003 QAPP.

## SS-B7 INSTRUMENT CALIBRATION AND FREQUENCY

As described in Section B7 of the Cypress Creek Basin Fiscal Year 2002-2003 QAPP.

## SS-B8 INSPECTION/ACCEPTANCE REQUIREMENT FOR SUPPLIES AND CONSUMABLES

All materials used for bacterial collection will be provided by Dr. Roy Darville of East Texas Baptist University (ETBU). Containers used for collection will be inspected both at ETBU and by the collection crew.

## SS-B9 NON_DIRECT MEASUREMENTS

As described in Section B9 on Page 44 of the Cypress Creek Basin Fiscal Year 2002-2003 QAPP.

## SS-B10 DATA MANAGEMENT

As described in Section B10 on page 45 of the Cypress Creek Basin Fiscal Year 2002-2003 QAPP.

## SS-C1 ASSESSMENTS AND RESPONSE ACTIONS

As described in Section C1 on page 46 of the Cypress Creek Basin Fiscal Year 2002-2003 QAPP.

**Corrective Action**

As described in Section C1 on Page 46 of the Cypress Creek Basin Fiscal Year 2002-2003 QAPP.

## SS-C2 REPORTS TO MANAGEMENT

**Reports to Cypress Creek Basin Planning Agency Project Management**

As described in Section C2 on page 48 of the Cypress Creek Basin Fiscal Year 2002-2003 QAPP.

**Reports to TNRCC Project Management**

A brief quarterly status report will be submitted on September 15 and December 15, 2002 and March 15 and June 15, 2003. Each report will include a summary of work efforts, analytical results, problems, delays, and corrective actions taken during the quarter's work. The draft report will submitted on July 15, 2003 for review and comments and the final report is due on August 31, 2003.

## SS-D1 DATA REVIEW, VERIFICATION, AND VALIDATION

As described in Section D1 on Page 49 of the Cypress Creek Basin Fiscal Year 2002-2003 QAPP.

## SS-D2 VERIFICATION AND VALIDATION METHODS

As described in Section D2 on Page 50 of the Cypress Creek Basin Fiscal Year 2002-2003 QAPP.

## SS-D3 RECONCILIATION WITH DATA QUALITY OBJECTIVES

No decision regarding the data results used to confirm or challenge prior assessment of bacterial levels in Tankersley Creek or the extension of bacterial assessments to Hart and Big Cypress creeks will be made by the project team. These data and data collected by the project team or other organizations will be subsequently analyzed and used by the TNRCC to conduct the water quality assessment.

An evaluation of the data will be made to monitor these waters for bacteria content and determine the relationship between bacterial levels and runoff, and provide a direct comparison of fecal coliform and *E. coli* results in Tankersley Creek. Sampling prior to a storm water event can provide an indication of whether ambient conditions of concern exist at the time of sampling. Initially, samples will be taken to define the ambient water quality condition at the six locations. Samples will then be taken to illustrate the flush effect that refers to the high concentrations in the first flush of runoff from an area after a long dry period. With sufficient data, a distribution can be created. An analysis of the results of the event and 24-hour runoff versus the non-runoff period for comparison of elevated counts to the typical background levels can be examined to show that runoff has significantly higher bacteria levels than baseflow. Data taken 7 days after the first flush may help track each streams' ability to recover, and the duration of the recovery period.

Data quality will be sufficient to meet the objectives if 1) sufficient samples are collected for standards evaluation, 2) holding times and other Quality Assurance criteria are met, and 3) that runoff samples and ancillary data are collected according to the criteria in the work plan.

**Letter to document adherence to the Basin-wide QAPP Appendix H**

20 September 2002

TO: Walt Sears, Jr. and
Howard Pafford
Northeast Texas Municipal Water District

FROM: David Thomas
Paul Price Associates, Inc.

Please sign and return this form by 3 October 2002 to:

David Thomas
Paul Price Associates, Inc.
3006 Bee Caves Road, Suite D-230
Austin, Texas 78746

I acknowledge receipt of the referenced document(s). I understand the document(s) describe quality assurance, quality control, and other technical activities that must be implemented to ensure the results of work performed will satisfy stated performance criteria.

_____

Signature Date

_____

Signature Date

**Letter to document adherence to the Basin-wide QAPP Appendix H**

20 September 2002

TO: Dwight K. Shellman, Jr. and
Dr. Roy Darville
Caddo Lake Institute/East Texas Baptist University

FROM: David Thomas
Paul Price Associates, Inc.

Please sign and return this form by 3 October 2002 to:

David Thomas
Paul Price Associates, Inc.
3006 Bee Caves Road, Suite D-230
Austin, Texas 78746

I acknowledge receipt of the referenced document(s). I understand the document(s) describe quality assurance, quality control, and other technical activities that must be implemented to ensure the results of work performed will satisfy stated performance criteria.

_____
Signature Date

_____
Signature Date

**Letter to document adherence to the Basin-wide QAPP Appendix H**

20 September 2002

TO: David Weidman and
J.R. Alphin
Franklin County Water District

FROM: David Thomas
Paul Price Associates, Inc.

Please sign and return this form by 3 October 2002 to:

David Thomas
Paul Price Associates, Inc.
3006 Bee Caves Road, Suite D-230
Austin, Texas 78746

I acknowledge receipt of the referenced document(s). I understand the document(s) describe quality assurance, quality control, and other technical activities that must be implemented to ensure the results of work performed will satisfy stated performance criteria.

_____

Signature Date

_____

Signature Date

## Appendix 1

1) Field Data Sheet
2) Bacteriological Raw Data Log Sheet (Fecal Coliform)
3) Colilert Raw Data Log Sheet (*E. coli*)
4) Indicator Bacteria Chain-Of-Custody Sheet

**Paul Price Associates, Inc.**
**3006 Bee Caves Road Suite D-230**
**Austin, Texas 78746**
**(512) 329-0155**

Page: ____ of:_____

**STREAM PHYSICAL CHARACTERISTICS CHECKLIST**

Job Name:_____Job No.:_____Date:___/___/___Observers:_____

Stream:_____Station ID:_____Time:_____ Nearest Stream Segment:_____

Location of Station:_____

WeatherConditions:_____ % Cloud Cover:_____ Air Temp:_____

Length of Stream Evaluated:_____ Days Since Last Rain:_____

| | | | | | |
|---|---|---|---|---|---|
| Stream Type: | perennial | intermittent with perennial pools | | intermittent | reservoir |
| Flow Severity | | | | | |
| 1) No Flow | 2) Low Flow | 3) Normal | 4) Flood | 5) High | 6) Dry |
| Evidence of Flow Fluctuations: | | | Observed Stream Uses: | | |
| Adjacent Land Use: | | | Aesthetics: | 1 Wilderness<br>2 Natural | 3 Common<br>4 Offensive |
| Water Conditions:<br>(foam, flood, etc.) | | | Channel Obstructions/Modifications: | | |
| Stream Bends: | No. Well Defined | No. Moderately Defined: | No. Poorly Defined: | No. of Riffles: | Rainfall Amount |
| Turbidity: | Color: | Water Odor | Flow: | Sediment Odor | |
| Temp: | pH: | Conductivity: | D.O.: | Secchi Depth: | |
| Riparian Vegetation: | Trees (%): | Shrubs (%): | Grasses, Forbs(%): | Cult. Fields (%): | Other (%): |

* Note: Copy on Waterproof Paper
revised from TNRCC form TNRCC-WQS hqi_phys.tbl (8 October 2001)