Sulphur River Basin Surface Water Quality Monitoring Plan
Quality Assurance Project Plan

Sulphur River Basin Authority
911 N. Bishop, Suite C-104
Wake Village, Texas 75501

Clean Rivers Program
Technical Analysis Division
Texas Commission on Environmental Quality
P.O. Box 13087, MC-147
Austin, Texas 78711-3087

Effective Period: September 2003 to August 2005

Questions concerning this quality assurance project plan should be directed to:

Michael Burke
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(903) 223-7887
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A1 APPROVAL PAGE

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Technical Analysis Division

Jim Thomas, Director Date
Technical Analysis Division

Charles Dvorsky, Manager Date
Water Quality Planning & Assessment Section

Linda Brookins Date
Program Manager, Clean Rivers Program

Patricia Wise Date
Project Manager, Clean Rivers Program

Compliance Support Division

Jose A. Franco, Director Date
Compliance Support Division

Stephen Stubbs Date
TCEQ Quality Assurance Manager

Bernard Ray Date
CRP Quality Assurance Specialist
Quality Assurance Section

SULPHUR RIVER BASIN AUTHORITY

Michael Burke Date
SRBA Project Manager

Mike Buttram Date
SRBA Quality Assurance Officer

SRBA will secure written documentation from each sub-tier project participant (e.g., subcontractors, other units of government, laboratories) stating the organization's awareness of and commitment to requirements contained in this quality assurance project plan and any amendments or revisions of this plan. SRBA will maintain this documentation as part of the project's quality assurance records, and will be available for review. (See sample letter in Attachment 1 of this document.)

A2 TABLE OF CONTENTS

LIST OF ACRONYMS

AWRL	**Ambient Water Reporting Limit**
BMP	**Best Management Practices**
CAR	**Corrective Action Report**
COC	**Chain-of Custody**
CRP	**Clean Rivers Program**
DOC	**Demonstration of Capability**
DQO	**Data Quality Objective**
FY	**Fiscal Year**
IS	**Intensive/Systematic Monitoring**
LM	**Laboratory Manager**
MDMA	**Monitoring Data Management & Analysis**
PM	**Program Manager**
QA	**Quality Assurance**
QAM	**Quality Assurance Manual**
QAO	**Quality Assurance Officer**
QAPP	**Quality Assurance Project Plan**
QAS	**Quality Assurance Specialist**
QC	**Quality Control**
QMP	**Quality Management Plan**
RBP	**Rapid Bioassessment Protocol**
RL	**Reporting Limit**
RT	**Routine Monitoring**
RWA	**Receiving Water Assessment**
SOP	**Standard Operating Procedure**
SWQM	**Surface Water Quality Monitoring**
SRBA	**Sulphur River Basin Authority**
TC	**Texarkana College**
TMDL	**Total Maximum Daily Load**
TCEQ	**Texas Commission on Environmental Quality**
TRACS	**TCEQ Regulatory Activities and Compliance System**
TSWQS	**Texas Surface Water Quality Standards**
VOA	**Volatile Organic Analytes**
WMT	**Watershed Management Team**
WPL	**Wright Patman Lake**

A3 DISTRIBUTION LIST

Texas Commission on Environmental Quality
P.O. Box 13087
Austin, Texas 78711-3087

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Clean Rivers Program
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CRP Lead Quality Assurance Specialist
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Dr. David W. Sullivan
Manager, Monitoring Data Management and Analysis Section
MC-165
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Sulphur River Basin Authority
911 N. Bishop, Suite C-104
Wake Village, Texas 75501

Michael Burke, Project Manager
(903) 223-7887

Mike Buttram, Quality Assurance Officer
(903) 838-4541

SRBA will provide copies of this project plan and any amendments or revisions of this plan to each person on this list and to each sub-tier project participant, e.g., subcontractors, other units of government, laboratories. SRBA will document distribution of the plan and any amendments and appendices, maintain this documentation as part of the project's quality assurance records, and will be available for review.

A4 PROJECT/TASK ORGANIZATION

Description of Responsibilities

TCEQ

Linda Brookins
CRP Program Manager
Responsible for TCEQ activities supporting the development and implementation of the Texas Clean Rivers Program. Responsible for verifying that the QMP is followed by CRP staff. Supervises TCEQ CRP staff. Reviews and responds to any deficiencies, nonconformances, or findings related to the area of responsibility. Oversees the development of QA guidance for the CRP. Reviews and approves all QA audits, corrective actions, reviews, reports, work plans, contracts, QAPPs, and program QMP. Enforces corrective action, as required, where QA protocols are not met. Ensures CRP personnel are fully trained.

Bernard Ray
CRP Lead Quality Assurance Specialist

Participates in the development, approval, implementation, and maintenance of written quality assurance standards (e.g., Program Guidance, SOPs, QAPPs, QMP). Assists program and project manager in developing and implementing quality system. Serves on planning team for CRP special projects. Coordinates the review and approval of CRP QAPPs. Prepares and distributes annual audit plans. Conducts monitoring systems audits of Planning Agencies. Concurs with and monitors implementation of corrective actions. Conveys QA problems to appropriate management. Recommends that work be stopped in order to safeguard programmatic objectives, worker safety, public health, or environmental protection. Ensures maintenance of QAPPs and audit records for the CRP.

Patricia Wise
CRP Project Manager

Responsible for the development, implementation, and maintenance of CRP contracts. Tracks deliverables. Participates in the development, approval, implementation, and maintenance of written quality assurance standards (e.g., Program Guidance, SOPs, QAPPs, QMP). Assists CRP Lead QA Specialist in conducting SRBA audits. Verifies QAPPs are being followed by contractors and that projects are producing data of known quality. Coordinates project planning with the SRBA Project Manager. Reviews and approves data and reports produced by contractors. Notifies QA Specialists of circumstances which may adversely affect the quality of data derived from the collection and analysis of samples. Develops, enforces, and monitors corrective action measures to ensure contractors meet deadlines and scheduled commitments.

Eric Reese
CRP Data Manager

Responsible for coordination and tracking of CRP data sets from initial submittal through CRP Project Manager review and approval. Performs automated data validation routines and coordinates error correction.

Provides quality assured data sets to TCEQ Information Resources in compatible formats for uploading to the statewide database. Generates reports to assist CRP Project Managers' data review. Provides training and guidance to CRP and Planning Agencies on technical data issues. Reviews and approves data-related portions of program QMP and project-specific QAPPs. Develops and maintains Standard Operating Procedures for CRP data management.

Laurie Curra
CRP Project Quality Assurance Specialist

Serves as liaison between CRP management and agency QA management. Participates in the development, approval, implementation, and maintenance of written quality assurance standards (e.g., Program Guidance, SOPs, QAPPs, QMP). Serves on planning team for CRP special projects. Coordinates documentation and implementation of corrective action for the CRP.

SRBA

Michael Burke
SRBA Project Manager

Responsible for implementing and monitoring CRP requirements in contracts, QAPPs, and QAPP amendments and appendices. Coordinates basin planning activities and work of basin partners. Ensures monitoring systems audits are conducted to ensure QAPPs are followed by planning agency participants and that projects are producing data of known quality. Ensures that subcontractors are qualified to perform contracted work. Ensures CRP project managers and/or QA Specialists are notified of deficiencies and nonconformances, and that issues are resolved. Responsible for validating that data collected are acceptable for reporting to the TCEQ. Responsible for writing and maintaining the QAPP and monitoring its implementation. Responsible for maintaining records of QAPP distribution, including appendices and amendments. Responsible for maintaining written records of sub-tier commitment to requirements specified in this QAPP.

Mike Buttram
SRBA Quality Assurance Officer

Services aquired through contract with Texarkana College. Responsible for coordinating the implementation of the QA program. Responsible for identifying, receiving, and maintaining project quality assurance records. Responsible for coordinating with the TCEQ QAS to resolve QA-related issues. Notifies the SRBA Project Manager of particular circumstances which may adversely affect the quality of data. Coordinates and monitors deficiencies, nonconformances and corrective action. Coordinates and maintains records of data verification and validation. Coordinates the research and review of technical QA material and data related to water quality monitoring system design and analytical techniques. Conducts monitoring systems audits on project participants to determine compliance with project and program specifications, issues written reports, and follows through on findings. Ensures that field staff are properly trained and that training records are maintained.

Patti Harman
SRBA Data Manager

Services acquired through contract with Texarkana College. Is responsible for ensuring that field data are properly reviewed and verified. Responsible for the transfer of basin quality-assured water quality data to the

TCEQ in a compatible format. Responsible for the basin Data Management Plan. Assists SRBA QAO in the training of TC Field Staff.

Paul Price, Paul Price and Associates, Inc.
Task 2, 4, and 5 Contractor

Responsible for assuring that certain tasks are completed per sub-contract under Tasks 2, 4, and 5 including project work plan, coordinated monitoring meeting, Web site updates and the Basin Highlights report. Maintains quality-assured data on SRBA Internet sites. Completes the Basin Summary Report.

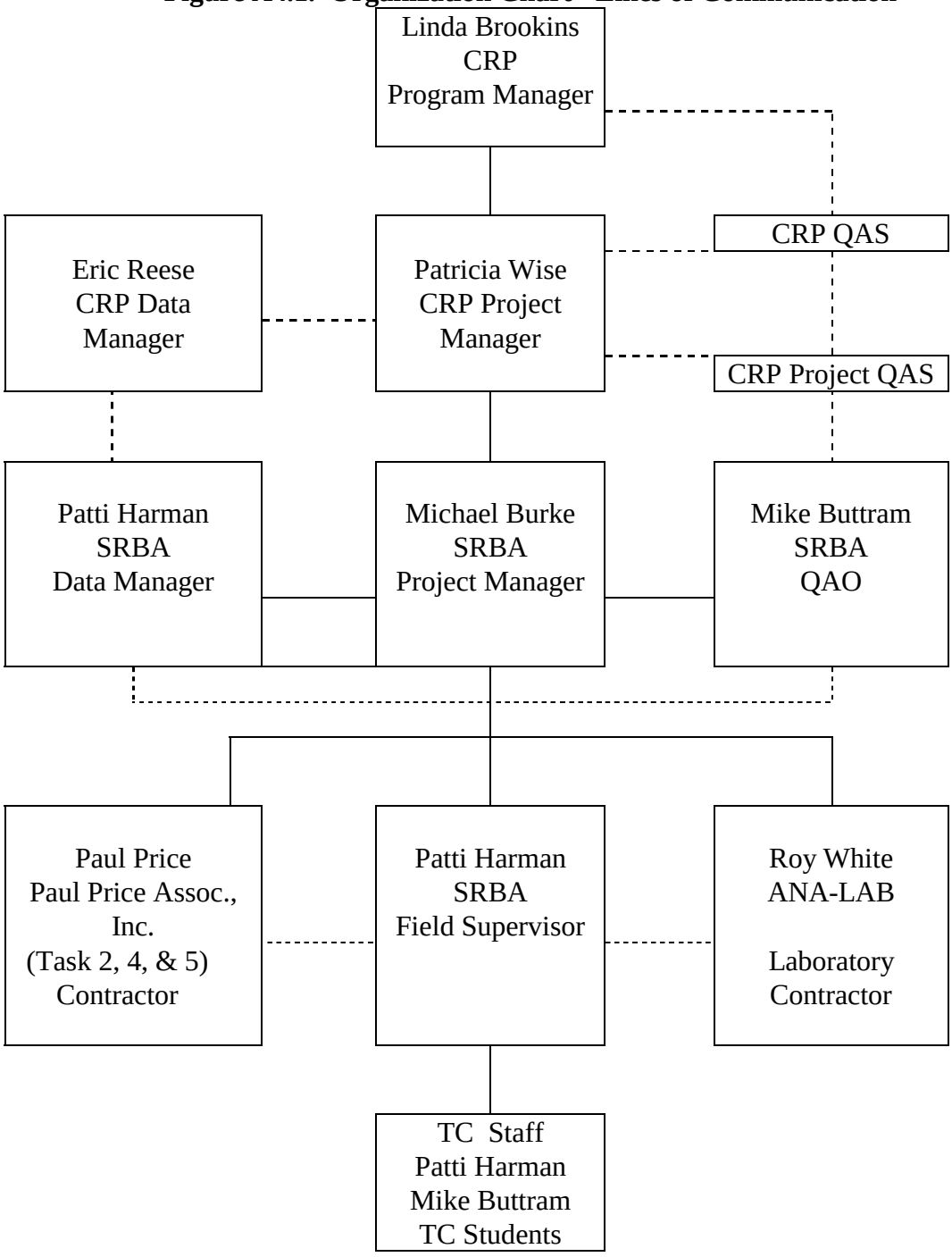
Roy White, ANA-LAB
Laboratory Manager

Ensure that analytical tests are performed in accordance with approved methods. Ensure that the laboratory maintains adequate QA/QC procedures during the time samples are being analyzed and that all results are presented in an organized manner.

TC Field Staff
Mike Buttram, Patti Harman, and TC students

Plan and carry out all monitoring activities under contract with Texarkana College. Ensure and verify that all data conform to data collection sample handling, chain of custody, calibration, analytical, and QC requirements described in the QAPP and SWQM Manual. Verify that required data is collected in the field and that data sheets are complete. Coordinate sample delivery with employees of ANA-LAB and certify the chain of custody. Maintain instrument calibration logs, calibration standards, and data required for the certification of *E-coli* counts.

Figure 1
PROJECT ORGANIZATION CHART
Figure A4.1. Organization Chart - Lines of Communication



Lines of Communication--------

Lines of Organization————

A5 PROBLEM DEFINITION/BACKGROUND

In 1991, the Texas Legislature passed the Texas Clean River Act (Senate Bill 818) in response to growing concerns that water resource issues were not being pursued in an integrated, systematic manner. The act requires that ongoing water quality assessments be conducted for each river basin in Texas, an approach that integrates water quality issues within the watershed. The CRP legislation mandates that "each river authority (or local governing entity) shall submit quality-assured data collected in the river basin to the commission." "Quality-assured data" in the context of the legislation means "data that complies with commission rules for water quality monitoring programs, including rules governing the methods under which water samples are collected and analyzed and data from those samples are assessed and maintained." This QAPP addresses the program developed between the Planning Agency and the TCEQ to carry out the activities mandated by the legislation. The QAPP was developed and will be implemented in accordance with provisions of the *Quality Management Plan for the Clean Rivers Program* (most recent version).

The purpose of this QAPP is to clearly delineate Planning Agency QA policy, management structure, and procedures that will be used to implement the QA requirements necessary to verify and validate the water quality data collected. The QAPP is reviewed by the TCEQ to help ensure that data generated for the purposes described above are scientifically valid and legally defensible. This process will ensure that data collected under this QAPP and submitted to the statewide database have been collected and managed in a way that guarantees its reliability and therefore can be used in water quality assessments and other programs deemed appropriate by the TCEQ. Project results will be used to support the achievement of Clean Rivers Program objectives as contained in the Clean Rivers *Program Guidance and Reference Guide* FY 2004 -2005.

In 1999 the SRBA conducted a review of five years of water quality data to characterize water quality in the Sulphur River Basin. A considerable body of information has been collected since that time. The following is a discussion of each segment covered in this QAPP, and reviews their history and current status.

Wright Patman Lake, WPL (Segment 0302 and 303)

WPL was listed on the 303(d) List (December 1999) for dissolved oxygen concentrations that are sometimes lower that the standard established to ensure optimum conditions for aquatic life. These conditions existed near the dam and in the upper regions near Hwy 8. The 303(d) List (August 31, 2000) notes that several areas of the lake fail to meet the dissolved oxygen criterion at times. These areas are the upper reservoir, near the damn, and the upper-middle portion of the lake. The overall priority for this impairment was established as "medium". The pH values are high during certain time periods in the northwestern-most tip, the Elliott Creek arm located northwest of the damn, and the middle-upper portion of the lake. These values were occasionally higher than the criterion established to safeguard general water quality uses. WPL was listed on the 303(d) List (October, 2002) for the "general use" criterion based on high pH in the arm west of the dam and in the northeast corner of the lake and for "aquatic life use" based on the depressed oxygen criterion. The overall impairment is listed as "low". The causes of the impairments are listed as both point and non-point sources. See Figure 2 for the location of the three sites on WPL.

Days Creek, (Segment 0304)

Days Creek is not listed on the 303(d) List. It has a "contact recreation concern" due to bacteria based on limited data. See Figure 2 for the location of the fixed/routine site on Days Creek. See Figure 3 for the location of the intensive/systematic sites that are part of the TCEQ special study on Days Creek. The TCEQ special study is to evaluate the source and impact of high levels of hydrocarbons in the sediment in Days Creek. The sites selected are down stream from two superfund sites and a wood treatment facility. SRBA will support this study by doing biological and habitat studies at each site twice during the summer of 2004.

White Oak Creek, (Segment 0303b)

The lower 50 miles of White Creek is listed on the 303(d) List (August 31, 2000). The dissolved oxygen concentrations are occasionally lower than the criterion established to assure optimum conditions for aquatic life. The overall priority for this impairment was established as "medium". The lower 25 miles and the middle 25 miles near Hwy 271 are listed for the "aquatic life use" criterion based on depressed dissolved oxygen levels. The cause of the impairment is listed as both point and non-point sources. See Figure 4 for the location of the sites on the basin map.

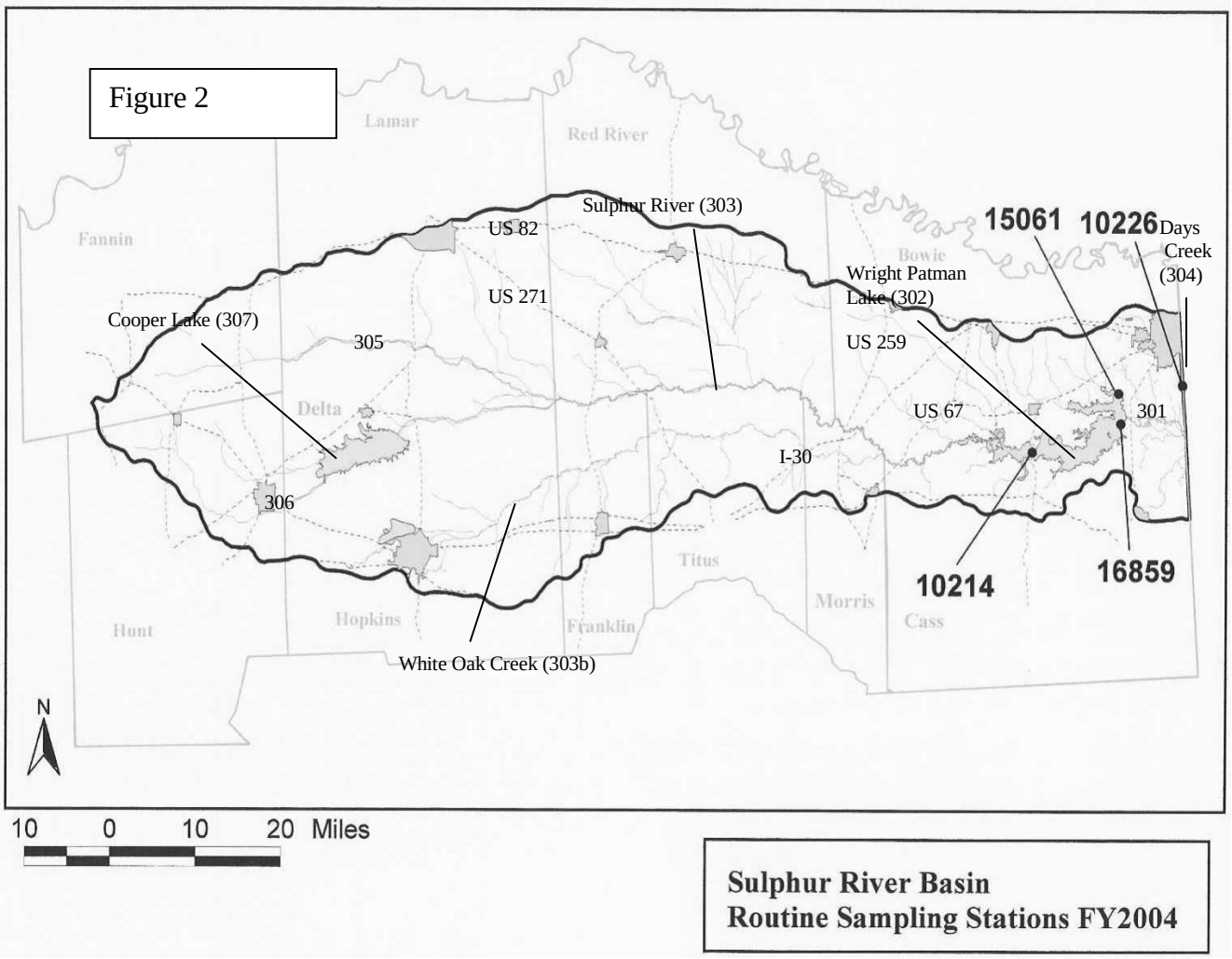


Figure 2
Lamar
Red River
Fannin
Bowie
Sulphur River (303)
US 82
US 271
Wright Patman
Lake (302)
15061
10226
Days
Creek
(304)
Cooper Lake (307)
305
US 259
Delta
US 67
301
I-30
306
Titus
10214
16859
Morris
Cass
Hunt
Hopkins
Franklin
White Oak Creek (303b)
N
10 0 10 20 Miles
Sulphur River Basin
Routine Sampling Stations FY2004

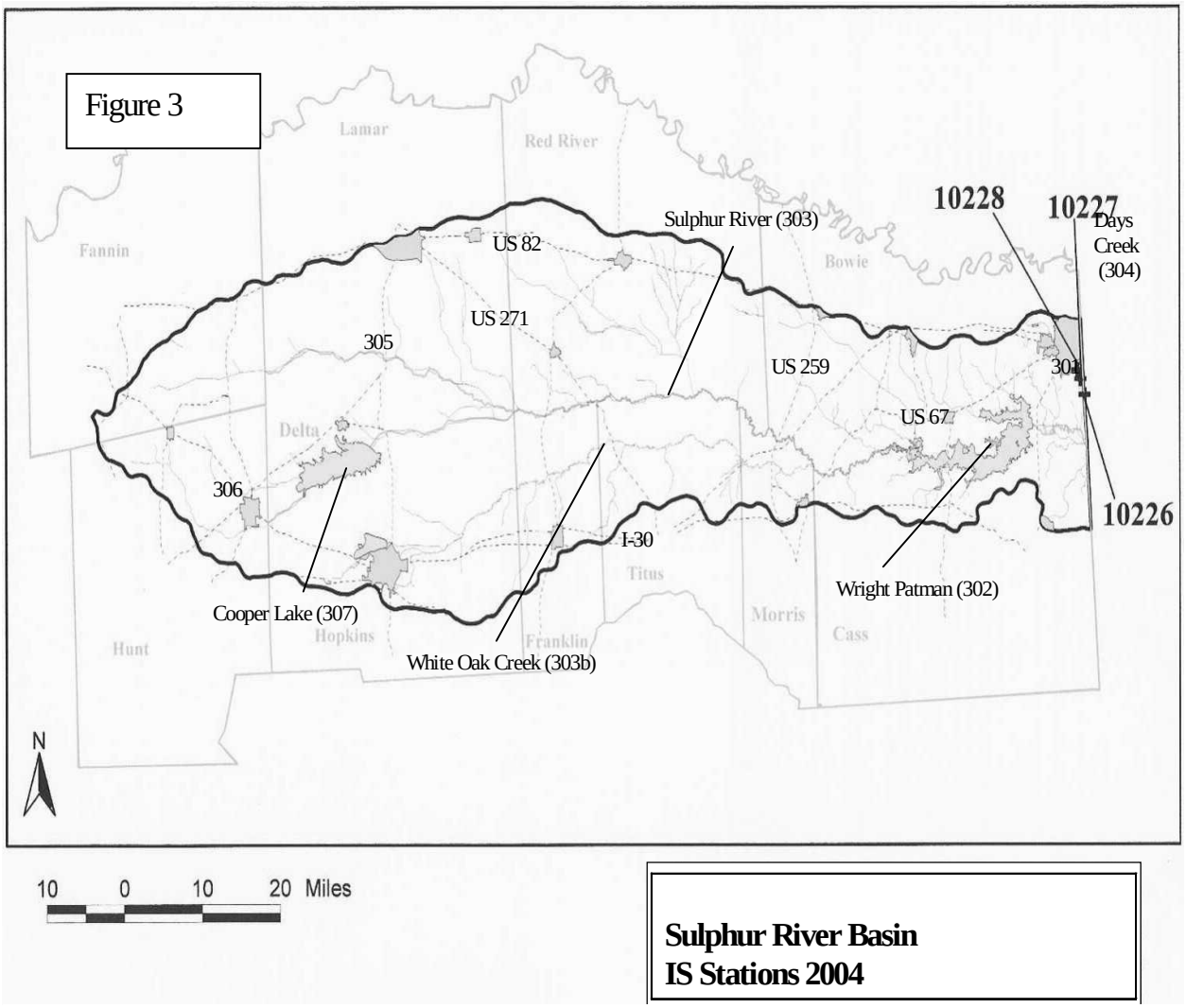


Figure 3
Lamar
Red River
Fannin
Bowie
10228
10227
Days Creek (304)
Sulphur River (303)
US 82
US 271
305
US 259
US 67
Delta
306
10226
I-30
Titus
Wright Patman (302)
Cooper Lake (307)
Hopkins
Franklin
Morris
Cass
Hunt
White Oak Creek (303b)
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Sulphur River Basin
IS Stations 2004

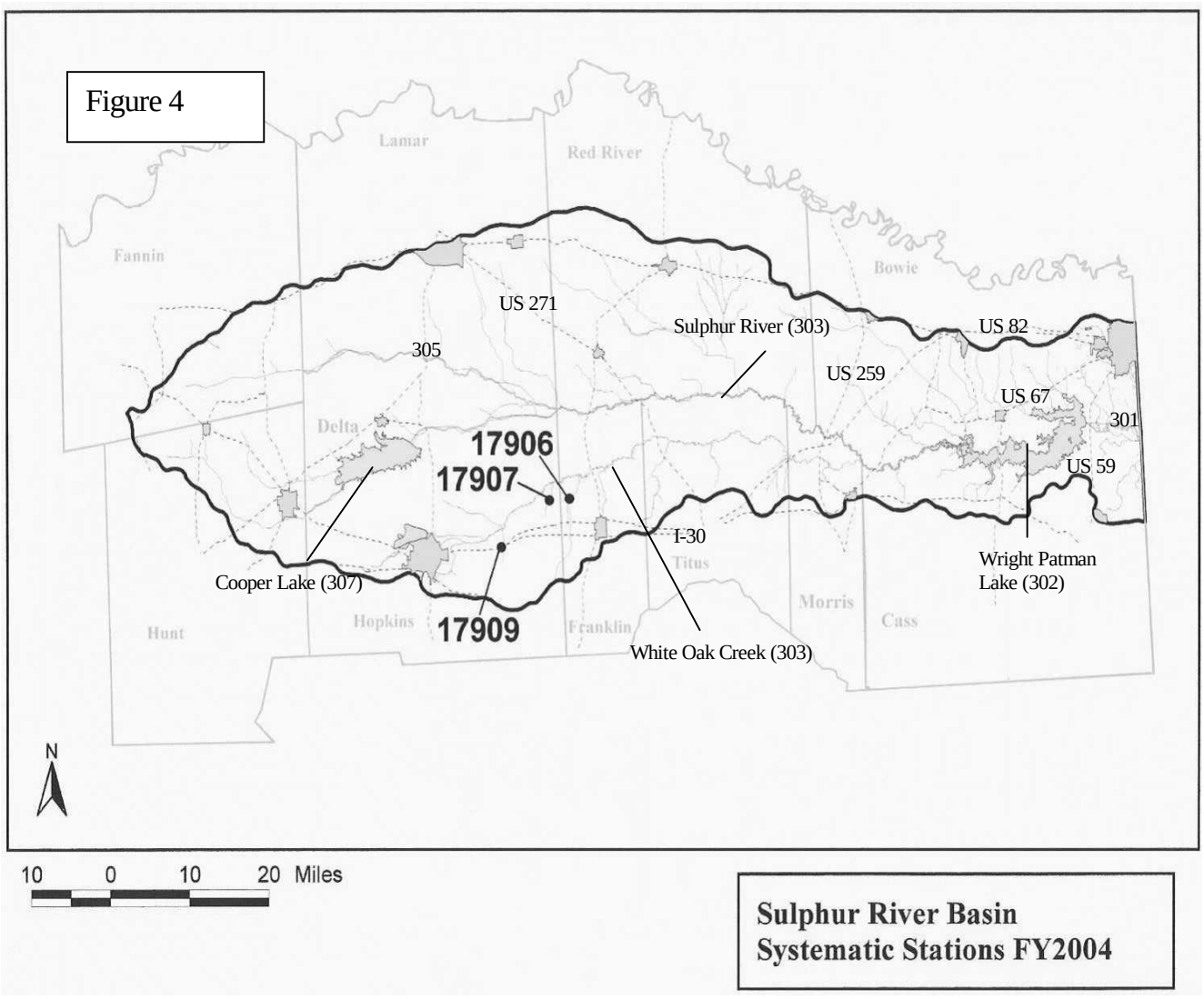
Figure 4
Lamar
Red River
Fannin
Bowie
US 271
Sulphur River (303)
US 82
305
US 259
US 67
301
Delta
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17907
US 59
I-30
Titus
Wright Patman
Lake (302)
Cooper Lake (307)
Morris
Cass
Hopkins
17909
Franklin
Hunt
White Oak Creek (303)
N
10 0 10 20 Miles
Sulphur River Basin
Systematic Stations FY2004

A6 PROJECT/TASK DESCRIPTION

See Appendix A for the project-related work plan tasks and schedule of deliverables for a description of work defined in this QAPP.
Surface water quality monitoring for FY 2004 conducted by SRBA will consist of fixed station monitoring and systematic monitoring. Appendix B contains a description of the two monitoring types.

Table B1.1 of Appendix B provides information on the location, parameters to be analyzed, and sample frequency of the fixed monitoring stations (RT). Four routine sites are to be monitored. One located on Day's Creek and the other three are located on Wright Patman Lake. The site on Days Creek will be monitored quarterly for field, flow, bacteria, and conventional water chemistry, while 24-hour and biological samples will be monitored twice. The WPL sites will be monitored quarterly for field, bacteria, depth profiles, and conventional chemistry while 24-hour data will be monitored twice.

Table B1.1 of Appendix B provides information on the location, parameters to be analyzed, and sample frequency for the intensive/systematic monitoring stations (IS). Three are located in the upper portion of Day's Creek and three are located on tributaries of White Oak Creek. The three sites on Days Creek will be monitored twice for 24-hour and biological parameters. These studies are designed to support the TCEQ Special Study of Days Creek and will be coordinated with TCEQ personnel. The three sites in the White Oak Creek watershed are being monitored quarterly for field, flow, bacteria, and conventional water chemistry while 24-hour and biological data will be monitored twice. These studies are part of SRBA's continuing effort to collect data about the whole of the basin. These sites are of particular interest to SRBA and TCEQ because they are located on tributaries of White Oak Creek. White Oak Creek is listed on the 303(d) List for depressed dissolved oxygen. Depressed dissolved oxygen may be caused by excessive nutrients from the tributaries in the upper reaches of White Oak Creek.

The FY 2004 monitoring work being done by SRBA is accomplished through a contract with Texarkana College. Ms Patti Harman and Dr. Mike Buttram of TC will be in charge of field sampling and biological identification. Texarkana College personnel will monitor, collect samples, send samples to laboratories, maintain documentation, count and identify biological samples, and report the results to SRBA. SRBA will utilize ANA-LAB Corporation of Kilgore, Texas for all laboratory work. Information about the sampling events will be submitted to Paul Price for inclusion in the SRBA web page along with the quality assured data from TCEQ.

This QAPP covers two years, FY 2004 and FY 2005. During FY 2005, it is likely that SRBA will continue to monitor the routine sites on WPL and Days Creek, as these efforts are important to both SRBA and TCEQ. After a review of the FY 2004 results and with consultation with TCEQ, about six intensive/systematic sites will be selected for further monitoring.

See Appendix B for sampling design and monitoring pertaining to this QAPP.

Amendments to the QAPP

Revisions to the QAPP may be necessary to reflect changes in project organization, tasks, schedules, objectives, and methods; to improve operational efficiency; and to accommodate unique or unanticipated circumstances. Requests for amendments are directed from the SRBA Project Manager to the CRP Project Manager in writing. They are effective immediately upon approval by the SRBA Project Manager, the SRBA QAO, the CRP Project Manager, the CRP Lead QA Specialist, and the CRP Project QA Specialist. They will be distributed by the Planning Agency Project Manager and incorporated into the QAPP by way of attachment and distributed to personnel on the distribution list.

Appendices to the QAPP

Projects requiring QAPP appendices will be planned in consultation with the Planning Agency and the TCEQ Project Manager and TCEQ technical staff. Appendices will be written in an abbreviated format and will reference the Basin QAPP where appropriate. Appendices will be approved by the SRBA Project Manager, the SRBA QAO, the CRP Project Manager, the CRP Project QA Specialist, the CRP Lead QA Specialist and other TCEQ personnel as appropriate. Copies of approved QAPPs appendices will be distributed by the SRBA to project participants before monitoring activities are commenced.

A7 QUALITY OBJECTIVES AND CRITERIA

The purpose of fixed/routine water quality monitoring is to collect surface water quality data needed for conducting water quality assessments in accordance with TCEQ's *Guidance for Assessing Texas Surface and Finished Drinking Water Quality Data*. These water quality data, and data collected by other organizations (e.g., USGS, TCEQ, etc.), will be subsequently reconciled for use and assessed by the TCEQ.

This project does purpose the study of six intensive/systematic sites. The three sites on Days Creek will be monitored twice for 24-hour and biological parameters. These studies are designed to support the TCEQ Special Study of Days Creek and will be coordinated with TCEQ personnel. The TCEQ Special Study is designed to evaluate the source and importance of high levels of semi-volatile hydrocarbons in the sediment. One major impact is likely to be on the fish and benthic organisms. The biological studies will be useful in assessing the importance of the hydrocarbon residues. The 24-hour DO studies are a required part of the biological studies and will allow that variable to be taken into account. The three sites in the White Oak Creek watershed are being monitored quarterly for field, flow, bacteria, and conventional water chemistry while 24-hour and biological data will be monitored twice. These studies are part of SRBA's continuing effort to collect data about the whole of the basin. These sites are of particular interest to SRBA and TCEQ because they are located on tributaries of White Oak Creek. White Oak Creek is listed on the 303(d) List for depressed dissolved oxygen. Depressed dissolved oxygen may be caused by excessive nutrients from the tributaries in the upper reaches of White Oak Creek. Depressed dissolved oxygen levels may impact both fish and benthic organisms. The 24-hour studies and the biological studies will add significant information about the dissolved oxygen levels and their impact on fish and benthics.
The measurement performance specifications to support the project objectives for a minimum data set are specified in Table A7.1 and in the text following.

Table A7.1 - Measurement Performance Specifications

PARAMETER	UNITS	MATRIX	METHOD	STORET	AWRL	Lab Reporting Limit (RL)	RECOVERY AT RLs	PRECISION (RPD of LCS/LCS dup)	BIAS (%Rec. of LCS)	Lab
Field Parameters										
pH	pH/ units	water	EPA 150.1 and TCEQ SOP	00400	NA*	NA	NA	NA	NA	Field
DO	mg/L	water	EPA 360.1 and TCEQ SOP	00300	NA*	NA	NA	NA	NA	Field
Conductivity	uS/cm	water	EPA 120.1 and TCEQ SOP	00094	NA*	NA	NA	NA	NA	Field
Temperature	°C	water	EPA 170.1 and TCEQ SOP	00010	NA*	NA	NA	NA	NA	Field
Secchi Depth	meters	water	TCEQ SOP	00078	NA*	NA	NA	NA	NA	Field
Days since last significant rainfall	days	NA	TCEQ SOP	72053	NA*	NA	NA	NA	NA	Field
Maximum pool width***	meters	water	TCEQ RWA SOP	89864	NA*	NA	NA	NA	NA	Field
Maximum pool depth***	meters	water	TCEQ RWA SOP	89865	NA*	NA	NA	NA	NA	Field
Pool length***	meters	water	TCEQ RWA SOP	89869	NA*	NA	NA	NA	NA	Field
% pool coverage***	%	water	TCEQ RWA SOP	89870	NA*	NA	NA	NA	NA	Field
Total water depth	meters	water	TCEQ RWA SOP	82903	NA*	NA	NA	NA	NA	Field
Flow	Cfs	water	TCEQ SOP	00061	NA*	NA	NA	NA	NA	Field
Flow measurement method	1-gage 2-electric 3-mechanical 4-weir/flume 5-doppler	water	TCEQ SOP	89835	NA*	NA	NA	NA	NA	Field
Flow severity	1-no flow, 2-low, 3-normal, 4-flood, 5-high, 6-dry	water	TCEQ SOP	01351	NA*	NA	NA	NA	NA	Field
Flow estimate	cfs	water	TCEQ SOP	74069	NA*	NA	NA	NA	NA	Field
Present Weather	1-clear 2-partly cloudy 3-cloudy 4-rain 5-other	NA	NA	89966	NA	NA	NA	NA	NA	Field
Wind Intensity	1-calm 2-slight 3-moderate 4-strong	NA	NA	89965	NA	NA	NA	NA	NA	Field

Water Surface	1-calm 2-ripples 3-waves	NA	NA	89968	NA	NA	NA	NA	NA	Field
DO 24-hr Average	ppm	water	TCEQ SOP	89857	NA	NA	NA	NA	NA	Field
DO 24-hr Maximum	ppm	water	TCEQ SOP	89856	NA	NA	NA	NA	NA	Field
DO 24-hr Minimum	ppm	water	TCEQ SOP	89855	NA	NA	NA	NA	NA	Field
Temperature 24-hr Average	°C	water	TCEQ SOP	00209	NA	NA	NA	NA	NA	Field
Temperature 24-hr Maximum	°C	water	TCEQ SOP	00210	NA	NA	NA	NA	NA	Field
Temperature 24-hr Average	°C	water	TCEQ SOP	00211	NA	NA	NA	NA	NA	Field
Conductivity 24-hr Average	microsiemen	water	TCEQ SOP	00212	NA	NA	NA	NA	NA	Field
Conductivity 24-hr Maximum	microsiemen	water	TCEQ SOP	00213	NA	NA	NA	NA	NA	Field
Conductivity 24-hr Average	microsiemen	water	TCEQ SOP	00214	NA	NA	NA	NA	NA	Field
pH 24-hr Maximum	pH units	water	TCEQ SOP	00215	NA	NA	NA	NA	NA	Field
pH 24-hr Minimum	pH units	water	TCEQ SOP	00216	NA	NA	NA	NA	NA	Field
24-hr DO # of Measurements	#	water	TCEQSOP	89858	NA	NA	NA	NA	NA	Field
24-hr DO # of Measurements	#	water	TCEQSOP	00221	NA	NA	NA	NA	NA	Field
24-hr DO # of Measurements	#	water	TCEQSOP	00222	NA	NA	NA	NA	NA	Field
24-hr DO # of Measurements	#	water	TCEQSOP	00223	NA	NA	NA	NA	NA	Field

PARAMETER	UNITS	MATRIX	METHOD	STORET	AWRL	Lab Reporting Limit (RL)	RECOVERY AT RLs	PRECISION (RPD of LCS/LCS dups)	BIAS %Rec. of LCS	Lab
Conventional and Bacteriological Parameters										
TSS	mg/L	water	EPA 160.2	00530	4	4	NA	20	NA	ANA-LAB
TDS, dried at 180 degrees C	mg/L	water	SM 18th 1030F	70300	10	10	NA	20	NA	ANA-LAB
TDS, calculated	mg/L	water	calculation	70294	NA	NA	NA	NA	NA	ANA-LAB
Sulfate	mg/L	water	EPA 300.0	00945	10	10	75-125	20	80-120	ANA-LAB
Chloride	mg/L	water	EPA 300.0	00940	10	10	75-125	20	80-120	ANA-LAB
Chlorophyll-a, spectrophotometric method	ug/L	water	EPA 446.0	32211	5	5	75-125	20	NA	ANA-LAB
Pheophytin, spectrophotometric method	ug/L	water	EPA 446.0	32218	3	3	75-125	20	NA	ANA-LAB

E. coli, IDEXX Colilert	MPN/100 mL	water	SM 9223-B	31699	1	1***	NA	.5***	NA	TC
Ammonia-N, total	mg/L	water	EPA 350.1	00610	.02	0.02	75-125	20	80-120	ANA-LAB
Nitrate-N	mg/L	water	EPA 300.0	00620	.02	0.02	75-125	20	80-120	ANA-LAB
Nitrite-N	mg/L	water	EPA 300.0	00615	.02	0.02	75-125	20	80-120	ANA-LAB
Total phosphate-P	mg/L	water	EPA 365.3	00665	.06	0.06	75-125	20	80-120	ANA-LAB

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

** To be routinely reported when collecting data from perennial pools.

*** Based on a range statistic as described in Standard Methods, 20th Edition, Section 9020-B, AQuality Assurance/Quality Control - Intralaboratory Quality Control Guidelines. This criterion applies to bacteriological duplicates with concentrations >10 MPN/100mL or 10 organisms/100mL.

Benthics- Freshwater - RBA (Qualitative)

PARAMETER	UNITS	MATRIX	METHOD	STORET	LAB
Biological Data Reporting Units	1= number of individuals from sub-sample; 2 = number of individuals/ft^2; 3 = number of individuals/m^2; 4 = total number in kicknet	Water	TCEQ RWA SOP	89899	NA
Kicknet Effort, area kicked	m^2	Water	TCEQ RWA SOP	89903	NA
Kicknet Effort, minutes kicked	minutes	Water	TCEQ RWA SOP	89904	NA
Snags and Shoreline Sampling Effort, minutes picked	minutes	Water	TCEQ RWA SOP	89905	NA
Number of individuals in benthic RBA sub-sample (± 100)	#	Water	TCEQ RWA SOP	89906	NA
Benthic Sampler	1=Surber, 2=Ekman, 3=kicknet, 4=Petersen, 5=Hester-Dendy	Water	TCEQ RWA SOP	89950	NA
Undercut bank at sample point	%	Water	TCEQ RWA SOP	89921	NA
Overhanging brush at sample point	%	Water	TCEQ RWA SOP	89922	NA
Gravel substrate at sample point	%	Water	TCEQ RWA SOP	89923	NA
Sand substrate at sample point	%	Water	TCEQ RWA SOP	89924	NA
Soft bottom at sample point	%	Water	TCEQ RWA SOP	89925	NA
Macrophyte bed at sample point	%	Water	TCEQ RWA SOP	89926	NA
Snags and brush at sample point	%	Water	TCEQ RWA SOP	89927	NA
Bedrock at sample point	%	Water	TCEQ RWA SOP	89928	NA
Benthic Organisms, None Present	NA	Water	TCEQ RWA SOP	90005	NA
Mesh Size, any net or sieve, average bar (diagonal measurement) for benthic collection	cm	NA	TCEQ RWA SOP	89946	NA
Stream Order	#	NA	TCEQ SOP	84161	NA
Ecoregion (Texas Ecoregion Code)	#	NA	TCEQ SOP	89961	NA
Total Taxa Richness, Benthos	#	Water	TCEQ RWA SOP	90055	NA
EPT Index, Abundance	#	Water	TCEQ RWA SOP	90008	NA
Biotic Index (HBI)	NA	Water	TCEQ RWA SOP	90007	NA
Chironomidae	%	Water	TCEQ RWA SOP	90062	NA
Dominant Taxon, Benthos	%	Water	TCEQ RWA SOP	90042	NA
Dominant FFG	%	Water	TCEQ RWA SOP	90010	NA
Predators	%	Water	TCEQ RWA SOP	90036	NA
Ratio of Intolerant:Tolerant taxa, Benthos	NA	Water	TCEQ RWA SOP	90050	NA
Total Trichoptera as Hydropsychidae	%	Water	TCEQ RWA SOP	90069	NA
Non-insect taxa	#	Water	TCEQ RWA SOP	90052	NA
Collector-gatherers	%	Water	TCEQ RWA SOP	90025	NA
Total number as Elmidae	%	Water	TCEQ RWA SOP	90054	NA

Nekton- Freshwater

PARAMETER	UNITS	MATRIX	METHOD	STORET	LAB
Nekton, none captured	NA	Water	TCEQ RWA SOP	98005	NA
Electrofishing effort, duration of shocking	Seconds	Water	TCEQ RWA SOP	89944	NA
Seining effort	# of Hauls	Water	TCEQ RWA SOP	89947	NA
Combined length of seine hauls	meters	Water	TCEQ RWA SOP	89948	NA
Seining effort, duration	minutes	Water	TCEQ RWA SOP	89949	NA
Seine Minimum Mesh Size, net average bar, Nekton	in	Water	TCEQ RWA SOP	89930	NA
Seine Maximum Mesh Size, net average bar, Nekton	in	Water	TCEQ RWA SOP	89931	NA
Net length	meters	Water	TCEQ RWA SOP	89941	NA
Electrofishing method	1 = boat 2 = backpack 3 = tote barge	Water	TCEQ RWA SOP	89943	NA
Area seined	m^2	Water	TCEQ RWA SOP	89976	NA
Stream Order	#	NA	TCEQ SOP	84161	NA
Ecoregion (Texas Ecoregion Code)	#	NA	TCEQ SOP	89961	NA
Total number fish species	#	Water	TCEQ RWA SOP	98003	NA
Total darter species	#	Water	TCEQ RWA SOP	98004	NA
Total sunfish species (except bass)	#	Water	TCEQ RWA SOP	98008	NA
Total sucker species	#	Water	TCEQ RWA SOP	98009	NA
Total intolerant fish species	#	Water	TCEQ RWA SOP	98010	NA
Tolerant individuals, fish	%	Water	TCEQ RWA SOP	98016	NA
Omnivore individuals, fish	%	Water	TCEQ RWA SOP	98017	NA
Insectivore individuals, fish	%	Water	TCEQ RWA SOP	98021	NA
Piscivore individuals, fish	%	Water	TCEQ RWA SOP	98022	NA
Total individuals, fish	#	Water	TCEQ RWA SOP	98023	NA

Hybrid individuals	%	Water	TCEQ RWA SOP	98024	NA
Individuals w/ disease/anomalies	%	Water	TCEQ RWA SOP	98030	NA

Physical Habitat

PARAMETER	UNITS	METHOD	STORET	LAB
Streambed slope over evaluated reach (from USES map)	NA	TCEQ RWA SOP	72052	NA
Approximate drainage area above the most downstream transect from USES map	km^2	TCEQ RWA SOP	89859	NA
Stream Order	#	TCEQ RWA SOP	84161	NA
Length of stream	km	TCEQ RWA SOP	89860	NA
Lateral transects made	#	TCEQ RWA SOP	89832	NA
Average stream width	meters	TCEQ RWA SOP	89861	NA
Average stream depth	meters	TCEQ RWA SOP	89862	NA
Instantaneous stream flow	cfs	TCEQ RWA SOP	00061	NA
Flow measurement method	1=gage 2= electric 3= mechanical 4=weir/flume	TCEQ RWA SOP	89835	NA
Channel Flow Status	1=no flow 2= low 3= moderate 4=high	TCEQ RWA SOP	89848	NA
Maximum pool width at time of study	meters	TCEQ RWA SOP	89864	NA
Maximum pool depth in study area	meters	TCEQ RWA SOP	89865	NA
Total stream bends	#	TCEQ RWA SOP	89839	NA
Well-defined stream bends	#	TCEQ RWA SOP	89840	NA
Moderately defined stream bends	#	TCEQ RWA SOP	89841	NA
Poorly defined stream bends	#	TCEQ RWA SOP	89842	NA
Riffles	#	TCEQ RWA SOP	89843	NA
Dominant substrate	1 = clay, 2 = silt, 3 = sand, 4 = gravel, 5 = cobble, 6 = boulder, 7 = bedrock, 8 = other	TCEQ RWA SOP	89844	NA
Avg. % of substrate gravel >2mm	%	TCEQ RWA SOP	89845	NA
Avg. % instream cover	%	TCEQ RWA SOP	84159	NA
Stream Cover Types	#	TCEQ RWA SOP	89929	NA
Avg. % stream bank erosion potential	%	TCEQ RWA SOP	89846	NA
Avg. stream bank angle	degrees	TCEQ RWA SOP	89847	NA
Avg. width natural riparian vegetation	meters	TCEQ RWA SOP	89866	NA
Avg. % trees as riparian vegetation	%	TCEQ RWA SOP	89849	NA
Avg. % shrubs as riparian vegetation	%	TCEQ RWA SOP	89850	NA
Avg. % grasses and forbes as riparian vegetation	%	TCEQ RWA SOP	89851	NA
Avg. % cultivated fields as riparian vegetation	%	TCEQ RWA SOP	89852	NA
Avg. % other as riparian vegetation	%	TCEQ RWA SOP	89853	NA
Avg.% tree canopy coverage	%	TCEQ RWA SOP	89854	NA
Overall Aesthetics	1= wilderness 2= natural 3= common 4= offensive	TCEQ RWA SOP	89867	NA
Texas Ecoregion Code	#	TCEQ RWA SOP	89961	NA
Land development impact	1= unimpacted 2= low 3= moderate 4=high	TCEQ RWA SOP	89962	NA

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

** Based on range statistic as described in Standard Methods, 20th Edition, Section 9020-B, "Quality Assurance/Quality Control - Intralaboratory Quality Control Guidelines." This criterion applies to bacteriological duplicates with concentrations > 10org./100 mL.

*** *Laboratory should be specified where applicable.*

References for Table A7.1:

United States Environmental Protection Agency (USEPA) AMethods for Chemical Analysis of Water and Wastes,@ Manual #EPA-600/4-79-020

American Public Health Association (APHA), American Water Works Association (AWWA), and Water Environment Federation (WEF), AStandard Methods for the Examination of Water and Wastewater,@ 20th Edition, 1998. *(Note: (The 21st edition may be cited if it becomes available.)*

TCEQ SOP - Surface Water Quality Monitoring Procedures Manual, Volume 1: Physical and Chemical Monitoring Methods for Water, Sediment and Tissue, 2003 or subsequent editions.

American Society for Testing and Materials (ASTM) Annual Book of Standards, Vol. 11.02

Ambient Water Reporting Limits (AWRLs)

The AWRL establishes the reporting specification at **or below** which data for a parameter must be reported to be compared with freshwater screening criteria. The AWRLs specified in Table A7.1 are the program-defined reporting specifications for each analyte and yield data acceptable for routine water quality monitoring. The reporting limit is the lowest concentration at which the laboratory will report quantitative data within a specified recovery range. The laboratory will meet two requirements in order to report meaningful results to the Clean Rivers Program:

$ The laboratory's reporting limit for each analyte will be at **or below** the AWRL. The laboratory will demonstrate and document on an ongoing basis the laboratory's ability to quantitate at its reporting limits.

Acceptance criteria are defined in Section B5.

Precision

Precision is a statistical measure of the variability of a measurement when a collection or an analysis is repeated and includes components of random error. It is strictly defined as the degree of mutual agreement among independent measurements as the result of repeated application of the same process under similar conditions.

Field splits are used to assess the variability of sample handling, preservation, and storage, as well as the analytical process, and are prepared by splitting samples in the field. Control limits for field splits are defined in Section B5.

Laboratory precision is assessed by comparing replicate analyses of laboratory control standards or sample/duplicate pairs in the case of bacterial analysis. Precision results are plotted on quality control charts which are based on historical data and used during evaluation of analytical performance. Program-defined measurement performance specifications for laboratory control standard/laboratory control standard duplicate pairs are defined in Table A7.1.

Bias

Bias is a statistical measurement of correctness and includes multiple components of systematic error. A measurement is considered unbiased when the value reported does not differ from the true value. Bias is verified through the analysis of laboratory control standards prepared with certified reference materials and by calculating percent recovery. Results are plotted on quality control charts, which are calculated based on historical data and used during evaluation of analytical performance. Program-defined measurement performance specifications for laboratory control standards are specified in Table A7.1.

Representativeness

Site selection, the appropriate sampling regime, the sampling of all pertinent media according to TCEQ SOPs, and use of only approved analytical methods will assure that the measurement data represents the conditions at the site. Fixed/routine data collected under the Clean Rivers Program for water quality assessments are considered to be spatially and temporally representative of fixed/routine water quality conditions. At a minimum, samples are collected over at least two seasons (to include inter-seasonal variation) and over two years (to include inter-year variation) to include some data collected during an index period (March 15-October 15). Although data may be collected during varying regimes of weather and flow, the data sets will not be biased toward unusual conditions of flow, runoff, or season. The goal for meeting total representation of the water body will be tempered by the potential funding for complete representativeness.

Comparability

Confidence in the comparability of fixed/routine data sets for this project and for water quality assessments is based on the commitment of project staff to use only approved sampling and analysis methods and QA/QC protocols in accordance with quality system requirements and as described in this QAPP and in TCEQ SOPs. Comparability is also guaranteed by reporting data in standard units, by using accepted rules for rounding figures, and by reporting data in a standard format as specified in Section B10.

Completeness

The completeness of the data is basically a relationship of how much of the data is available for use compared to the total potential data. Ideally, 100% of the data should be available. However, the possibility of unavailable data due to accidents, insufficient sample volume, broken or lost samples, etc. is to be expected. Therefore, it will be a general goal of the project(s) that 90% data completion is achieved.

A8 SPECIAL TRAINING/CERTIFICATION

New field personnel will receive training in proper sampling and field analysis in the laboratory and the field by Mike Buttram, SRBA QAO or Patti Harman, SRBA Data Manager. Much of the training is done in the field. Before new personnel do any actual sampling or field analysis occurs, they will demonstrate to the Mike Buttram, SRBA QAO, their ability to properly calibrate field equipment and perform field sampling and analysis procedures. All calibration of field equipment and field sampling is done by Mike Buttram, SRBA QAO, Patti Harman, SRBA Data Manager, or trained student field personnel under close supervision. All calibration of field equipment and field sampling is verified with either Mike Buttram's or Patti Harman's name. Training is documented and retained on calibration documentation and field data sheets that are available during a monitoring systems audit.

Laboratory analysts have a combination of experience, education, and training to demonstrate a knowledge of their function. Laboratories have documented training records for each test that an analyst performs. Training is performed prior to analyzing samples and annually thereafter.

A9 DOCUMENTS AND RECORDS

The documents and records that describe, specify, report, or certify activities are listed.

Table A9.1 Project Documents and Records

Document/Record	Location	Retention (yrs)	Format
QAPPs, amendments and appendices	SRBA	7	Paper
Field SOPs	SRBA/TC	7	Paper
Laboratory QA Manuals	TC/ANA-LAB	7 / 7	Paper
Laboratory SOPs	TC/ANA-LAB	7 / 7	Paper
QAPP distribution documentation	SRBA	7	Paper
Field staff training records	SRBA/ TC	7 / 7	Paper
Field equipment calibration/maintenance logs	SRBA / TC	7 / 7	Paper
Field instrument printouts	SRBA / TC	7 / 7	Paper
Field notebooks or data sheets	SRBA / TC	7 / 7	Paper
Chain of custody records	SRBA / TC	7 / 7	Paper
Laboratory calibration records	TC/ANA-LAB	7/7	Paper
Laboratory instrument printouts	ANA-LAB	7	Paper
Laboratory data reports/results	SRBA /ANA-LAB	7 / 7	Paper
Laboratory equipment maintenance logs	TC/ANA-LAB	7/7	Paper
QAPP Commitment Letters	SRBA	7	Paper
Laboratory Staff Training Records	ANA-LAB	7	Paper
Corrective Action Documentation	SRBA/TC/ANA-LAB	7 / 7/7	Paper

Laboratory Data Reports

Data reports from the laboratory will report the test results clearly and accurately. The test report will include the information necessary for the interpretation and validation of data and will include the following:

- $ name and address of the laboratory
- $ name and address of the client
- $ a clear identification of the sample(s) analyzed
- $ identification of samples that did not meet QA requirements and why (e.g., holding times exceeded)
- $ date of sample receipt
- $ sample results
- $ field split results (as applicable)
- $ clearly identified subcontract laboratory results (as applicable)
- $ a name and title of person accepting responsibility for the report
- $ project-specific quality control results to include LCS sample results (% recovery), LCS duplicate results (%RPD), equipment, trip, and field blank results (as applicable), and RL confirmation (% recovery)
- $ narrative information on QC failures or deviations from requirements that may affect the quality of results.

ANA-LAB returns a comprehensive sample report with each sample set. These are retained in an "event" folder" where they are filed by date and site for each event. Remarks about problems with lab reports are written directly on the data sheet along with their resolution. Problems that occur with the "sampling event" can be found at the front of the folder along with the data summary forms and remarks about the data sets reported to TCEQ.

Electronic Data

Data will be submitted electronically to the TCEQ in the Event/Result file format described in the CRP Guidance. The data will be compiled in an Access database in the Event/Result format. This data will be exported and saved as "text" files. These "text" files will be sent as email attachments to Ms Patricia Wise of TCEQ. A completed Data Summary Form (see example in Appendix E) will be provided by mail with each data submittal. The data will be entered into the SRBA database by Patti Harman, SRBA Data Manager, and reviewed by Mike Buttram, SRBA QAO, prior to its submittal to TCEQ.

B1 SAMPLING PROCESS DESIGN

See Appendix B for sampling process design information and monitoring tables associated with data collected under this QAPP.

B2 SAMPLING METHODS

Field Sampling Procedures

Field sampling will be conducted according to procedures documented in the TCEQ Surface Water Quality Monitoring Procedures Manual (2003). Additional aspects outlined in Section B below reflect specific requirements for sampling under the Clean Rivers Program and/or provide additional clarification.

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

Table B2.1 Sample Storage, Preservation and Handling Requirements

Parameter	Matrix	Container	Preservation*	Sample Volume	Holding Time
TSS	Water	Plastic or Glass Bottles	Cool to 4 ^{o}C, dark	400 mL	7 days
TDS	Water	Plastic or Glass Bottles	Cool to 4 ^{o}C, dark	250 mL	7 days
Chloride	Water	Plastic or Glass Bottles	Cool to 4 ^{o}C, dark	100 mL	28 days
Sulfate	Water	Plastic or Glass Bottles	Cool to 4 ^{o}C, dark	100 mL	28 days
Nitrate-N	Water	Plastic or Glass Bottles	Cool to 4 ^{o}C, dark	150 mL	48 hours
Nitrite-N	Water	Plastic or Glass Bottles	Cool to 4 ^{o}C, dark	150 mL	48 hours
Ammonia-N	Water	Plastic or Glass Bottles	1-2mL conc. H_2SO_4 to pH<2 and cool to 4 ^{o}C, dark	1000 mL	28 days
Total Phosphate-P	Water	Plastic or Glass Bottles	1-2mL conc. H_2SO_4 to pH<2 and cool to 4 ^{o}C, dark	1000 mL	28 days
Chlorophyll a	Water	Amber Glass Bottles	Cool to 4 ^{o}C, dark	100 mL	Filter <= 48 hours Filters may be stored frozen up to 30 days
Pheophytin a	Water	Amber Glass Bottles	Cool to 4 ^{o}C, dark	100 mL	Filter <= 48 hours Filters may be stored frozen up to 30 days

E. coli, IDEXX Colilert	Water	Plastic (sterile)**	Cool to 4 °C, dark	200 mL	6 hours
Benthic marcroinverte-brates & fish	Tissue	Plastic or glass	70% ethyl alcohol or 70% isopropyl alcohol, or add formaldehyde to produce a 5-10% formalin solution. Store in dark and away from extremes of hot and cold.	Variable	5 years

*Preservation is performed within 15-minutes of collection.
** Certified by IDEXX

Sample Containers

Sample containers are supplied by ANA-LAB. They are prepared by ANA-LAB and already contain acid where required. Bottles for *E. coli* collection are supplied by IDEXX and contain sodium thiosulfate powder. The IDEXX bottles are certified for sterility and documentation is maintained in the TC laboratory. Amber glass bottles supplied by ANA-LAB are used routinely for chlorophyll samples. No bottles are reused.

Processes to Prevent Contamination

Procedures outlined in the TCEQ Surface Water Quality Procedures Manual outline the necessary steps to prevent contamination of samples. This includes direct collection into sample containers.

Documentation of Field Sampling Activities

Field sampling activities are documented on field data sheets as presented in Appendix C. The following will be recorded for all visits:

1. Station ID
2. Location
3. Sampling time
4. Sampling date
5. Sampling depth
6. Sample collector's name/signature
7. Values for all measured field parameters
8. Preservative added
9. Detailed observational data, including:
   - $ water appearance
   - $ weather
   - $ days since last significant rainfall
   - $ flow severity
10. Other observational data (*as applicable*), including:
    - $ biological activity

- $ pertinent observations related to water quality or stream uses (e.g., exceptionally poor water quality conditions/standards not met; stream uses such as swimming, boating, fishing, irrigation pumps, etc.)
- $ watershed or instream activities (events impacting water quality, e.g., bridge construction, livestock watering upstream, etc.)
- $ unusual odors
- $ specific sample information (number of sediments grabs, type/number of fish in a tissue sample, etc.)
- $ missing parameters (i.e., when a scheduled parameter or group of parameters is not collected)

Recording Data

For the purposes of this section and subsequent sections, all field and laboratory personnel follow the basic rules for recording information as documented below:

1. Legible writing in indelible ink with no modifications, write-overs or cross-outs;
2. Correction of errors with a single line followed by an initial and date;
3. Close-out on incomplete pages with an initialed and dated diagonal line.

Deficiencies, Nonconformances and Corrective Action Related to Sampling Requirements

Deficiencies are defined as unauthorized deviations from procedures documented in the QAPP or other applicable documents. Nonconformances are deficiencies, which affect quality and render the data unacceptable or indeterminate. Deficiencies related to sampling methods requirements include, but are not limited to, such things as sample container, volume, and preservation variations, improper/inadequate storage temperature, holding-time exceedances, and sample site adjustments.

Deficiencies are documented in logbooks, field data sheets, etc. by field or laboratory staff and reported to the cognizant field or laboratory supervisor who will notify the SRBA QAO or the SRBA Project Manager. The SRBA Project Manager will be notified by the SRBA QAO if he is not notified directly. The SRBA Project Manager or QAO will notify the TC Field Staff of the potential nonconformance within 24 hours. The SRBA QAO will initiate a Nonconformance Report (NCR) to document the deficiency.

The SRBA Project Manager, in consultation with the SRBA QAO (and other affected individuals/organizations), will determine if the deficiency constitutes a nonconformance. If it is determined the activity or item in question does not affect data quality and therefore, is not a valid nonconformance, the NCR will be completed accordingly and the NCR closed. If it is determined a nonconformance does exist, the SRBA Project Manager in consultation with SRBA QAO will determine the disposition of the nonconforming activity or item and necessary corrective action(s); results will be documented by the Patti Harman of the TC Field Staff by completion of a Corrective Action Report.

Corrective Action Reports (CARs) document: root cause(s); impact(s); specific corrective action(s) to address the deficiency; action(s) to prevent recurrence; individual(s) responsible for each action; the timetable for completion of each action; and the means by which completion of each corrective action will be documented. CARs will be included with quarterly progress reports. In addition, significant conditions (i.e., situations which, if uncorrected, could have a serious effect on safety or on the validity or integrity of data) will be reported to the TCEQ immediately both verbally and in writing.

B3 SAMPLE HANDLING AND CUSTODY

Chain-of-Custody

The COC system described in this QAPP replaces the Atag@ system as described in the SWQM Manual.

Proper sample handling and custody procedures ensure the custody and integrity of samples beginning at the time of sampling and continuing through transport, sample receipt, preparation, and analysis.

A sample is in custody if it is in actual physical possession or in a secured area that is restricted to authorized personnel. The COC form is used to document sample handling during transfer from the field to the laboratory and among subcontract laboratories. The following information concerning the sample is recorded on the COC form (See Appendix D). The list of included items should match the COC form in Appendix D. These are standard requirements for COC forms. All COC forms to be used in the project should be included in Appendix D for the TCEQ's review.

1. Date and time of collection
2. Site identification
3. Sample matrix
4. Number of containers
5. Preservative used or if the sample was filtered
6. Analyses required
7. Name of collector
8. Custody transfer signatures and dates and time of transfer

Sample Labeling

Samples are labeled on the container label with an indelible marker. Label information includes:

1. Site identification
2. Date and time of sampling
3. Preservative added, if applicable
4. Designation of “field-filtered” as applicable
5. Sample type (e.g., conventional water parameters, organics, etc. as defined in the monitoring schedule in Appendix B*)*

Sample Handling

A sample is in custody if it is in actual physical possession or in a secured area that is restricted to authorized personnel. The COC form is used to document sample handling during transfer from the field to the laboratory and among contractors. The following information concerning the sample is recorded on the COC form (See Appendix D).

1. Date and time of collection
2. Site identification

3. Sample matrix
4. Number of containers
5. Preservative used or if the sample was filtered
6. Analyses required
7. Name of collector
8. Custody transfer signatures and dates and time of transfer

The principle of sample custody is simply being able to account for sample integrity from the moment the portion of water, soil, waste, etc. is placed in a sample container until all analytical tests have been completed and any remaining sample is discarded. Documentation that will verify these actions will be a joint effort of the sampling team, the sample transporter, and the laboratory staff and involve chain-of-custody (COC) sheets and field data sheets. Copies of the COC forms can be found in Appendix D.

Field personnel will be responsible for recording all data and relevant observations on the field data sheet and COC sheets. Transportation of samples to ANA-LAB is provided by ANA-LAB. Personnel from ANA-LAB pick the samples up directly from the TC sampling team. Transfer of samples to laboratory personnel is indicated on COC forms. Standard operating procedures for the handling of samples at ANA-LAB are detailed in the Login Sample SOP and Sample Tracking SOP of ANA-LAB. Problems encountered during transportation or with the samples on arrival at the lab are documented on the COC form. Samples not collected and documented properly will be refused and sampled again when possible.

Sample bottles used in the testing procedures are supplied by ANA-LAB. The bottles are supplied pre-labeled. The labels indicate how the bottles will be used and the test to be preformed on the contents. The use and contents is both written and color-coded. The bottles are pre-acetified by ANA-LAB as required by analytical methods. TC personnel complete much of the label information prior to going into the field and group them by putting the bottles for each site in a plastic bag. The sampling time is added to the label in the field. The bottles are returned to the plastic bag and packed in ice. The sample times are recorded on the field data sheets. At the laboratory the COCs are completed when ANA-LAB personnel pick up the samples.

Deficiencies, Nonconformances and Corrective Action Related to Chain-of-Custody

Deficiencies are defined as unauthorized deviations from procedures documented in the QAPP or other applicable documents. Nonconformances are deficiencies, which affect quality and render the data unacceptable or indeterminate. Deficiencies related to chain-of-custody include but are not limited to delays in transfer, resulting in holding time violations; incomplete documentation, including signatures; possible tampering of samples; broken or spilled samples, etc.
Deficiencies are documented in logbooks, field data sheets, etc. by field or laboratory staff and reported to the cognizant field or laboratory supervisor who will notify the SRBA QAO or the SRBA Project Manager. The SRBA Project Manager will be notified by the SRBA QAO if he is not notified directly. The SRBA Project Manager or QAO will notify ANA-LAB of the potential nonconformance within 24 hours. The SRBA QAO will initiate a Nonconformance Report (NCR) to document the deficiency.

The SRBA Project Manager, in consultation with the SRBA QAO (and other affected individuals/organizations), will determine if the deficiency constitutes a nonconformance. If it is determined the activity or item in question does not affect data quality and therefore, is not a valid nonconformance, the NCR will be completed accordingly and the NCR closed. If it is determined a nonconformance does exist, the SRBA Project Manager in consultation with SRBA QAO will determine the disposition of the nonconforming

activity or item and necessary corrective action(s); results will be documented by ANA-LAB by completion of a Corrective Action Report.

Corrective Action Reports (CARs) document: root cause(s); impact(s); specific corrective action(s) to address the deficiency; action(s) to prevent recurrence; individual(s) responsible for each action; the timetable for completion of each action; and the means by which completion of each corrective action will be documented. CARs will be included with quarterly progress reports. In addition, significant conditions (i.e., situations which, if uncorrected, could have a serious effect on safety or on the validity or integrity of data) will be reported to the TCEQ immediately both verbally and in writing.

B4 ANALYTICAL METHODS

The analytical methods, associated matrices, and performing laboratories are listed in Table A7.1 of Section A7. The authority for analysis methodologies under the Clean Rivers Program is derived from the TSWQS (' '307.1 - 307.10) in that data generally are generated for comparison to those standards and/or criteria. The Standards state that AProcedures for laboratory analysis will be in accordance with the most recently published edition of *Standard Methods for the Examination of Water and Wastewater*, the latest version of the *TCEQ Surface Water Quality Monitoring Procedures Manual*, 40 CFR 136, or other reliable procedures acceptable to the Agency.@

Laboratories collecting data under this QAPP are compliant with ISO/IEC Guide 25, at a minimum. Copies of laboratory Quality Assurance Manuals (QAMs) and SOPs are available for review by the TCEQ.

Standards Traceability

All standards used in the field and laboratory are traceable to certified reference materials. Standards preparation is fully documented and maintained in a standards log book. Each documentation includes information concerning the standard identification, starting materials, including concentration, amount used and lot number; date prepared, expiration date and preparer's initials/signature. The reagent bottle is labeled in a way that will trace the reagent back to preparation.

Analytical Method Modification

Only data generated using approved analytical methodologies as specified in this QAPP will be submitted to the TCEQ. Requests for method modifications will be documented on form TCEQ-10364, the TCEQ Application for Analytical Method Modification, and submitted for approval to the TCEQ Quality Assurance Section. Work will begin only after the modified procedures have been approved.

Deficiencies, Nonconformances and Corrective Action Related to Analytical Methods

Deficiencies are defined as unauthorized deviations from procedures documented in the QAPP or other applicable documents. Nonconformances are deficiencies, which affect quality and render the data unacceptable or indeterminate. Deficiencies related to field and laboratory measurement systems include but are not limited to instrument malfunctions, blank contamination, quality control sample failures, etc.

Deficiencies are documented in logbooks, field data sheets, etc. by field or laboratory staff and reported to the cognizant field or laboratory supervisor who will notify the SRBA QAO or the SRBA Project Manager. The SRBA Project Manager will be notified by the SRBA QAO if he is not notified directly. The SRBA Project

Manager or QAO will notify the ANA-LAB QAO of the potential nonconformance within 24 hours. The SRBA QAO will initiate a Nonconformance Report (NCR) to document the deficiency.

The SRBA Project Manager, in consultation with the SRBA QAO (and other affected individuals/organizations), will determine if the deficiency constitutes a nonconformance. If it is determined the activity or item in question does not affect data quality and therefore, is not a valid nonconformance, the NCR will be completed accordingly and the NCR closed. If it is determined a nonconformance does exist, the SRBA Project Manager in consultation with SRBA QAO will determine the disposition of the nonconforming activity or item and necessary corrective action(s); results will be documented by the ANA-LAB QAO by completion of a Corrective Action Report.

Corrective Action Reports (CARs) document: root cause(s); impact(s); specific corrective action(s) to address the deficiency; action(s) to prevent recurrence; individual(s) responsible for each action; the timetable for completion of each action; and, the means by which completion of each corrective action will be documented. CARs will be included with quarterly progress reports. In addition, significant conditions (i.e., situations which, if uncorrected, could have a serious effect on safety or on the validity or integrity of data) will be reported to the TCEQ immediately both verbally and in writing.

The TCEQ has determined that analyses associated with the remark codes "holding time exceedance", "sample received unpreserved," "estimated value," etc. may have unacceptable measurement uncertainty associated with them. This will immediately disqualify analyses from submittal to TRACS. Therefore, data with these types of problems are not to be reported to the TCEQ.

B5 QUALITY CONTROL

Sampling Quality Control Requirements and Acceptability Criteria

The minimum Field QC Requirements are outlined in the *TCEQ Surface Water Quality Monitoring Procedures Manual*. Specific requirements are outlined below. Field QC sample results are submitted with the laboratory data report (see Section A9.).

Field Split - A field split is a single sample subdivided by field staff immediately following collection and submitted to the laboratory as two separately identified samples according to procedures specified in the SWQM Procedures Manual. Split samples are preserved, handled, shipped, and analyzed identically and are used to assess variability in all of these processes. Field splits apply to conventional samples only and are collected on a 10% basis or one per batch, whichever is greater. The precision of field split results is calculated by relative percent difference (RPD) using the following equation:

$$RPD = (X1-X2)/((X1+X2)/2))$$

A 30% RPD criteria will be used to screen field split results as a possible indicator of excessive variability in the collection and analytical system. If it is determined that meaningful quantities of constituent (i.e., >AWRL) were measured and analytical variability can be eliminated as a factor, than variability in field split results will primarily be used as a trigger for discussion with field staff to ensure samples are being handled in the field correctly. Some sample results or batches of samples may be invalidated based on the examination of all extenuating information. Professional judgment during data validation will be relied upon to interpret the results and take appropriate action. The qualification (i.e., invalidation) of data will be documented on the Data Summary. Deficiencies will be addressed as specified in this section under Deficiencies, Nonconformances, and Correction Action related to Quality Control.

Laboratory Measurement Quality Control Requirements and Acceptability Criteria

Detailed laboratory QC requirements and corrective action procedures are contained within the individual laboratory quality assurance manuals (QAMs). The minimum requirements that all participants abide by are stated below. Lab QC sample results are submitted with the laboratory data report (see Section A9.).

AWRL/Reporting Limit Verification

The laboratory=s reporting limit for each limit will be at or below the AWRL. To demonstrate the ongoing ability to recover at the reporting limit, the laboratory will analyze a calibration standard (if applicable) at or below the reporting limit on each day Clean Rivers Program samples are analyzed. Two acceptance criteria will be met or corrective action will be implemented. First, calibrations including the standard at the reporting limit will meet the calibration requirements of the analytical method. Second, the instrument response (e.g., absorbance, peak area, etc.) for the standard at the reporting limit will be treated as a response for a sample by use of the calibration equation (e.g., regression curve, etc.) in calculating an apparent concentration of the standard. The calculated and reference concentrations for the standard will then be used to calculate percent recovery (%R) at the reporting limit using the equation:

$$\%R = CR/SA * 100$$

where CR is the calculated result and SA is reference concentration for the standard. Recoveries must be within 75-125% of the reference concentration.

When daily calibration is not required (e.g., EPA Method 624), or a method does not use a calibration curve to calculate results, the laboratory will analyze a check standard at the reporting limit on each day Clean Rivers Program samples are analyzed. The check standard does not have to be taken through sample preparation, but must be recovered within 75-125% of the reference concentration for the standard. The percent recovery of the check standard is calculated using the following equation in which %R is percent recovery, SR is the sample result, and SA is the reference concentration for the check standard:

$$\%R = SR/SA * 100$$

If the calibration (when applicable) or the recovery of the calibration or control standard is not acceptable, corrective actions (e.g., re-calibration) will be taken to meet the specifications before proceeding with analyses of CRP samples.

The laboratory will report results of quantitation checks with the data.

Laboratory Control Standard (LCS) - A LCS consists of analyte-free water spiked with the analyte of interest prepared from standardized reference material. The LCS is spiked into laboratory-pure water at a level less than or equal to the mid-point of the calibration curve for each analyte. The LCS is carried through the complete preparation and analytical process. The LCS is used to document the bias of the analytical process. LCSs are run at a rate of one per batch. Results of LCSs are calculated by percent recovery (%R), which is defined as 100 times the measured concentration, divided by the true concentration of the spiked sample.

The following formula is used to calculate percent recovery, where %R is percent recovery; SR is the measured result; SA is the true result

$$\%R = SR/SA * 100$$

Performance limits and control charts are used to determine the acceptability of LCS analyses. Project control limits are specified in Table A7.1.

Laboratory Duplicates - A laboratory duplicate is prepared in the laboratory by splitting aliquots of an LCS. Both samples are carried through the entire preparation and analytical process. LCS duplicates are used to assess precision and are performed at a rate of one per batch.

For most parameters, precision is calculated by the relative percent difference (RPD) of LCS duplicate results as defined by 100 times the difference (range) of each duplicate set, divided by the average value (mean) of the set. For duplicate results, X_1 and X_2, the RPD is calculated from the following equation:

$$RPD = (X_1 - X_2)/\{(X_1+X_2)/2\} * 100$$

A bacteriological duplicate is considered to be a special type of laboratory duplicate and applies when bacteriological samples are run in the field as well as in the lab. Bacteriological duplicate analyses are performed on samples from the sample bottle on a 10% basis. Results of bacteriological duplicates are evaluated by calculating the logarithm of each result and determining the range of each pair.

Performance limits and control charts are used to determine the acceptability of duplicate analyses. Project control limits are specified in Table A7.1. The specifications for bacteriological duplicates in Table A7.1 apply to samples with concentrations > 10 org./100mL.

Laboratory equipment blank - Laboratory equipment blanks are prepared at the laboratory where collection materials for metals sampling equipment are cleaned between uses. These blanks document that the materials provided by the laboratory are free of contamination. The QC check is performed before the metals sampling equipment is sent to the field. The analysis of laboratory equipment blanks should yield values less than the reporting limit. Otherwise, the equipment should not be used.

Matrix spike (MS) - A matrix spike is an aliquot of sample spiked with a known concentration of the analyte of interest. Percent recovery of the known concentration of added analyte is used to assess accuracy of the analytical process. The spiking occurs prior to sample preparation and analysis. Spiked samples are routinely prepared and analyzed at a rate of 10% of samples processed, or one per batch whichever is greater. The MS is spiked at a level less than or equal to the midpoint of the calibration or analysis range for each analyte. Percent recovery (%R) is defined as 100 times the observed concentration, minus the sample concentration, divided by the true concentration of the spike.

The percent recovery of the matrix spike is calculated using the following equation in which %R is percent recovery, SSR is the observed spiked sample concentration, SR is the sample result, and SA is the reference concentration of the spike added:

$$\%R = (SSR - SR)/SA * 100$$

MS recoveries are plotted on control charts and used to control analytical performance. Measurement performance specifications for matrix spikes are not specified in this document.

Method blank - A method blank is an analyte-free matrix to which all reagents are added in the same volumes or proportions as used in the sample processing and analyzed with each batch. The method blank is carried through the complete sample preparation and analytical procedure. The method blank is used to document contamination from the analytical process. The analysis of method blanks should yield values less than the

reporting limit. For very high-level analyses, the blank value should be less then 5% of the lowest value of the batch, or corrective action will be implemented.

Additional method-specific QC requirements - Additional QC samples are run (e.g., sample duplicates, surrogates, internal standards, continuing calibration samples, interference check samples) as specified in the methods. The requirements for these samples, their acceptance criteria, and corrective actions are method-specific.

Deficiencies, Nonconformances and Corrective Action Related to Quality Control

Deficiencies are defined as unauthorized deviations from procedures documented in the QAPP. Nonconformances are deficiencies, which affect quality and render the data unacceptable or indeterminate. Deficiencies related to quality control include but are not limited to field and laboratory quality control sample failures.

Deficiencies are documented in logbooks, field data sheets, etc. by field or laboratory staff and reported to the cognizant field or laboratory supervisor who will notify the SRBA QAO or the SRBA Project Manager. The SRBA Project Manager will be notified by the SRBA QAO if he is not notified directly. The SRBA Project Manager or QAO will notify the TC Field Staff QAO of the potential nonconformance within 24 hours. The SRBA QAO will initiate a Nonconformance Report (NCR) to document the deficiency.

The SRBA Project Manager, in consultation with the SRBA QAO (and other affected individuals/organizations), will determine if the deficiency constitutes a nonconformance. If it is determined the activity or item in question does not affect data quality and therefore, is not a valid nonconformance, the NCR will be completed accordingly and the NCR closed. If it is determined a nonconformance does exist, the SRBA Project Manager in consultation with SRBA QAO will determine the disposition of the nonconforming activity or item and necessary corrective action(s); results will be documented by the TC Field Staff QAO by completion of a Corrective Action Report.

Corrective Action Reports (CARs) document: root cause(s); impact(s); specific corrective action(s) to address the deficiency; action(s) to prevent recurrence; individual(s) responsible for each action; the timetable for completion of each action; and, the means by which completion of each corrective action will be documented. CARs will be included with quarterly progress reports. In addition, significant conditions (i.e., situations which, if uncorrected, could have a serious effect on safety or on the validity or integrity of data) will be reported to the TCEQ immediately both verbally and in writing.

B6 INSTRUMENT/EQUIPMENT TESTING, INSPECTION AND MAINTENANCE

All sampling equipment testing and maintenance requirements are detailed in the *TCEQ Surface Water Quality Monitoring Procedures Manual*. Sampling equipment is inspected and tested upon receipt and is assured appropriate for use. Equipment records are kept on all field equipment and a supply of critical spare parts is maintained.

All laboratory tools, gauges, instrument, and equipment testing and maintenance requirements are contained within laboratory QAM(s). Testing and maintenance records are maintained and are available for inspection by the TCEQ. Instruments requiring daily or in-use testing include, but are not limited to, water baths, ovens, autoclaves, incubators, refrigerators, and laboratory-pure water. Critical spare parts for essential equipment are maintained to prevent downtime. Maintenance records are available for inspection by the TCEQ.

B7 INSTRUMENT CALIBRATION AND FREQUENCY

Field equipment calibration requirements are contained in the *TCEQ Surface Water Quality Monitoring Procedures Manual*. Post-calibration error limits and the disposition resulting from error are adhered to. Data not meeting post-error limit requirements invalidate associated data collected subsequent to the pre-calibration and are not submitted to the TCEQ.

Detailed laboratory calibrations are contained within the QAM(s). The laboratory QAM identifies all tools, gauges, instruments, and other sampling, measuring, and test equipment used for data collection activities affecting quality that must be controlled and, at specified periods, calibrated to maintain bias within specified limits. Calibration records are maintained, are traceable to the instrument, and are available for inspection by the TCEQ. Equipment requiring periodic calibrations includes, but are not limited to, thermometers, pH meters, balances, incubators, turbidity meters, and analytical instruments.

B8 INSPECTION/ACCEPTANCE OF SUPPLIES AND CONSUMABLES

Items for use in monitoring and laboratory are ordered from various sources as needed. Calibration standards are often obtained directly from ANA-LAB. The items are examined to make certain these meet TCEQ specifications and they are dated with the date of arrival. Standards and chemicals that are out of date as specified in the QAMs are not used in quality assured work. The invoice for purchase of supplies and consumables are maintained in a logbook. Standards are traceable.

B9 NON-DIRECT MEASUREMNETS

This QAPP does not include the use of data obtained from non-direct measurement sources.

B10 DATA MANAGEMENT PLAN

Data Management Process

The data management functions of the SRBA are many. Probably the most important, is to gather raw data that is collected from field monitors and laboratories and prepare it for entry into the TCEQ database as "quality assured data". The data comes to the data management team on field data sheets and laboratory report forms. The field data sheets are prepared by the data manager. The data sheets contain much of the data that is required by the TCEQ. However, a significant amount of data, such as storet codes, etc, is already stored in the Microsoft Access 2000 interface used for data entry. The field and laboratory data are inspected to see that all holding times have been met and that the parameters reported are reasonable. When problems with the data set are found, the field data monitors are usually contacted directly to see if the problem can be corrected. Laboratories are contacted by telephone or email. Problems that cannot be corrected are detailed on the Data Summary and the data is entered in the SRBA database only as a comment with the appropriate notation. Outliers are documented and confirmed. The field data and laboratory results are entered into a corresponding or "look alike" Access data entry form. The form is capable of carrying out many functions to assist in the data entry. Storet codes are automatically entered. The form checks data as it is entered to see if it is in an appropriate type of entry or if a number is within certain limits. The person doing the data entry visually inspects the data sheet. The form checks the data for errors as it is entered into the database and gives prompts. In a number of the cases the form can carry out numerous complex and repetitive calculations that aid in building certain required parameters. After the SRBA database files are completed, a set of queries are used to build Microsoft database files that have the "event" and "result" structure required by the TCEQ. These files are inspected visually and inspected by computer for entry errors, omissions, and file duplication. After the "event" and "results" files are deemed correct by the Data Manager and QA Officer, they are converted into a "|" delimited text format and electronically submitted to the TCEQ for inclusion in the TCEQ Regulatory Activities and Compliance System Database. The required Data Summary is mailed to the TCEQ CRP Project Manager. Figure 5 details the data management procedures.

Data Errors and Loss

The field data sheets and the computer data entry screen look exactly the same. They are compared for completeness of data entry. The computer form can be printed out and compared to the data sheets where the entries can be validated manually. The computer form checks to see if many of the parameters are within reasonable limits and is capable of catching many entry errors. The data is analyzed visually in tabular form to catch obvious errors in format. When the data is transferred to TCEQ is checked by computer for obvious errors of format and for completeness by the CRP Program Manager. See Appendix C for examples of data forms and Appendix E for the Data Summary Form.

Data Handling, Hardware, and Software Requirements

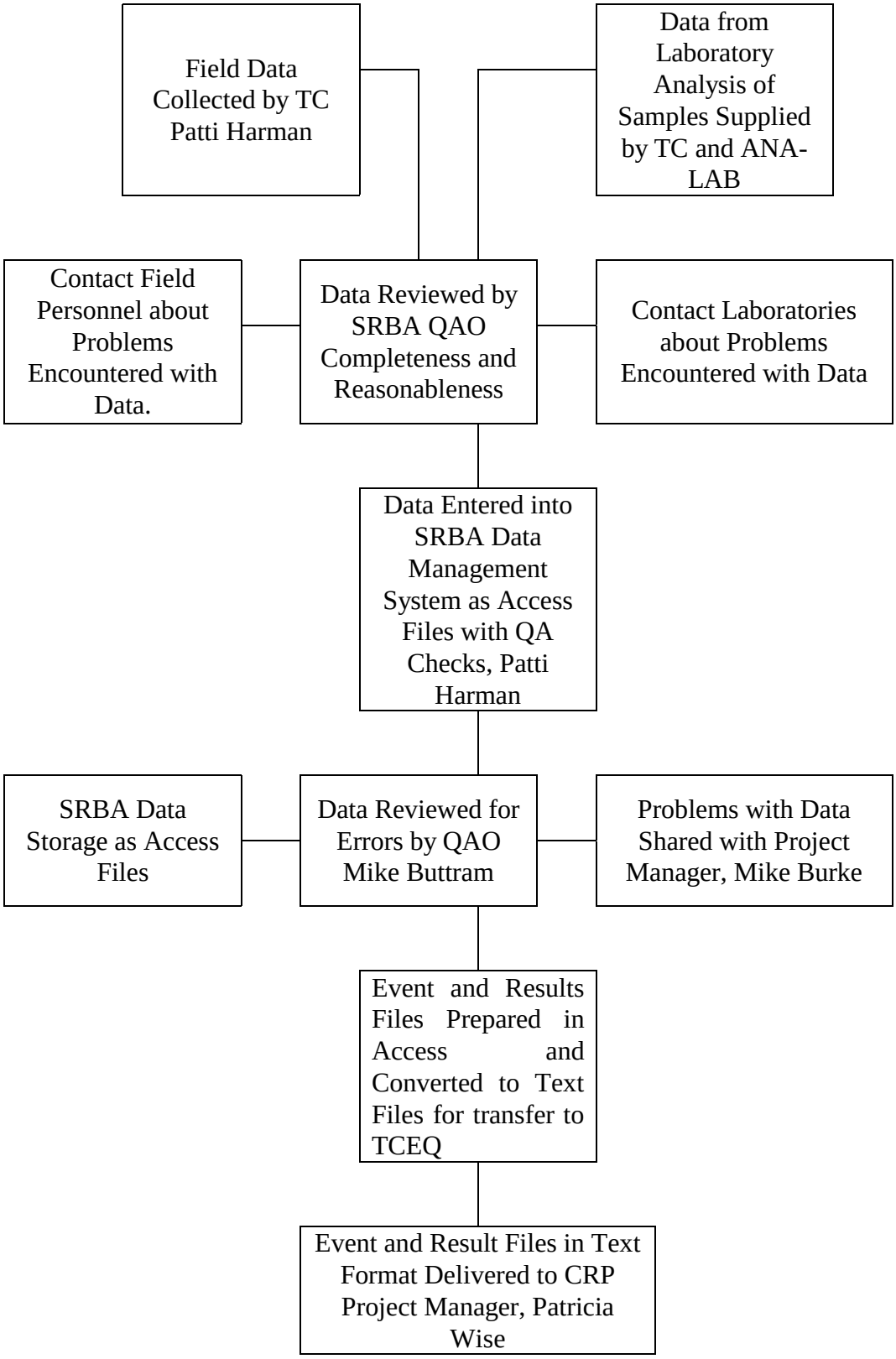
SRBA uses Microsoft Access as it database software. All database files are delivered to the TCEQ as ASCII text files that are generated from Access files. A significant amount of effort is expended with the production of GIS related documents. ArcView software by ESRI is utilized in the production of maps. GPS information about monitoring sites is used to locate the sites on maps and in the field. Maps are generated locally using TCEQ data files downloaded from the TCEQ website. Basins 3.0 by the EPA and the Street Atlas USA 7.0 by DeLorme are used as aids in certain instances. PPAI does some map work for the SRBA. Much of the work done requires that reports be written and presentations be produced. All word processing activities are produced in Microsoft Word 2000. Microsoft Power Point is utilized as the presentation software. Word Perfect Office 2002 is also available. This package includes Word Perfect 10, Quattro Pro 10, and Paradox 10 for use as needed. Any computer system capable of handling the Microsoft 2000 Office

Professional Edition and Arc View 8 and equipped with a RW CD burner and modem is acceptable. Of course a fast computer and more storage space on the hard drive is better.

Record Keeping and Data Storage

Computer generated field data sheet similes are printed and filed in a data notebook along with all original field data sheets, laboratory reports, chain of custody forms, laboratory QA information, and information about duplicates. This notebook represents a complete hard copy of all data collected. The SRBA data files are maintained in two formats. The data, as entered into the Access forms, is maintained and can be recovered as sets of data exactly as entered. Data in this format is easily recovered and reviewed without much effort, but the database to accomplish this is not very efficient in terms of memory required. The files are also maintained in an Access database that is similar to the "event" and "results" files required by the TCEQ. These are somewhat more difficult to utilize but very efficient in terms of the memory required. Data files in either of the formats are available from the SRBA either electronically or on CD-ROMs. Requests should be made to Mr. Mike Burke of the SRBA. The data as submitted to the TCEQ is entered into the state database after is approved. The quality assured data from this database is made available on the SRBA web page maintained by Paul Price Associates. The web address is SULPHURR.org

Figure 5 Flow Sheet For SRBA Data Management Procedures



C1 ASSESSMENTS AND RESPONSE ACTIONS

The following table presents the types of assessments and response actions for data collection activities applicable to the QAPP.

Table C1.1 Assessments and Response Requirements

Assessment Activity	Approximate Schedule	Responsible Party	Scope	Response Requirements
Status Monitoring Oversight, etc.	Continuous	SRBA	Monitoring of the project status and records to ensure requirements are being fulfilled	Report to TCEQ in Quarterly Report
Monitoring Systems Audit	Dates to be determined by TCEQ CRP	TCEQ	Field sampling, handling and measurement; facility review; and data management as they relate to CRP	30 days to respond in writing to the TCEQ to address corrective actions
Monitoring Systems Audit	Once per contract period	SRBA QAO-Mike Buttram	TC Field Staff, field sampling, handling and measurement; facility review; and data management as they relate to CRP	30 days to respond in writing to the SRBA. PA will report problems to TCEQ in Progress Report.
Laboratory Inspection	Dates to be determined by TCEQ	TCEQ Laboratory Inspector	Requirements appearing in lab SOPs and QAPP, ISO/IEC Guide 25, applicable EPA methods and Standard Methods, 40 CFR 136, and other documents applicable to CRP programs including portions of the Texas Administrative Code and the Code of Federal Regulations.	30 days to respond in writing to the TCEQ to address corrective actions

Corrective Action

The Planning Agency Project Manager is responsible for implementing and tracking corrective action procedures as a result of audit findings. Records of audit findings and corrective actions are maintained by both the CRP and the SRBA Project Manager. Corrective action documentation will be submitted to the TCEQ with the Progress Report.

If audit findings and corrective actions cannot be resolved, then the authority and responsibility for terminating work are specified in the CRP QMP and in agreements in contracts between participating organizations.

The SRBA Project Manager is responsible for implementing and tracking corrective action procedures as a result of audit findings. Upon receipt of an audit finding the SRBA Project Manager will initiate the Corrective Action Response. A corrective action report form, CAR, will be opened to record the audit finding and document the management of the finding's resolution. The SRBA Project Manager will communicate the audit finding to the SRBA QAO who will access its impact on current projects and quality assured records previously submitted by SRBA. The assessment will identify the cause of the

audit finding and suggest changes in methodology where necessary. The QAO will propose a corrective action that will be recorded on the CAR. The corrective action may require that data be removed from the database. Once this assessment of the finding has been completed the SRBA Project Manager will communicate the proposed corrective action to the CRP Project Manager who will judge its for correctness and appropriateness. After the CRP Project Manager approves the corrective action of the finding, the corrective action will be implemented as directed by the SRBA Project Manager. Both the CRP and SRBA Project Managers maintain records of audit findings and corrective actions. Corrective action documentation will be submitted to the TCEQ with the Progress Report

If audit findings and corrective actions cannot be resolved, then the authority and responsibility for terminating work is specified in the CRP QMP and in agreements in contracts between participating organizations.

C2 REPORTS TO MANAGEMENT

Laboratory Data Reports

Laboratory data reports contain QC information so that this information can be reviewed by the Planning Agency Project Manager.

Reports to SRBA Project Management

The Project Manager will receive copies of the following information and forward them to the SRBA QAO:

- Field data sheets, notes, and photos
- Field instrument reading print outs
- COC forms
- Laboratory results, including QA testing
- Reports of all significant QA issues pertaining to sampling, field measurements, laboratory analyses, or data compilation

Reports to TCEQ Project Management

All reports detailed in this section are contract deliverables and are transferred to the TCEQ in accordance with contract requirements.

Progress Report- Summarizes the SRBA's activities for each task; reports monitoring status, problems, delays, and corrective actions; and outlines the status of each task's deliverables.

Monitoring Systems Audit Report and Response- Following any audit performed by the SRBA, a report of findings, recommendations and response is sent to the TCEQ in the quarterly progress report.

Reports by TCEQ Project Management

Contractor Evaluation- The SRBA participates in a Contractor Evaluation by the TCEQ annually for compliance with administrative and programmatic standards. Results of the evaluation are submitted to the TCEQ Financial Administration Division, Procurements and Contracts Section.

D1 DATA REVIEW, VERIFICATION, AND VALIDATION

All field and laboratory data will be reviewed and verified for integrity and continuity, reasonableness, and conformance to project requirements, and then validated against the data quality objectives, which are listed in Section A7. Only those data, which are supported by appropriate quality control data and meet the data quality objectives defined for this project will be considered acceptable, and will be reported for entry into the SWQM portion of TRACS.

D2 VERIFICATION AND VALIDATION METHODS

All field and laboratory data will be reviewed, verified and validated to ensure they conform to project specifications and meet the conditions of end use as described in Section A7 of this document.

Data review, verification, and validation will be performed using self-assessments and peer and management review as appropriate to the project task. The information to be reviewed, verified, and validated (listed by task and responsible party in Table D2.1) is evaluated against technical and project specifications and checked for errors, especially errors in calculations, data reduction, and transcription. Potential errors are identified by examination of documentation and by manual and computer-asisted examination of corollary or unreasonable data. If a question arises or an error is identified, the manager of the task responsible for generating the data is contacted to resolve the issue. Issues, which can be corrected are corrected and documented. If an issue cannot be corrected, the task manager consults with higher-level project management to establish the appropriate course of action, or the data associated with the issue are rejected. Field and laboratory reviews, verifications, and validations will be documented.

Data validation tasks to be addressed by the SRBA include, but are not limited to, the confirmation of lab and field data review, evaluation of field QC results, additional evaluation of anomalies and outliers, analysis of sampling and analytical gaps, and confirmation that all parameters and sampling sites are included in the QAPP. Any suspected errors or anomalous data must be addressed by the manager of the task associated with the data before data validation can be completed. A second element of the validation process is consideration of any findings identified during the annual monitoring systems audit conducted by the TCEQ Quality Assurance Specialist assigned to the project. Any issues requiring corrective action must be addressed, and the potential impact of these issues on previously collected data will be assessed. Finally, the SRBA Project Manager validates that the data meet the data quality objectives of the project and are suitable for reporting to TCEQ. Pertinent information having to do with inconsistencies with reporting limit specifications; failures in sampling methods and/or laboratory procedures resulting in unavailable data; etc. will be provided on the Data Summary when the data are submitted to the TCEQ.

Table D2.1 Data Review, Verification, and Validation Tasks

Task	Verification	Validation	Responsibility
Field data reviewed for conformance with data collection, sample handling and chain of custody, analytical and QC requirements	Y		SRBA QAO and TC Field Staff
Post-calibrations checked to ensure compliance with error limits	Y		SRBA QAO
Field data calculated, reduced, and transcribed correctly	Y		SRBA QAO
Laboratory data reviewed for conformance with data collection, sample handling and chain of custody, and analytical and QC requirements to include documentation, holding times, sample receipt, sample preparation, sample analysis, project and program QC results, and reporting	Y		ANA-LAB LM
Laboratory data calculated, reduced, and transcribed correctly	Y		ANA-LAB LM
Reporting limits consistent with requirements for AAmbient Water Reporting Limits.@	Y	Y	ANA-LAB LM
Analytical data documentation evaluated for consistency and/or improper practices	Y	Y	ANA-LAB LM
Analytical QC information evaluated to determine impact on individual analyses	Y	Y	ANA-LAB LM
All laboratory samples analyzed for all parameters	Y	Y	ANA-LAB LM
Data set (to include field and laboratory data) evaluated for reasonableness and if corollary data agree	Y	Y	SRBA QAO
Data review, verification, and validation performed and deviations documented		Y	SRBA QAO
Outliers confirmed and documented		Y	SRBA DM
Field QC acceptable (e.g., field splits and trip, field and equipment blanks)		Y	SRBA QAO
Sampling and analytical data gaps checked and documented		Y	SRBA QAO
Verification and validation confirmed. Data meets conditions of end use and are reportable		Y	SRBA, PM

D3 RECONCILIATION WITH USER REQUIREMENTS

Data produced in this project, and data collected by other organizations (e.g., USGS, TCEQ, etc.), will be analyzed and reconciled with project data quality requirements. Data meeting project requirements will be used by the TCEQ for the Water Quality Inventory in accordance with TCEQ's Guidance for Assessing Texas Surface and Finished Drinking Water Quality Data, and for TMDL development, stream standards modifications, and permit decisions as appropriate. Data, which do not meet requirements will not be submitted to the SWQM portion of TRACS nor will be considered appropriate for any of the uses noted above.

APPENDIX A

TASK 3 WORK PLAN

Objectives: Data collection efforts will focus on providing information to support:

- temporal and spatial analysis of water quality
- knowledge of water quality and flow for unclassified streams
- evaluation and development of state-wide, regional, and site-specific water quality standards
- permit criteria related to the perennial or intermittent nature of receiving streams
- receiving water assessments
- 305(b) assessment and 303(d) priority monitoring
- use attainability assessments
- waste load evaluations (WLE) or total maximum daily load (TMDL) development

Task Description: The continued implementation of a basin-wide water quality monitoring plan is the primary focus for this biennium. A new Quality Assurance Project Plan (QAPP) will be completed to reflect any additional monitoring. Updates to the QAPP will be made annually at the beginning of each fiscal year or as requested by TCEQ. In addition, any changes to the monitoring plan will be made through an amendment to the QAPP before the changes are implemented. The monitoring plan will strive to meet quality assured monitoring and analytical protocols while addressing the following goals:

-- determine standards compliance and provide documented water quality data basin-wide for further evaluation of trends and other related issues
-- collect data to aid in developing and evaluating watershed specific standards
-- provide supplemental data to complete the Clean Water Act (CWA) 305(b) Water Quality Inventory

The Sulphur River Basin Authority monitoring plan will continue to attempt to address water quality goals identified in the CRP 1996 Assessment Report and 1999 Basin Summary Report, and provide a unified plan with both regional and local agencies. The monitoring plan for Fiscal Year 2004-2005 includes routine monitoring and systematic monitoring.

Task 3.1 The primary objective of the Routine Monitoring Program is to continue and extend the long-term water quality database to follow trends and identify water quality changes in major sub-basins of the Sulphur River system. FY 2004 Routine Monitoring Plan provides for four fixed monitoring stations. SRBA will assist Region 5 in monitoring three stations located on Lake Wright Patman (Segment 0302). Field measurements, and conventional chemistry will be collected for times by SRBA to complement TCEQ quarterly monitoring. Diurnal dissolved oxygen studies will be undertaken twice. In addition, SRBA will monitor quarterly one site on Days Creek at State Line Road for field measurements, E. coli, fecal coliform, and conventional chemistry. Biological and habitat assessments, and 24-hour dissolved oxygen measurements will be conducted at this site on a semi-annual basis during the index period (between March 15 and October 15) with one of the two events occurring during the critical period (July 1 and September 30) separated by at least 30 days under normal to low flow conditions.

Task 3.2 During FY 2004, systematic monitoring will be conducted in the White Oak Creek (Segment 0303B) and Days Creek (Segment 0304) watersheds. A total of six stations have been selected for field investigation. Three tributaries of White Oak Creek will be studied. These are Big Creek, Stouts Creek and Caney Creek. Each will be monitored quarterly for field and conventional parameters, and *E. coli* bacteria. These sites will be studied twice a year for diurnal DO, nekton, and benthic populations, and habitat assessments will be conducted. Three sites on Days Creek will be monitored twice for diurnal DO, nekton, and benthic populations, and habitat assessments.

Task 3.3 Targeted Monitoring - No targeted monitoring has been planned for the FY 2004-2005 biennium.

Task 3.4 Special Studies – No special studies have been planned for the FY 2004-2005 biennium.

Progress Reports will describe the number of sampling events and the types of monitoring (including targeted) being conducted.

Deliverables
& Dues Dates: September 1, 2003 through August 31, 2004

Task 3.1 - Routine Monitoring & 3.2 - Systematic Monitoring

A. Conduct water quality monitoring and provide details of the monitoring activities in Progress Reports - December 15, 2003; March 15 and June 15, 2004

September 1, 2003 through August 31, 2004

Task 3.1 - Routine Monitoring & 3.2 - Systematic Monitoring

A. Conduct water quality monitoring - provide details of the monitoring activities in Progress Reports - September 15 and December 15, 2003; March 15 and June 15 and August 31, 2004

Appendix B
Sampling Process Design and Monitoring Schedule (plan)

Sample Design Rationale

The sample design is based on the legislative intent of the Clean Rivers Program. Under the legislation, the Planning Agencies have been tasked with providing data to identify significant long-term water quality trends to characterize water quality conditions in support of the 305(b) assessment. Based on Steering Committee input, achievable water quality objectives and priorities and the identification of water quality issues are used to develop work plans, which are in accord with available resources. As part of the Steering Committee process, the *SRBA* coordinates closely with the TCEQ and other participants to ensure a comprehensive water monitoring strategy within the Watershed.

The SRBA monitoring program in FY 2004 is part of a multi-year, strategic plan. The multi-year plan has two primary objectives.

- Characterize major water bodies on an ongoing basis to determine if the water quality is suitable for designated water uses. A fixed/routine monitoring program is used to fulfill this objective.

- Screen significant tributaries periodically to determine if there are previously unidentified, localized water quality problems or if tributary inflows may be adversely affecting the quality of major water bodies. An intensive/systematic monitoring program is used to fulfill this objective.

The systematic monitoring program continues a basin wide study of the Sulfur River watershed. After completing a study of the main stem of the Sulfur River and White Oak Creek in 1999, the Lake Wright Patman tributaries in FY 2000, the Days Creek watershed in FY 2001, the middle Sulphur Basin in FY 2002, and upper Sulphur Basin in FY 2003, the systematic monitoring effort for 2004 is directed at the sub watersheds of White Oak Creek (Segment 303B) and the upper reaches of Days Creek. Three tributaries of White Oak Creek are scheduled for monitoring that includes field data, conventional water chemistry, habitat assessment, *E. coli* counts, nekton and benthic collections, and DIEL studies. The function of this systematic study is to collect data that will give a general overview of stream conditions and problems in these sub watersheds. The streams are Big Creek, Stout Creek and Caney Creek. White Oak Creek is listed on the 303(d) list for low dissolved oxygen. The tributaries drain a large agricultural area where a number of dairies are located. Nutrients in the runoff from this area may impact the dissolved oxygen level in White Oak Creek Three sites on Days Creek are scheduled for monitoring that includes habitat assessment, nekton and benthic collections, and DIEL studies. The study of these sites will support a special study of Days Creek by TCEQ personnel. TCEQ's special study will focus on the impact of two superfund sites and local industry on the water quality in Day's Creek. The stream has high levels of semi-volatile hydrocarbon residue in the sediment and is listed for bacteria on the 303(d) List. The data collected at these six sites will be useful in making decisions about future study needs in these watersheds. Figure 2 and Figure 3 show the location of the systematic sites.

The routine monitoring for FY 2004 involves the study of four fixed sites. The site on Days Creek has been studied by the TCEQ for a number of years. It is however located a long way from the Tyler office. The SRBA has selected this site to support the TCEQ in its overall monitoring effort where resources have been stretched thin. This site is located downstream from the Texarkana Regional Wastewater Treatment Plant and carries all of the runoff from Texarkana including that from industry and two superfund sites. Three routine sites on Wright Patman Lake have been adopted by SRBA for study. These sites are currently monitored by TCEQ for field and water chemistry however the resources are not available to do DIEL studies. The SRBA will do DIEL studies and collect field data and conventional water chemistry at

these sites. This data is considered very important because of the listing of Wright Patman Lake on the 303(d) List for low levels of dissolved oxygen and pH considerations. Wright Patman Lake is a flood control lake and is the source of most of the area drinking water. Figure 1 shows the location of the fixed sites.

Site Selection Criteria

This data collection effort involves monitoring fixed/routine water quality, using procedures that are consistent with the TCEQ SWQM program, for the purpose of data entry into the statewide database maintained by the TCEQ. To this end, some general guidelines are followed when selecting sampling sites, as identified below. Overall consideration is given to accessibility and safety. All monitoring activities have been developed with coordination with the CRP Steering Committee and with the TCEQ.

1. Fixed/routine monitoring sites are representative of in-stream data and are free from back-water effects.

2. Fixed/routine monitoring sites are selected to maximize stream coverage or basin coverage. For very long stretches of river length, a station is considered representative of a water body for not more than 25 miles in freshwater and tidal streams. A single monitoring site is considered representative of 25 percent of the total reservoir acres and estuary or ocean square miles, but not more than 5,120 acres or 8 square miles.

3. Fixed/routine monitoring sites are located preferentially where there are “localized" water quality effects based on past water quality data.

4. Fixed/routine monitoring sites are located where historical data exists. No degradation of water quality may be indicated. However, the continuation of water quality monitoring at this site has been deemed important.

5. At least one site for each classified segment will be selected for fixed/routine monitoring unless the segment is already covered by TCEQ or other qualified monitoring entities reporting fixed/routine data to TCEQ.

6. Fixed/routine monitoring sites may be selected to bracket sources of pollution, influence of tributaries, changes in land uses, and hydrological modifications.

7. Fixed/routine monitoring sites are chosen based on accessibility. When possible, sites are selected where it is possible to collect flow measurements during routine visits or where a stream flow gage is located.

Monitoring Sites

This QAPP covers a two-year period that includes FY 2004 and FY 2005. This appendix applies only to the work to be done in FY 2004. The appendix will be amended to include the work to be done in FY 2005 prior to starting work in FY 2005.

The intensive/systematic sites are selected to screen significant tributaries periodically to determine if there are previously unidentified, localized water quality problems or if tributary inflows may be adversely affecting the quality of major water bodies. The three sites on tributaries of White Oak Creek were selected because they

were previously unstudied and they may impact Days Creek, which has been listed on the 303(d) list for low dissolved oxygen. The main stem of White Oak Creek is the subject of routine monitoring by TCEQ personnel. Days Creek has been studied at several sites over a period of years because it drains two superfund sites, numerous industrial sites, and the whole of Texarkana. The stream has been documented to have high levels of semi-hydrocarbon residue in sediment samples by TCEQ (Crowe, 1994), and SRBA (IS, 2001). Data from the sites selected on Days Creek will help to identify the source of the hydrocarbons and to quantify their impact. The data collected by SRBA from the Days Creek sites will be used in a special study being conducted by TCEQ on the upper portion of Days Creek.

Monitoring Sites and Tables for FY 2004

The sample design for surface water quality monitoring is shown in Table B1.1 below.

Table B1.1, FY 2004

Basin_id: 03
Segment: 0302
Wright Patman Lake

Region	Station ID	Site Description	Start Date	End Date	SC1/ SC2 (1)	Prog Code (2)	E. coli Bacteria	24 Hr DO	Aq. Hab	Routine Benthics	Routine Nekton	Conv (3)	Inst Flow	Field (4)
5	10214	Wright Patman Lake at SH 8	9/1/03	8/31/04	SU/TC	RT	4					4		4
5	10214	Wright Patman Lake at SH 8	9/1/03	8/31/04	SU/TC	DI		2						
5	15061	Lake Wright Patman, @ North Shore	9/1/03	8/31/04	SU/TC	RT	4					4		4
5	15061	Lake Wright Patman, @ North Shore	9/1/03	8/31/04	SU/TC	DI		2						
5	16859	Lake Wright Patman @ IP intake	9/1/03	8/31/04	SU/TC	RT	4					4		4
5	16859	Lake Wright Patman @ IP intake	9/1/03	8/31/04	SU/TC	DI		2						

(1) SU=Sulphur River Basin Authority, TC=Texarkana College
(2) RT=Routine water sampling baseline, DI=DIEL sampling, IS=Intensive/Systematic
(3) Conventionals = TSS, TDS, sulfate, chloride, chlorophyll-a, pheophytin, ammonia, nitrate-N, nitrite-N, and total phosphate-P
(4) Field = pH, DO, conductivity, temperature, Secchi depth, and observations

Basin_id: 03
Segment 0303
Sulphur/South Sulphur River

Region	Station ID	Site Description	Start Date	End Date	SC1/ SC2 (1)	Prog Code (2)	E. coli Bacteria	24 Hr DO	Aq. Hab	Routine Benthics	Routine Nekton	Conv (3)	Inst Flow	Field (4)
5	17909	East Caney Creek at US 30	9/1/03	8/31/04	SU/TC	IS	4		2	2	2	4	4	4
5	17909	East Caney Creek at US 30	9/1/03	8/31/04	SU/TC	DI		2						
5	17907	Stouts Creek at FM 900	9/1/03	8/31/04	SU/TC	IS	4		2	2	2	4	4	4
5	17907	Stouts Creek at FM 900	9/1/03	8/31/04	SU/TC	DI		2						
5	17906	Big Creek at Franklin CR 1018	9/1/03	8/31/04	SU/TC	IS	4		2	2	2	4	4	4
5	17906	Big Creek at Franklin CR 1018	9/1/03	8/31/04	SU/TC	DI		2						

(1) SU=Sulphur River Basin Authority, TC=Texarkana College
(2) RT=Routine water sampling baseline, DI=DIEL sampling, IS=Intensive/Systematic
(3) Conventionals = TSS, TDS, sulfate, chloride, chlorophyll-a, pheophytin, ammonia, nitrate-N, nitrite-N, and total phosphate-P
(4) Field = pH, DO, conductivity, temperature, Secchi depth, and observations

Basin_id: 03
Segment: 0304
Days Creek

Region	Station ID	Site Description	Start Date	End Date	SC1/ SC2 (1)	Prog Code (2)	E. coli Bacteria	24 Hr DO	Aq. Hab	Routine Benthics	Routine Nekton	Conv (3)	Inst Flow	Field (4)
5	10226	Days Creek at State Line Road South of Texarkana	9/1/03	8/31/04	SU/TC	RT	4		2	2	2	4	4	4
5	10226	Days Creek at State Line Road South of Texarkana	9/1/03	8/31/04	SU/TC	DI		2						
5	10227	Days Creek 0.9 km below Howard Creek confluence	9/1/03	8/31/04	SU/TC	IS			2	2	2		2	2
5	10228	Days Creek near Kerr McGee	9/1/03	8/31/04	SU/TC	IS			2	2	2		2	2
5	10229	Days Creek at Lubbock Street	9/1/03	8/31/04	SU/TC	IS			2	2	2		2	2

(1) SU=Sulphur River Basin Authority, TC=Texarkana College
(2) RT=Routine water sampling baseline, DI=DIEL sampling, IS=Intensive/Systematic
(3) Conventionals = TSS, TDS, sulfate, chloride, chlorophyll-a, pheophytin, ammonia, nitrate-N, nitrite-N, and total phosphate-P
(4) Field = pH, DO, conductivity, temperature, Secchi depth, and observations

Critical vs. non-critical measurements

All data taken for CRP and entered into the SWQM portion of the TRACS database are considered critical.

APPENDIX C
Field Data Sheets

APPENDIX D
Chain of Custody Form

APPENDIX E

ATTACHMENT 1 Example Letter to Document Adherence to the QAPP

TO: (name)
(organization)

FROM: (name)
(organization)

Please sign and return this form by (date) to:

(address)

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

_____

Signature Date