

**Clean Rivers Program
Quality Assurance Project Plan
for the**

Red and Canadian River Basins

Revision 1.0

**Red River Authority of Texas
3000 Hammon Road
PO Box 240
Wichita Falls, Texas 76307-0240**

**Clean Rivers Program
Monitoring Operations Division
Texas Commission on Environmental Quality
P.O. Box 13087, MC 165
Austin, Texas 78711-3087**

Effective Period: FY 2008 to FY 2009

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

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LIST OF ACRONYMS

AWRL	Ambient Water Reporting Limits	NTU	Nephelometric Turbidity Units
BAC	Basin Advisory Committee	QA	Quality Assurance
CAR	Corrective Action Report	QM	Quality Manual
COC	Chain-of-Custody	QAO	Quality Assurance Officer
COD	Chemical Oxygen Demand	QAPP	Quality Assurance Project Plan
CS	City of Sherman	QAS	Quality Assurance Specialist
CRP	Clean Rivers Program	QC	Quality Control
DBMS	Database Management System	QMP	Quality Management Plan
DMP	Data Management Plan	RL	Reporting Limit
DO	Dissolved Oxygen	RPD	Relative Percent Difference
DOC	Demonstration of Capability	RRA	Red River Authority of Texas (Authority)
DQO	Data Quality Objective	SOP	Standard Operating Procedure
EDP	Electronic Data Processing	SQL	Structured Query Language
EPA	U.S. Environmental Protection Agency	SWQM	Surface Water Quality Monitoring
ESD	RRA Environmental Services Division	SWQMIS	Surface Water Quality Monitoring Information System
FY	Fiscal Year	TCEQ	Texas Commission on Environmental Quality
GIS	Geographic Information System	TDS	Total Dissolved Solids
GPS	Global Positioning System	TMDL	Total Maximum Daily Load
HUA	Hydrologic Unit Area	TOC	Total Organic Carbon
LAN	Local Area Network	TRACS	TCEQ Regulatory Activities/Compliance System
LCRA	Lower Colorado River Authority	TSS	Total Suspended Solids
LCS	Laboratory Control Standard	TSWQS	Texas Surface Water Quality Standards
LCSD	Laboratory Control Standard Duplicate	TWQI	Texas Water Quality Inventory
LOD	Limit of Detection	µg	Micrograms
LOQ	Limit of Quantitation	USGS	United States Geological Survey
mg	Milligrams	VOA	Volatile Organic Analytes
mL	Milliliter	VSS	Volatile Suspended Solids

A3 DISTRIBUTION LIST

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The Red River Authority will provide copies of this project plan and any amendments or appendices of this plan to each person on this list and to each sub-tier project participant, e.g., subcontractors, other units of government. The Red River Authority 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 ensure the documentation is available for review.

A4 PROJECT/TASK ORGANIZATION

Description of Responsibilities

Texas Commission on Environmental Quality

Laurie Curra, CRP 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.

Daniel R. Burke, 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.

Cory Horan, 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 Red River Authority audits. Verifies QAPPs are being followed by contractors and that projects are producing data of known quality. Coordinates project planning with the Red River Authority 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.

A4 PROJECT/TASK ORGANIZATION (continued)

Jennifer Delk, CRP Project Quality Assurance Specialist

Serves as liaison between CRP management and TCEQ 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.

Red River Authority of Texas

James E. Wright, CRP 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 Red River Authority 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. Ensures ESD staff is properly trained and that training records are maintained. Ensures that personnel and equipment are available at appropriate times to collect analyze samples. Serves as alternate CRP Sample Custodian.

David L. Holub, CRP Quality Assurance Officer

Responsible for coordinating the implementation of the QA program. Responsible for writing and maintaining the QAPP and monitoring its implementation. Responsible for identifying, receiving, and maintaining project quality assurance records. Responsible for coordinating with the TCEQ QAS to resolve QA-related issues. Notifies the Red River Authority 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 staff are properly trained in CRP QA/QC procedures. Responsible for validating that data collected are acceptable for reporting to the TCEQ. Serves as alternate CRP Sample Custodian.

Danna K. Prichard, CRP Data Manager

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 format compatible with SWQMIS (formerly the SWQM portion of the TRACS database). Maintains quality-assured data on the Authority's internet site. 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.

A4 PROJECT/TASK ORGANIZATION (continued)

James J. Quashnock, CRP Laboratory Supervisor

Responsible for ensuring that all samples received in the Environmental Services Division Laboratory are within the allotted time, and that the chain-of-custody has been observed. Ensures that the samples are analyzed in accordance with standard accepted methods as described in the SOP manual. Ensures all analysis results are correctly performed and properly recorded on the lab data sheets and in the appropriate analytical log books prior to transmittal to the Quality Assurance Officer. Responsible for the implementation of the QA program for the Authority's Laboratory. Responsible for identifying, and maintaining Laboratory quality assurance records.

W. Scott Burns, CRP Field Supervisor

Responsible for overseeing the field personnel that conduct sampling events. Ensures that all field personnel are properly trained and equipped to conduct the necessary monitoring. The Field Supervisor ensures that all field data are collected as outlined by the QAPP and the *TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods for Water, Sediment, and Tissue, 2003 (RG-415)*. Ensures that field staff are properly trained to collect samples and data for the CRP Program. Serves as CRP Sample Custodian.

Other Entities

City of Sherman, Texas

Collects and analyzes specific water quality samples required for their specific operations. Data which are submitted to the Authority, as identified in **Table A7.1** for use in the CRP, will be collected and analyzed under the guidelines set forth by the QAPP.

Wayne Kuse, CRP Project Manager

Responsible for implementing and monitoring CRP requirements of the QAPPs, QAPP amendments and appendices. Coordinates planning activities and ensures internal monitoring systems audits are conducted to ensure that staff adheres to the QAPP and that the City of Sherman Waste Water Laboratory participants are producing data of known quality. Ensures that subordinates are qualified to perform contracted work. Ensures that Authority CRP Project Managers and/or QA Specialists are notified of deficiencies and nonconformances, and that issues are resolved.

Nathan Whiddon, CRP Quality Assurance Officer

Responsible for coordinating the implementation of the QA program. Notifies RRA 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 internal monitoring systems audits to determine compliance with project and program specifications. Ensures that field staff are properly trained and that training records are maintained.

A4 PROJECT/TASK ORGANIZATION (continued)

Nicole Moseley, CRP Laboratory Supervisor

Responsible for ensuring that all samples received in the laboratory are within the allotted time, and that proper chain-of-custody procedures have been observed. Ensures that samples are analyzed in accordance with standard accepted methods as described in the SOP manual. The Laboratory Supervisor further ensures that all analysis results are correctly performed and properly recorded on the lab data sheets and in the appropriate analytical log books prior to transmittal to the Quality Assurance Officer.

Leanne Wilson, CRP Field Supervisor

Responsible for overseeing the field personnel that conduct sampling events. Ensures that all field personnel are properly trained and equipped to conduct the necessary monitoring. Ensures that personnel and equipment are available at appropriate times. The Field Supervisor ensures that all field data are collected as outlined by the QAPP and the *TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods for Water, Sediment, and Tissue, 2003 (RG-415)*.

Contract Laboratories

Lower Colorado River Authority Laboratory

The Lower Colorado River Authority Laboratory (LCRA) is a river authority laboratory that is able to perform sophisticated chemical tests as required by the CRP and has contracted with the Authority to perform specific specialized analyses. The Authority will utilize LCRA as a source for specific tests, as identified in **Table A7.1** that the Authority's laboratory cannot perform in-house.

Gary Franklin, CRP Project Manager

Responsible for implementing and monitoring CRP requirements in contracts, QAPPs, and QAPP amendments and appendices. Ensures internal monitoring systems audits are conducted to ensure that LCRA Environmental Laboratory are producing data of known quality. 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 customer or to the TCEQ.

Alicia Gill, Environmental Laboratory CRP Manager

Responsible for overall performance, administration, and reporting of analyses performed by LCRA's Environmental Laboratory Services. Responsible for supervision of laboratory personnel involved in generating analytical data for the Clean Rivers Program. Ensures that laboratory personnel have adequate training and thorough knowledge of the QAPP and related SOPs. Responsible for oversight of all laboratory operations ensuring that all QA/QC requirements are met, documentation is complete and adequately maintained, and results are reported accurately.

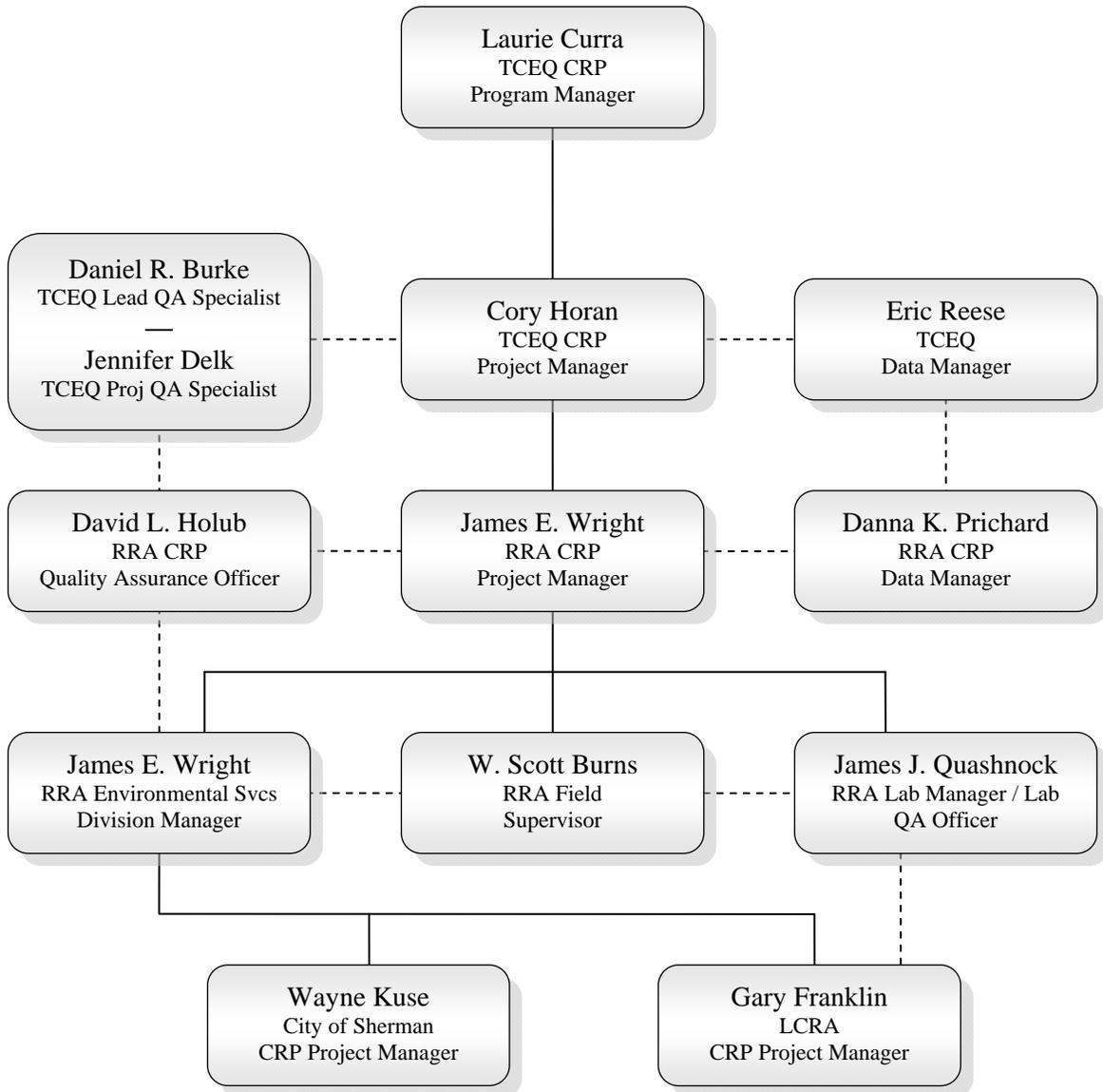
A4 PROJECT/TASK ORGANIZATION (continued)

Hollis Pantalion, Environmental Laboratory CRP Quality Assurance Officer

Responsible for the overall quality control and quality assurance of analyses performed by LCRA's Environmental Laboratory Services. Monitors the implementation of the QAM/QAPP within the laboratory to ensure complete compliance with QA data quality objectives, as defined by the contract and in the QAPP. Conducts in-house audits to ensure compliance with written SOPs and to identify potential problems. Responsible for supervising and verifying all aspects of the QA/QC in the laboratory.

A4 PROJECT/TASK ORGANIZATION (continued)

Organization Chart - Lines of Communication



-----Lines of Communication

————— Lines of Management

A5 PROBLEM DEFINITION/BACKGROUND

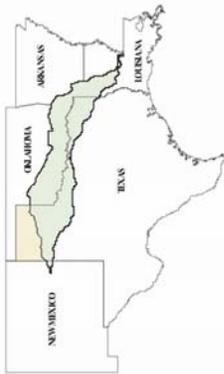
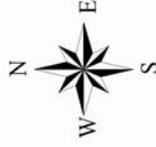
In 1991, the Texas Legislature passed the Texas Clean River Act (Senate Bill 818) in response to growing concerns that water resource issues were not being pursued in an integrated, systematic manner. The act requires that ongoing water quality assessments be conducted for each river basin in Texas, 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 comply with Commission rules for surface 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 Red River Authority 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 Red River Authority QA policy, management structure, and procedures which will be used to implement the QA requirements necessary to verify and validate the surface 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 2008 -2009*.

The FY 2008 monitoring schedule and QAPP are based on results from previous Water Quality Assessment Reports conducted under the CRP, specific constituents listed on the Texas Surface Water Quality Inventory or the §303(d), and specific requests from TCEQ and the Red and Canadian River Basins Advisory Committees. The primary concerns in the basins are elevated chloride levels, low dissolved oxygen levels, bacterial exceedances, and the lack of water quality data. Therefore, the monitoring plan developed by the Authority is designed to accomplish the following: adequate baseline water quality data throughout each basin, collect the data necessary to prove or dispute the §303(d) listings, and collect the data needed to meet the needs of TCEQ and/or the stakeholders as requested by the Basin Advisory Committees. **Figure 1** illustrates the vicinity of the Red and Canadian River Basins, followed by Reach Maps (**Figures 1-1 through 2-5**) that reveal the geographical locations of the FY 2008 Monitoring Sites.

The City of Sherman is a cooperating partner with the Authority and collects and analyzes specific water quality samples from sites around the City of Sherman, Texas in the Red River Basin under the guidance of the Authority’s QAPP. The data collected by the City of Sherman are submitted to the Authority, quality assured, and submitted to TCEQ with the Authority’s data submittal.

Red and Canadian River Basin General Vicinity Map



- Basins**
- Canadian
- Red
- Subwatershed Boundaries
- Major Highways
- General Hydrology
- County Boundaries
- Stream Segments
- Reservoirs
- Population Densities**
- 0 - 2826
- 2827 - 10875
- 10876 - 34395
- 34396 - 101986
- 101987 - 172289

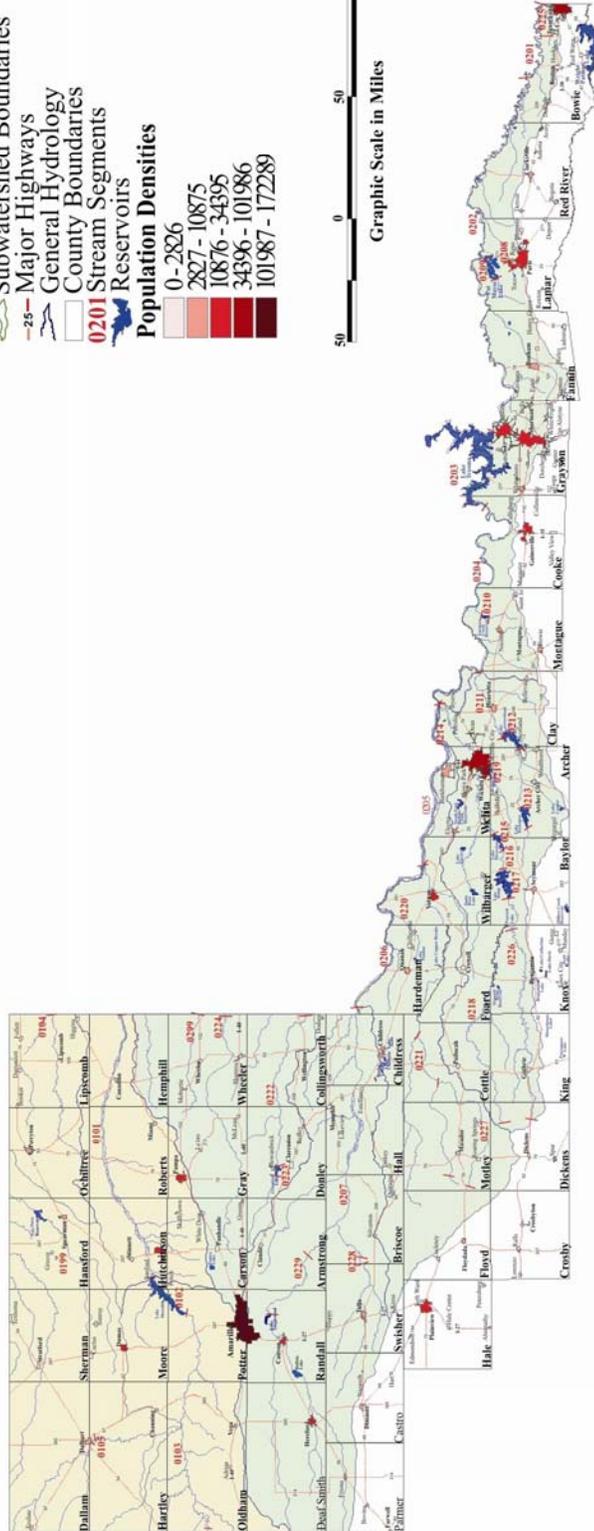


Figure 1



Canadian River Basin Reach I

- Reach I WQ Stations
- Stream Segments
- Subwatershed Boundary
- County Boundary
- Major Highways
- General Hydrology
- Reservoirs

- Population Densities**
- 0 - 2826
 - 2827 - 10875
 - 10876 - 34395
 - 34396 - 101986
 - 101987 - 172289

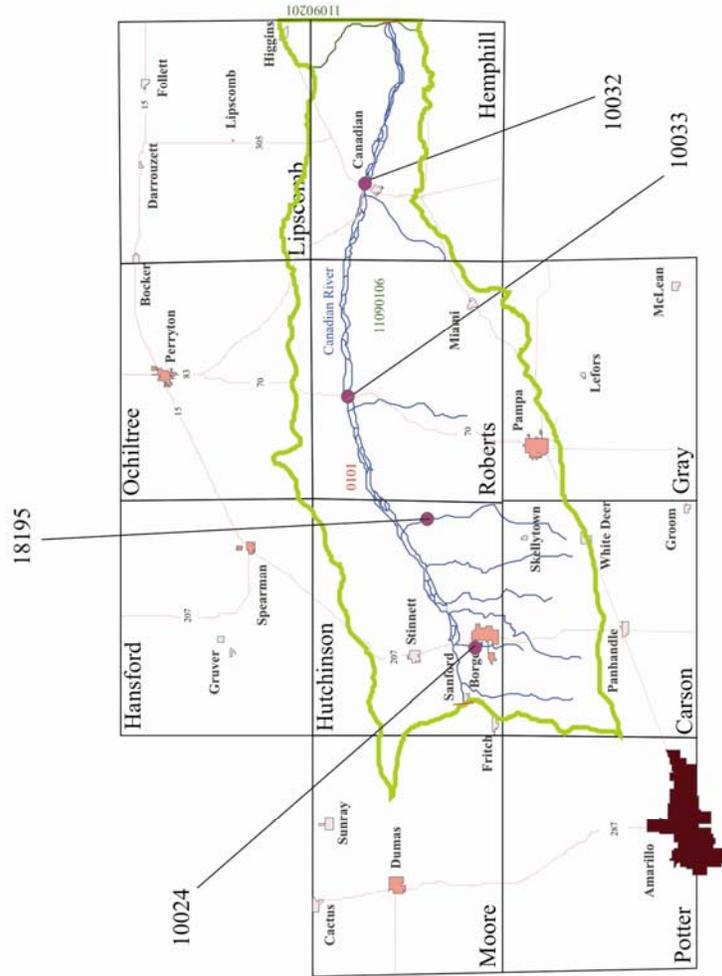
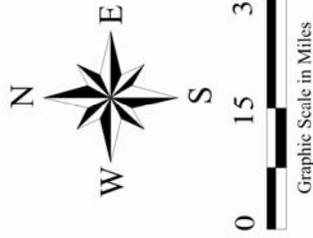


Figure 1-1



Canadian River Basin Reach II

- Reach II WQ Stations
- 0101 Stream Segments
- Subwatershed Boundary
- County Boundary
- Major Highways
- General Hydrology
- Reservoirs

- Population Densities**
- 0 - 2826
 - 2827 - 10875
 - 10876 - 34395
 - 34396 - 101986
 - 101987 - 172289

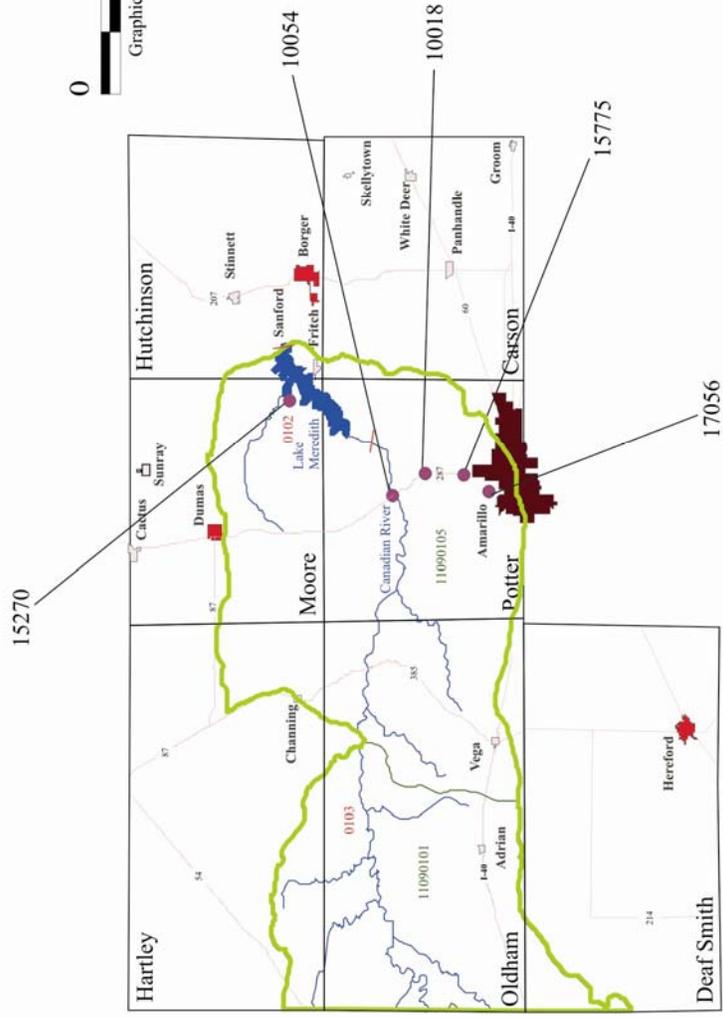
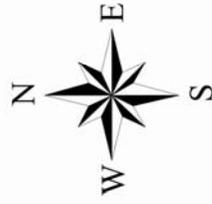


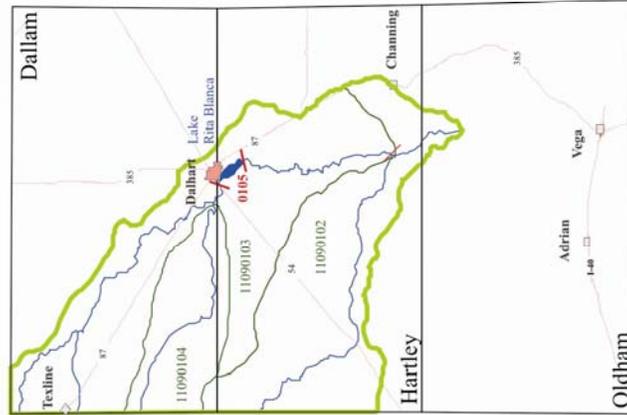
Figure 1-2

Canadian River Basin Reach III



- Reach III WQ Stations
- 0101 Stream Segments
- Subwatershed Boundary
- County Boundary
- Major Highways
- General Hydrology
- Reservoirs

- Population Densities**
- 0 - 2826
 - 2827 - 10875
 - 10876 - 34395
 - 34396 - 101986
 - 101987 - 172289



This Reach Monitored
by TCEQ



Graphic Scale in Miles

Figure 1-3

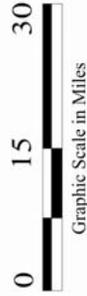
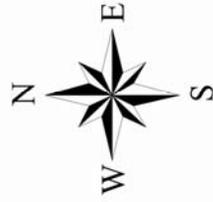
Canadian River Basin Reach IV



- Reach IV WQ Stations
- 0101 Stream Segments
- Subwatershed Boundary
- County Boundary
- Major Highways
- General Hydrology
- Reservoirs

Population Densities

0 - 2826
2827 - 10875
10876 - 34395
34396 - 101986
101987 - 172289



This Reach Monitored by TCEQ and USGS

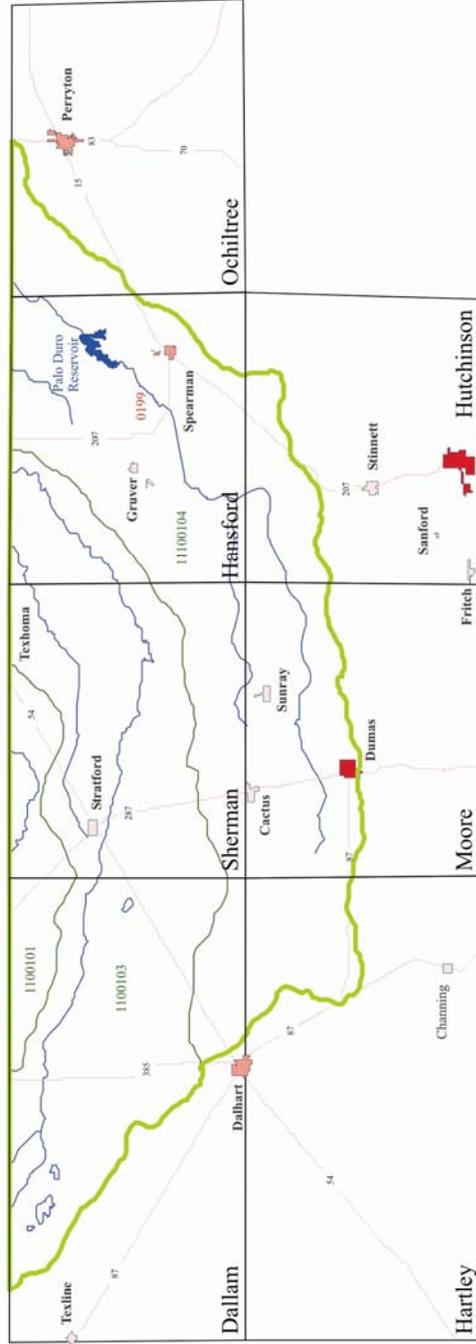


Figure 1-4

Canadian River Basin Reach V



- Reach V WQ Stations
- 0101 Stream Segments
- Subwatershed Boundary
- County Boundary
- Major Highways
- General Hydrology
- Reservoirs

- Population Densities**
- 0 - 2826
 - 2827 - 10875
 - 10876 - 34395
 - 34396 - 101986
 - 101987 - 172289

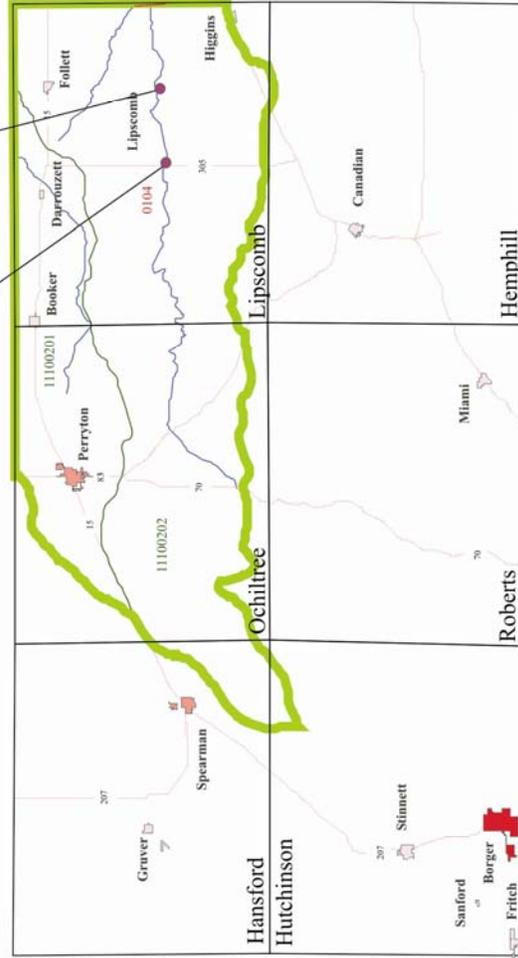
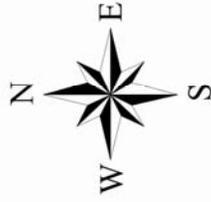


Figure 1-5



Red River Basin Reach I

- Reach I WQ Stations
- Stream Segments
- Subwatershed Boundary
- County Boundary
- Major Highways
- General Hydrology
- Reservoirs

Population Densities

- 0 - 2826
- 2827 - 10875
- 10876 - 34395
- 34396 - 101986
- 101987 - 172289

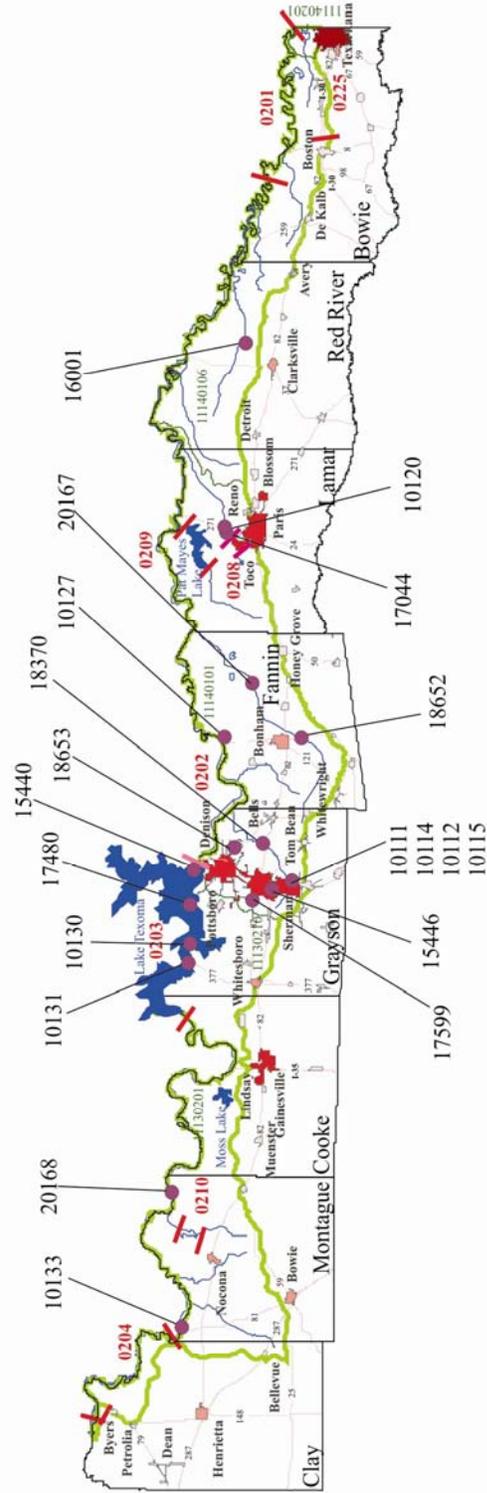
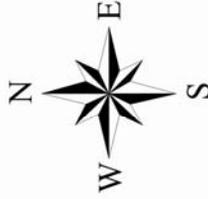


Figure 2-1



Red River Basin Reach II

- Reach II WQ Stations
- Stream Segments
- Subwatershed Boundary
- County Boundary
- Major Highways
- General Hydrology
- Reservoirs

- Population Densities**
- 0 - 2826
 - 2827 - 10875
 - 10876 - 34395
 - 34396 - 101986
 - 101987 - 172289

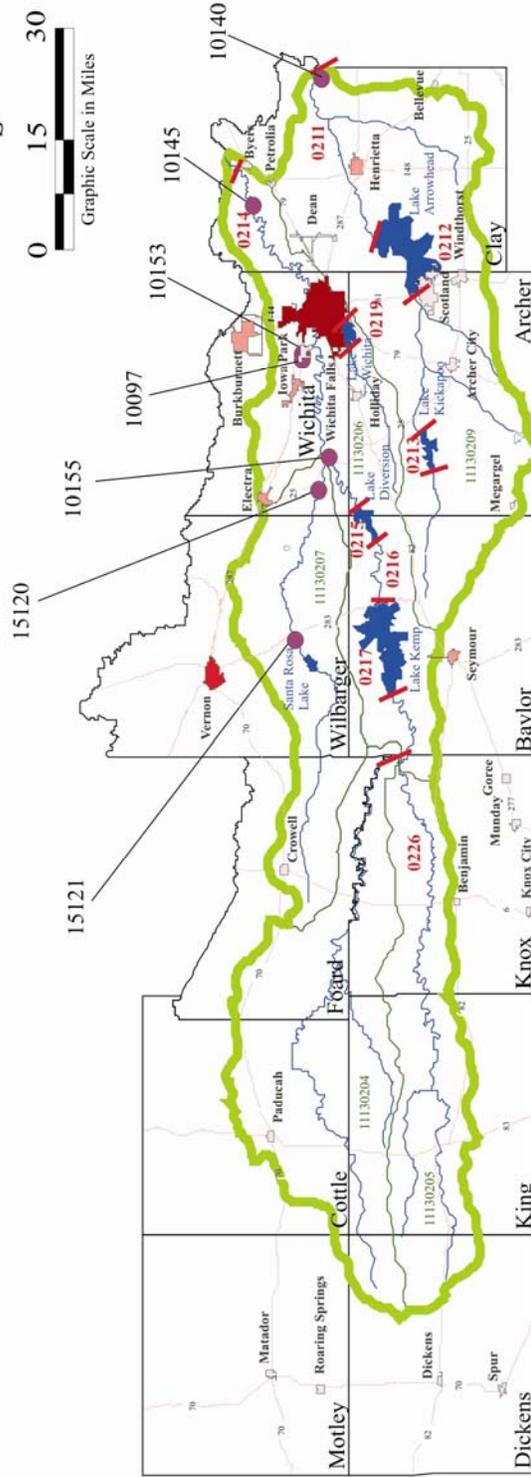
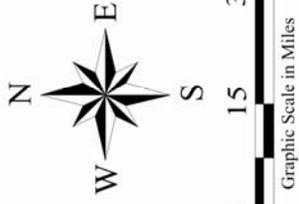


Figure 2-2



Red River Basin Reach III

- **Reach III WQ Stations**
- Stream Segments
- Subwatershed Boundary
- County Boundary
- 25- Major Highways
- General Hydrology
- Reservoirs

- Population Densities**
- 0 - 2826
 - 2827 - 10875
 - 10876 - 34395
 - 34396 - 101986
 - 101987 - 172289

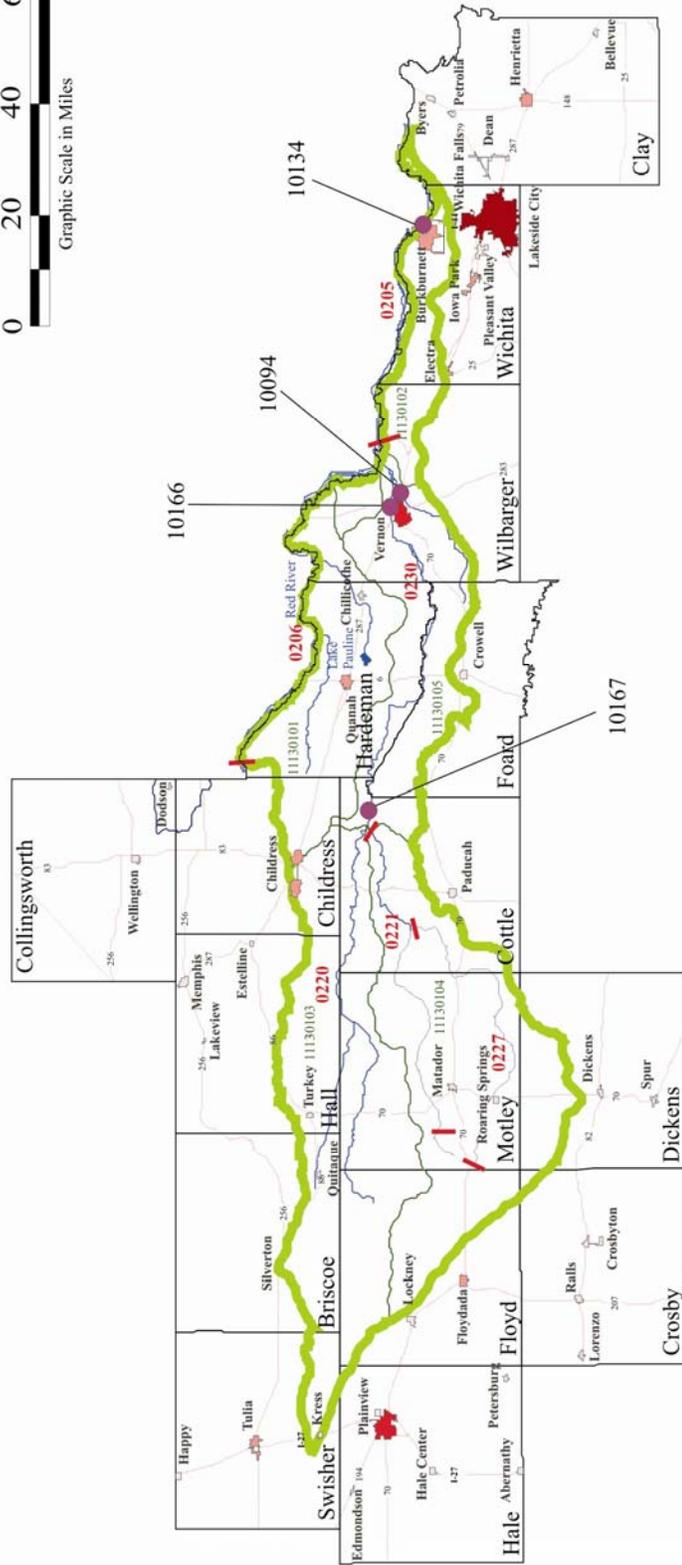
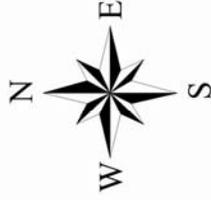
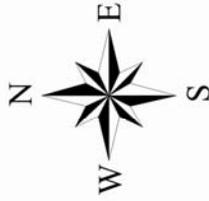


Figure 2-3



Red River Basin Reach IV

Reach IV WQ Stations

- 0201
- Stream Segments
- Subwatershed Boundary
- County Boundary
- Major Highways
- General Hydrology
- Reservoirs

Population Densities

- 0 - 2826
- 2827 - 10875
- 10876 - 34395
- 34396 - 101986
- 101987 - 172289

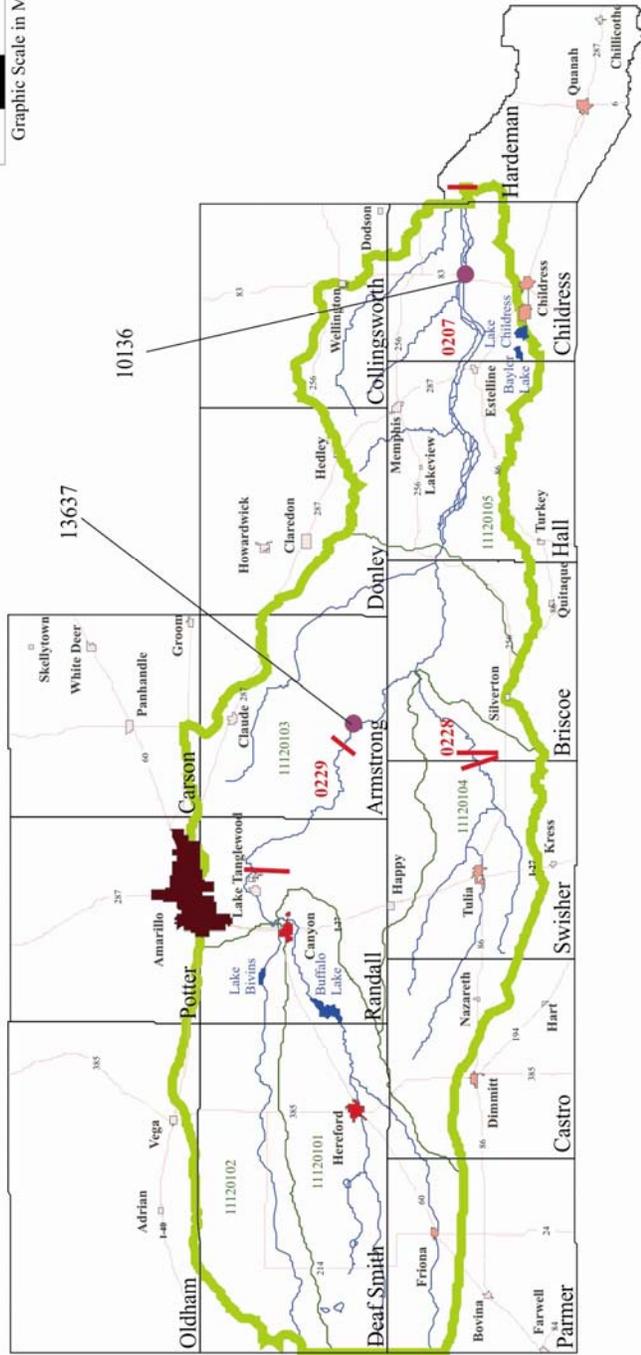


Figure 2-4

Red River Basin Reach V



- Reach V WQ Stations
- 0201 Stream Segments
- Subwatershed Boundary
- County Boundary
- Major Highways
- General Hydrology
- Reservoirs

- Population Densities**
- 0 - 2826
 - 2827 - 10875
 - 10876 - 34395
 - 34396 - 101986
 - 101987 - 172289

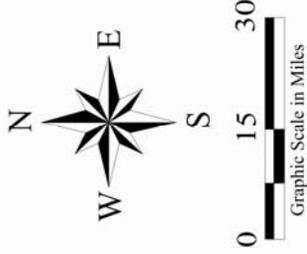
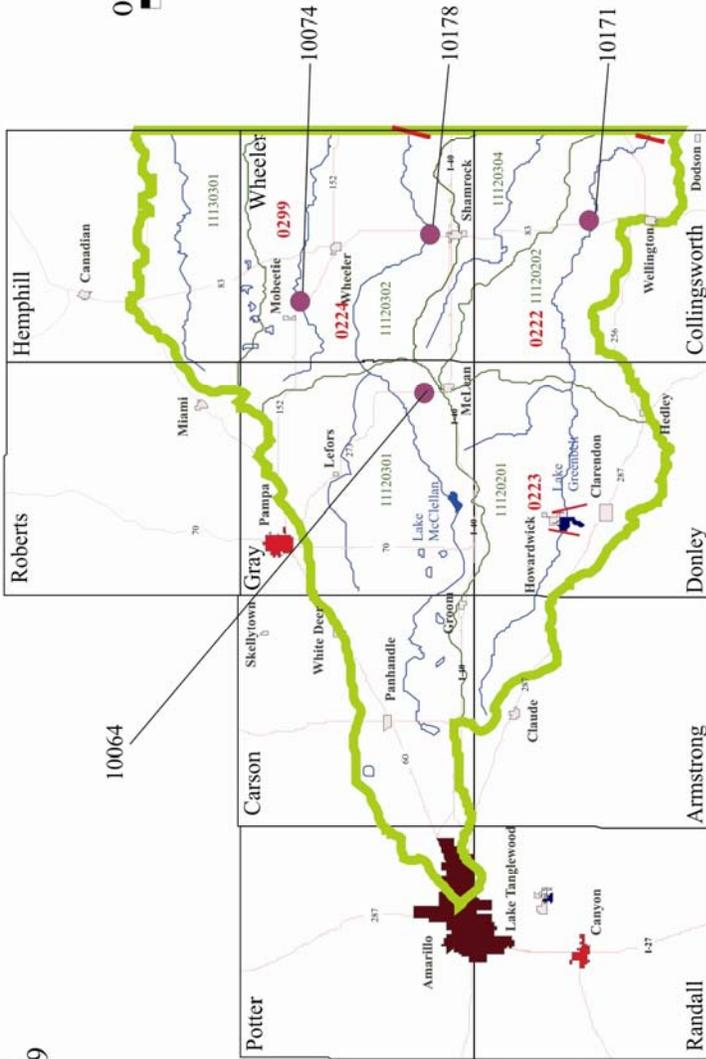


Figure 2-5

A6 PROJECT/TASK DESCRIPTION

The Authority's staff will be responsible for coordinating and conducting the collection of water samples and performing field measurements. The water samples will be relinquished to the Authority's Environmental Services Laboratory or LCRA for analysis. The City of Sherman will collect and analyze water samples in their respective lab with the data to be submitted to the Authority under the QAPP. The parameters to be analyzed by each laboratory are shown in **Table A7.1**.

Canadian River Basin

The Canadian River Basin, with the headwaters beginning in northeastern New Mexico, has a total drainage area of 22,866 square miles. The Canadian River is a tributary of the Arkansas River, which eventually flows into the Mississippi River. The Canadian River Basin was divided into five reaches with a strategy to design the most efficient sampling plan within the limited budget and monitoring resources available. There are 13 Hydrologic Unit Areas (HUAs) in the five reaches of the Canadian River Basin. Classified segments were identified and evaluated in accordance with guidance and procedures developed by the TCEQ and the Environmental Protection Agency (EPA). Classified segments were ranked; by the assessment of data collected in the reaches, by looking at the total number of domestic and industrial dischargers in the reach, and the total volume of effluent discharged in the reach. The resultant ranking and corresponding schedule for focused monitoring are as follows:

FY 2008 ~ Reach IV

FY 2009 ~ Reach V

The main water quality problems within the Canadian River Basin are elevated total dissolved solids (TDS) [chloride and sulfate], bacteria and nutrient issues. The elevated TDS levels within the basin originate primarily from a shallow semi permeable brine aquifer under artesian pressure in the western part of the basin.

The monitoring plan for the reaches above Lake Meredith, in the Canadian River Basin, will attempt to determine mineral loading for the major tributaries (including the main stem of the Canadian River), in order to determine inputs into Lake Meredith, which serves as the primary drinking water supply in the Panhandle of Texas.

Other problems in the basin include elevated nutrient levels, which can have varied sources. To ensure that these issues are addressed, detailed nutrient analyses utilizing sound statistically based sampling methodologies will ensure adequate samples are collected.

As resources become available, diurnal dissolved oxygen studies will be performed to determine whether the elevated nutrients are causing problems via depleted oxygen and/or eutrophication.

Screening of *E. coli* concentrations showed many segments potentially having concerns or possible concerns for exceedances for contact recreation uses. A comprehensive sampling regime throughout the basin targeting these segments will aid in identifying the cause of these concerns or problems.

A6 PROJECT/TASK DESCRIPTION (continued)

Implementation of a standardized statistical approach will aid in determining whether there truly are concerns and if so, potentially what the sources are and how the relationship might affect other parameters (i.e. flow).

Red River Basin

The Red River Basin covers a total drainage area of 94,450 square miles; 24,463 square miles lie within Texas. The basin was divided into five reaches in an attempt to design the most efficient sampling plan within the limited budget available. Reach I contains four HUAs. The remaining reaches each contain five HUAs. Classified segments were identified and evaluated in accordance with guidance and procedures developed by the TCEQ and the Environmental Protection Agency (EPA). Classified segments were ranked; by the assessment of data collected in the reaches, by looking at the total number of domestic and industrial dischargers in the reach, and the total volume of effluent discharged in the reach. The resultant ranking and corresponding schedule for focused monitoring are as follows:

FY 2008 ~ Reach III
FY 2009 ~ Reach IV

The main water quality concern within the Red River Basin is elevated TDS [chloride and sulfate]. The elevated TDS within the basin is naturally occurring from salt springs. Other potential sources include oilfield brine and urban activities. The monitoring plans for the reaches in the Red River Basin will attempt to determine mineral loading for the major tributaries, in order to clarify sources and to what extent these sources contribute to the elevated TDS concentrations.

Although nutrients were not considered a major concern during screening, several nutrient parameters showed abnormal fluctuations. These will be addressed through detailed nutrient analyses. As resources become available, diurnal dissolved oxygen studies will be performed to determine whether the elevated nutrients are causing problems via depleted oxygen and/or eutrophication.

Screening of *E. coli* concentrations showed many segments potentially having concerns and possible concerns for exceedances for contact recreation uses. A comprehensive sampling regime throughout the basin targeting those segments will aid in the identification of these concerns or potential problems. Implementation of a standardized statistical approach will aid in determining whether there truly are concerns and if so, potentially what the sources are and how the relationship might affect other parameters (i.e. flow).

See **Appendix A** for the project-related work plan tasks and schedule of deliverables for a description of work defined in this QAPP.

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

A6 PROJECT/TASK DESCRIPTION (continued)

Amendments to the QAPP

Revisions to the QAPP may be necessary to address incorrectly documented information or to reflect changes in project organization, tasks, schedules, objectives, and methods. Requests for amendments will be directed from the Authority's Project Manager to the CRP Project Manager electronically. Amendments are effective immediately upon approval by the Authority's Project Manager, the Authority's QAO, the CRP Project Manager, the CRP Lead QA Specialist, and the CRP Project QA Specialist. They will be incorporated into the QAPP by way of attachment and distributed to personnel on the distribution list by the Authority's Project Manager.

Special Project Appendices

Projects requiring QAPP appendices will be planned in consultation with the Red River Authority 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 Authority's Project Manager, the Authority's QAO, and the CRP Project Manager, the CRP Project QA Specialist, the CRP Lead QA Specialist and other TCEQ personnel as appropriate. Copies of approved QAPP appendices will be distributed by the Red River Authority to project participants before data collection activities commence.

A7 QUALITY OBJECTIVES AND CRITERIA

The purpose of 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.

Systematic watershed monitoring is defined by sampling that is planned for a short duration (1 to 2 years) and is designed to: screen waters that would not normally be included in the routine monitoring program, monitor at sites to check the water quality situation, and investigate areas of potential concern. Due to the limitations regarding these data, the data will be used to determine whether any locations have values exceeding the TCEQ's water quality criteria and/or screening levels (or in some cases values elevated above normal). The Red River Authority will use this information to determine future monitoring priorities. 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.

The City of Sherman is a cooperating partner with the Authority. They will collect and analyze specific water quality samples under the guidance of the Authority's QAPP. The data collected will then be submitted to the Authority, quality assured, then submitted with the Authority's data submittal.

The measurement performance specifications to support the project purpose 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	Parameter Code	AWRL	Limit of Quantitation (LOQ)	LOQ Check Standard %Rec	Precision (RPD of LCS/LCSD)	Bias % Rec. of LCS	Lab
FIELD PARAMETERS										
pH	pH/units	Water	TCEQ SOP V-1 and SM 4500-H ⁺ B	00400	NA*	NA	NA	NA	NA	Field
DO	mg/L	Water	TCEQ SOP V-1 SM 4500-O C	00300	NA*	NA	NA	NA	NA	Field
Conductivity	μS/cm	Water	TCEQ SOP V-1 SM 2510 B	00094	NA*	NA	NA	NA	NA	Field
Temperature	°C	Water	TCEQ SOP V-1 SM 2550 B	00010	NA*	NA	NA	NA	NA	Field
Secchi Depth	meters	Water	TCEQ SOP V-1	00078	NA*	NA	NA	NA	NA	Field
Days Since Last Significant Rain	Days	NA	TCEQ SOP V-1	72053	NA*	NA	NA	NA	NA	Field
Flow	cfs	Water	TCEQ SOP V-1	00061	NA*	NA	NA	NA	NA	Field
Flow Measurement Method	1 - gage 2 - electric 3 - mechanical 4 - weir/flume 5 - Doppler	Water	TCEQ SOP V-1	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 V-1	01351	NA*	NA	NA	NA	NA	Field
Flow Estimate	cfs	Water	TCEQ SOP V-1	74069	NA*	NA	NA	NA	NA	Field
Present Weather	1 - clear 2 - ptly cldy 3 - cloudy 4 - rain 5 - other	NA	NA	89966	NA	NA	NA	NA	NA	Field
Water Clarity	1 - excellent 2 - good 3 - fair 4 - poor 5 - other	NA	NA	20424	NA	NA	NA	NA	NA	Field
Water Color	1 - brownish 2 - reddish 3 - greenish 4 - blackish 5 - clear 6 - other	NA	NA	89969	NA	NA	NA	NA	NA	Field
Water Odor	1 - sewage 2 - chemical 3 - rotten egg 4 - musky 5 - fishy 6 - none 7 - other	NA	NA	89971	NA	NA	NA	NA	NA	Field

Parameter	Units	Matrix	Method	Parameter Code	AWRL	Limit of Quantitation (LOQ)	LOQ Check Standard %Rec	Precision (RPD of LCS/LCSD)	Bias % Rec. of LCS	Lab
FIELD PARAMETERS (continued)										
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
Turbidity	NTU	Water	SM 2130B	82079	.5	.5	70-130	20	80-120	Field
CONVENTIONAL AND BACTERIOLOGICAL PARAMETERS										
TSS	mg/L	Water	SM 2540 D	00530	4	4	NA	20	NA	RRA
TDS, Dried at 180 Degrees C	mg/L	Water	SM 2540 C	70300	10	10	NA	20	NA	RRA
TDS, calculated	mg/L	Water	Calculation	70294	NA	NA	NA	NA	NA	RRA
Sulfate	mg/L	Water	SM 4110 B	00945	5	5	70-130	20	80-120	RRA
Chloride	mg/L	Water	SM 4110 B	00940	5	5	70-130	20	80-120	RRA
Chlorophyll-a, Spectrophoto-metric Method	µg/L	Water	EPA 446.0	32211	3	2	NA	20	80-120	LCRA
Pheophytin, Spectrophoto-metric Method	µg/L	Water	EPA 446.0	32218	3	2	NA	20	80-120	LCRA
E. coli, IDEXX Colilert	MPN/100 mL	Water	SM 9223-B	31699	1	1	NA	.5 **	NA	RRA
E. coli, IDEXX Colilert	MPN/100 mL	Water	SM 9223-B	31699	1	1	NA	.5 **	NA	SH
Fecal coliform, membrane filtration	org/100mL	Water	SM 9222-D	31616	1	1	NA	.5 **	NA	RRA
Ammonia-N, tot	mg/L	Water	SM 4500-NH3C (18 th only)	00610	.1	.1	70-130	20	80-120	RRA
Ammonia-N, tot	mg/L	Water	SM 4500-NH3D	00610	.1	.1	70-130	20	80-120	RRA
Fluoride, tot	mg/L	Water	SM 4110 B	00951	.5	.5	70-130	20	80-120	RRA
Total Kjeldahl N	mg/L	Water	SM 4500-Norg B	00625	.2	.2	70-130	20	80-120	RRA
Alkalinity, tot	mg/L	Water	SM 2320 B	00410	20	20	NA	20	80-120	RRA
COD	mg/L	Water	SM 5220 D	00335	10	10	70-130	20	80-120	RRA
Hardness, tot (as CaCO3)	mg/L	Water	SM 2340 B or C	00900	5	5	NA	20	80-120	RRA
O-Phosphate-P, field filter <15 min	mg/L	Water	SM 4110 B	00671	.04	.04	70-130	20	80-120	RRA
Total Phosphorus-P	mg/L	Water	SM 4500-P F	00665	.06	.06	70-130	20	80-120	RRA
Nitrate/nitrite-N, tot	mg/L	Water	SM4500-NO3-E SM4500-NO3-H EPA 300.0	00630	.05	.02	70-130	20	80-120	LCRA
Nitrate/nitrite-N, tot	mg/L	Water	SM 4110 B	00630	.05	.04	70-130	20	80-120	RRA

Parameter	Units	Matrix	Method	Parameter Code	AWRL	Limit of Quantitation (LOQ)	LOQ Check Standard %Rec	Precision (RPD of LCS/LCSD)	Bias % Rec. of LCS	Lab
CONVENTIONAL AND BACTERIOLOGICAL PARAMETERS(continued)										
Nitrate-N	mg/L	Water	SM 4110 B	00620	.05	.02	70-130	20	80-120	RRA
TOC	mg/L	Water	SM 5310B	00680	2.0	2.0	70-130	20	80-120	RRA
VSS	mg/L	Water	EPA 160.4	00535	4	4	NA	20	80-120	RRA
Silica	mg/L	Water	SM 4500C	00955	N/A	5	70-130	20	80-120	RRA
METALS										
Calcium, dis.	mg/L	Water	SM 3500CaB	00915	.5	0.1	70-130	20	80-120	RRA
Calcium, tot.	mg/L	Water	SM 3111 B	00916	.5	0.01	70-130	20	80-120	RRA
Magnesium, dis.	mg/L	Water	SM 3111 B	00925	.5	0.01	70-130	20	80-120	RRA
Magnesium, tot.	mg/L	Water	SM 3111 B	00927	.5	0.01	70-130	20	80-120	RRA
Potassium, dis.	mg/L	Water	SM 3111 B	00935	200	0.01	70-130	20	80-120	RRA
Potassium, tot.	mg/L	Water	SM 3111 B	00937	200	0.01	70-130	20	80-120	RRA
Sodium, dis.	mg/L	Water	SM 3111 B	00930	500	0.01	70-130	20	80-120	RRA
Sodium, tot.	mg/L	Water	SM 3111 B	00929	500	0.002	70-130	20	80-120	RRA
Manganese, dis.	µg/L	Water	SM 3111 B	01056	50	50	70-130	20	80-120	RRA
Manganese, tot.	µg/L	Water	SM 3111 B	01055	50	50	70-130	20	80-120	RRA
Zinc, dis.	µg/L	Water	SM 3111 B	01090	5	5.0	70-130	20	80-120	RRA
Zinc, dis.	µg/L	Water	EPA 200.8	01090	5	5.0	70-130	20	80-120	LCRA
Zinc, tot.	µg/L	Water	SM 3111 B	01092	5	5.0	70-130	20	80-120	RRA
Nickel, dis.	µg/L	Water	EPA 200.8	01065	10	1.0	70-130	20	80-120	LCRA
Selenium, dis.	µg/L	Water	EPA 200.9	01145	2	2.0	70-130	20	80-120	RRA
Selenium, tot.	µg/L	Water	EPA 200.9	01147	2	2.0	70-130	20	80-120	RRA
Selenium, tot.	µg/L	Water	EPA 200.8	01147	2	2.0	70-130	20	80-120	LCRA
Arsenic, dis.	µg/L	Water	EPA 200.9	01000	5	2.0	70-130	20	80-120	RRA
Arsenic, dis.	µg/L	Water	EPA 200.8	01000	5	2.0	70-130	20	80-120	LCRA
Arsenic, tot.	µg/L	Water	EPA 200.9	01002	5	2.0	70-130	20	80-120	RRA
Iron, dis.	µg/L	Water	SM 3111 B	01046	300	100	70-130	20	80-120	RRA
Iron, tot.	µg/L	Water	SM 3111 B	01045	300	100	70-130	20	80-120	RRA

Parameter	Units	Matrix	Method	Parameter Code	AWRL	Limit of Quantitation (LOQ)	LOQ Check Standard %Rec	Precision (RPD of LCS/LCSD)	Bias % Rec. of LCS	Lab
METALS (continued)										
Silver, dis.	µg/L	Water	EPA 200.8	01075	.5	0.5	70-130	20	80-120	LCRA
Chromium, dis.	µg/L	Water	EPA 200.8	01030	10	1.0	70-130	20	80-120	LCRA
Copper, dis.	µg/L	Water	EPA 200.8	01040	1 for waters <50 mg/L hardness <hr/> 3 for waters ≥50 mg/L hardness	1.0	70-130	20	80-120	LCRA

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

** Based on a 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 >10 MPN/100mL or >10 organisms/100mL.

References for Table A7.1:

United States Environmental Protection Agency (USEPA) "Methods 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), "Standard Methods for the Examination of Water and Wastewater," 20th Edition, 1998. *(Note: The 21st edition may be cited if it becomes available.)*

TCEQ SOP, V1 - TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods for Water, Sediment, and Tissue, 2003 (RG-415).

TCEQ SOP, V2 - TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Community and Habitat Data, 2005 (RG-416)

A7 QUALITY OBJECTIVES AND CRITERIA (continued)

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 the TCEQ's water quality assessment. The limit of quantitation (formerly known as the reporting limit) is the minimum level, concentration, or quantity of a target variable (e.g., target analyte) that can be reported with a specified degree of confidence. The following requirements must be met in order to report results to the CRP:

- **The laboratory's LOQ for each analyte must be at or below the AWRL as a matter of routine practice**
- **The laboratory must demonstrate its ability to quantitate at its LOQ for each analyte by running an LOQ check standard for each batch of CRP Samples are analyzed.**

Laboratory Measurement Quality Control Requirements and Acceptability Criteria are provided in **Section B5**.

Precision

Precision is the degree to which a set of observations or measurements of the same property, obtained under similar conditions, conform to themselves. It is a measure of agreement among replicate measurements of the same property, under prescribed similar conditions, and is an indication of random error.

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 samples in the sample matrix (e.g. deionized water, sand, commercially available tissue) or sample/duplicate pairs in the case of bacterial analysis. Precision results are compared against measurement performance specifications and used during evaluation of analytical performance. Program-defined measurement performance specifications for precision 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 determined through the analysis of laboratory control samples and LOQ Check Standards prepared with verified and known amounts of all target analytes in the sample matrix (e.g. deionized water, sand, commercially available tissue) and by calculating percent recovery. Results are compared against measurement performance specifications and used during evaluation of analytical performance. Program-defined measurement performance specifications for bias are specified in **Table A7.1**.

A7 QUALITY OBJECTIVES AND CRITERIA (continued)

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. Routine data collected under the Clean Rivers Program for water quality assessment are considered to be spatially and temporally representative of routine water quality conditions. Water Quality data are collected on a routine frequency and are separated by approximately even time intervals. 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) and includes 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 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 receive training in proper sampling and field analysis. Before actual sampling or field analysis occurs, they will demonstrate to the QA Officer (or designee) their ability to properly calibrate field equipment and perform field sampling and analysis procedures. Field personnel training is documented and retained in the personnel file and will be available during a monitoring systems audit.

Contractors and subcontractors must ensure that laboratories analyzing samples under this QAPP meet the requirements contained in Section 5.4.4 of the NELAC Standards (concerning Review of Requests, Tenders and Contracts).

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	TCEQ, RRA	Seven	Paper, Digital
Field SOPs	RRA, SH	Seven	Paper, Digital
Laboratory QA Manuals	RRA, LCRA ¹ , SH	Seven	Paper, Digital
Laboratory SOPs	RRA, LCRA ¹ , SH	Seven	Paper, Digital
QAPP Distribution Documentation	RRA, SH	Seven	Paper
Field Staff Training Records	RRA, SH	Seven	Paper
Field Equip. Calibration/Maintenance Logs	RRA, SH	Seven	Paper
Field Instrument Printouts	RRA, SH	Seven	Paper, Digital
Field Notebooks or Data Sheets	RRA, SH	Seven	Paper
Chain of Custody Records	RRA, LCRA ¹ , SH	Seven	Paper
Laboratory Calibration Records	RRA, LCRA ¹ , SH	Seven	Paper
Laboratory Instrument Printouts	RRA, LCRA ¹ , SH	Seven	Paper, Digital
Laboratory Data Reports/Results	RRA, LCRA ¹ , SH	Seven	Paper, Digital
Laboratory Equip. Maintenance Logs	RRA, LCRA ¹ , SH	Seven	Paper
Corrective Action Documentation	RRA, LCRA ¹ , SH	Seven	Paper

1. Red River Authority of Texas (RRA)
 Environmental Laboratory
 P. O. Box 240
 Wichita Falls, Texas 76307-0240
(3000 Hammon Road, 76310-7500)

2. LCRA Environmental Laboratory Services
 P. O. Box 200
 Austin, Texas 78767
(3505 Montopolis, 78744-1417)

3. City of Sherman (SH)
 288 Post Oak Road
 Sherman, TX 75090

¹ LCRA document retention is five years.

A9 DOCUMENTS AND RECORDS (continued)

Laboratory Test Reports

Test/data reports from the laboratory will document the test results clearly and accurately. Routine data reports will be consistent with the NELAC Standards (Section 5.5.10) and include the information necessary for the interpretation and validation of data and will include the following:

- Title of report and unique identifiers on each page
- Name and address of the laboratory
- Name and address of the client
- A clear identification of the sample(s) analyzed
- Date and time of sample receipt
- Identification of method used
- Identification of samples that did not meet QA requirements and why (e.g., holding times exceeded)
- Sample results
- 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 field split results (as applicable) and RL confirmation (% recovery)
- Narrative information on QC failures or deviations from requirements that may affect the quality of results or is necessary for verification and validation of data
- LOQ and LOD (formerly referred to as the reporting limit and the method detection limit, respectively), and qualification of results outside the working range (if applicable)
- Certification of NELAC compliance on a result by result basis

Electronic Data

Data will be submitted electronically to the TCEQ in the Event/Result file format described in the CRP Guidance. A completed Data Summary (see example in **Appendix E**) will be submitted with each data submittal.

The City of Sherman will submit their data at least monthly but no less than quarterly to the Authority in either digital or paper format. Data packets submitted to the Authority will be reviewed for completeness prior to its admission to the CRP data files.

The LCRA Environmental Laboratory is utilized as a contract lab. Results from samples submitted to the LCRA Lab are electronically submitted to the Authority for review and submission in each data submittal to the 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 Volume 1: Physical and Chemical Monitoring Methods for Water, Sediment, and Tissue, 2003.(RG-415) and Volume 2: Methods for Collecting and Analyzing Biological Community and Habitat Data (RG-416)*. Additional aspects outlined in **Section B** below reflect specific requirements for sampling under the Clean Rivers Program and/or provide additional clarification

Table B2.1 Sample Storage, Preservation and Handling Requirements

Parameter	Container ¹	Preservation ²	Sample Volume ³	Holding Time ⁴
Bacteriological (Water)				
Escherichia coli, Fecal Coliform	P or G	Sodium Thiosulfate, Cool < 6°C	250 mL	6 Hours
Conventionals and Minerals (Water)				
Alkalinity, Total	P or G	Cool < 6°C	1.0 L	14 Days
Calcium, Dissolved (EDTA)	P or G	HNO ₃ to pH<2	250 mL	6 Months
Solids (TSS, TDS, VSS)	P or G	Cool < 6°C	1.0 L	7 Days
Chloride	P or G	None Required	1.0 L	28 Days
Sulfate	P or G	Cool < 6°C	1.0 L	28 Days
Turbidity	P or G	Cool < 6°C	250 mL	24 Hours
Fluoride, Chloride, Nitrite, Nitrate, O-Phosphorus, Sulfate	P or G	None Required Field Filtered ⁵ , Cool < 6°C	125 mL	48 Hours for Ion Chromatography
Nutrients (Water)				
Ammonia, Nitrate-N, Nitrate/Nitrite-N, Total Phosphorus, TOC & COD	P or G	Cool < 6°C, H ₂ SO ₄ to pH<2	500 mL	28 Days
O-Phosphorus	P or G	Field Filtered ⁵ , Cool < 6°C	125 mL	48 Hours
Chlorophyll <i>a</i> and Pheophytin	P or G Opaque ⁶	Unfiltered, Dark, Cool < 6°C	500 mL	48 Hours
		Filtered, Dark, Frozen		28 Days
Metals (Water)				
Dissolved and Total	P or G	HNO ₃ to pH<2	250 mL	6 Months

¹ Polyethylene (P) or Glass (G).

² Sample preservation is performed immediately upon sample collection.

³ Samples volumes are combined by preservative to minimize volumes and reduce container size and space.

⁴ Samples are analyzed as soon as possible after collection. The times listed are the maximum times that samples are held before sample preparation or analysis and still be considered valid.

⁵ Orthophosphorus samples are field filtered within 15 minutes of sample collection. DI blanks are run on filter lots to ensure quality control. Individual filters are rinsed with collected sample prior to actual filling of the designated container.

⁶ Chlorophyll *a* and Pheophytin will be collected in brown opaque containers.

B2 SAMPLING METHODS (continued)

Sample Containers

Sample containers are purchased pre-cleaned for conventional parameters and are washable. Laboratory autoclaved 250 mL plastic bottles or IDEXX sterile 120 mL plastic bottles are used for bacteriological samples and may have 1% sodium thiosulfate added. Amber bottles are used routinely for chlorophyll samples. The sample containers for metals are new, certified glass or plastic bottles, or glass or plastic bottles cleaned and documented according to EPA method 1669. Certificates are maintained in a notebook by the laboratory.

The sample containers that are re-used are washed and/or autoclaved according to procedures outlined in the Laboratory QM.

Processes to Prevent Contamination

Procedures outlined in the *TCEQ Surface Water Quality Monitoring Procedures* outline the necessary steps to prevent contamination of samples. These include: direct collection into sample containers, when possible; clean sampling techniques for metals; and certified containers for organics. Field QC samples (identified in **Section B5**) are collected to verify that contamination has not occurred.

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. Sampling Date
3. Location
4. Sampling depth
5. Sampling time
6. Sample collector's name/signature
7. Values for all field parameters
8. Detailed observational data, including:
 - water appearance
 - weather
 - biological activity
 - unusual odors
 - 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.)
 - specific sample information, missing parameters (i.e., when a scheduled parameter or group of parameters is not collected)

B2 SAMPLING METHODS (continued)

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. Write legibly in indelible ink
2. Changes should be made by crossing out original entries with a single line, entering the changes, and initialing and dating the corrections.
3. Close-out 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 data quantity and/or 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 Authority's Project Manager. The Authority's Project Manager will notify the Authority's QAO of the potential nonconformance. The Authority's QAO will initiate a Nonconformance Report (NCR) to document the deficiency.

The Authority's Project Manager, in consultation with the Authority's 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 Authority's Project Manager in consultation with Authority's QAO will determine the disposition of the nonconforming activity or item and necessary corrective action(s); results will be documented by the contractor 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.

B3 SAMPLE HANDLING AND CUSTODY

Sample Tracking

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 Chain of Custody (COC) form is a record that documents the possession of the samples from the time of collection to receipt in the laboratory. The following information concerning the sample is recorded on the COC form (See **Appendix D**). The following list of items matches the COC form in Appendix D.

1. Date and time of collection
2. Site identification
3. Sample matrix
4. Number of containers
5. Preservative used
6. Was the sample was filtered
7. Analyses required
8. Name of collector
9. Custody transfer signatures and dates and time of transfer
10. Bill of lading (*if applicable*)

Sample Labeling

Samples from the field are collected in containers with prefixed with printed labels that include much of the site information that does not change such as the Station ID, the Station Description, the parameter collected, designation and preservation if applicable. Sample collection date, time and samplers initials are marked in the field on the labels with an indelible marker. All label information includes:

1. Site identification
2. Date and time of collection
3. Preservative added, if applicable
4. Designation of "field-filtered" (*for metals or Ion Chromatograph samples*) as applicable
5. Sample type (i.e., analysis(es)) to be performed

Sample Handling

Written SOPs have been developed for sample handling, sample receiving, and sample shipping and are included in the QA Manual. The SOPs utilized for all Clean Rivers Program sampling include the following procedures:

During preparations for a sampling event, samples scheduled to be collected are assigned an ID number which is recorded in the lab accessions logbook. Preliminary sample and event information is recorded on a COC form, leaving only the date, time and sample information to be recorded when the sample is collected.

B3 SAMPLE HANDLING AND CUSTODY (continued)

1. Sample kits are prepared, assembled prior to the actual sampling event(s). The kits include all sample container types, size and preservatives required, which are predetermined by the type of analyses to be conducted.
2. Samples are collected under protocols documented in the TCEQ Surface Water Quality Monitoring Procedures Volume 1: Physical and Chemical Monitoring Methods for Water, Sediment, and Tissue, 2003 (RG-415). The preserved samples are *packed in loose ice in accordance with the preservation* (or – preserved according to) criteria listed in **Table B2.1** of this document
3. The date, time and collector information is completed on the sample container labels and the COC.
4. The ice chests with the samples are secured until delivered to the laboratory. If the samples are left overnight in a vehicle, the vehicle will be locked and monitored periodically.
5. The samples are received in the lab in a designated area where the Sample Collector relinquishes the samples to the sample custodian who in turn inspects the containers and signs the COC on the receiving line.
6. Each sample is logged into a lab accessions logbook that documents the following information and given a unique identification number. Data added to the accessions logbook include:
 - Current Date
 - Client
 - Lab ID Number
 - Sample ID
 - Sample Source
 - Collected by
 - Collection Date
 - Collection Time
 - Parameters
 - Time Sample Received
 - Preservative
 - Chain of Custody Number
7. The unique ID number assigned to each sample is written on the sample container with a permanent marker.
8. Samples are then transferred to the laboratory storage facility by the sample custodian. Access to the storage facility is limited to authorized personnel only.
9. In the event that the Authority ships samples to LCRA Laboratory for analyses, samples to be shipped are recorded on a separate COC form with the original COC number written in the comment section. LCRA's name and the shipping COC number will be written in the comment section of the original COC form which will remain at the Authority's laboratory. The samples along with the COC are then packed in an ice chest with ice or in a box depending on the preservation requirements. The shipping container is then sealed, marked with an up-arrow (↑) on all four sides and labeled with LCRA's name and address. The sealed sample containers are then shipped via overnight delivery. LCRA is contacted by phone and/or e-mail informing them of the shipped sample(s) and when they should expect delivery.

B3 SAMPLE HANDLING AND CUSTODY (continued)

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 data quantity and/or 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 Authority's Project Manager. The Authority's Project Manager will notify the Authority's QAO of the potential nonconformance. The Authority's QAO will initiate a Nonconformance Report (NCR) to document the deficiency. The Authority's Project Manager, in consultation with Authority's 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 Authority's Project Manager in consultation with the Authority's QAO will determine the disposition of the nonconforming activity or item and necessary corrective action(s); results will be documented by the Authority's 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.

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 "Procedures 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*, 40 CFR 136, or other reliable procedures acceptable to the Executive Director."

Laboratories collecting data under this QAPP are compliant with the NELAC standards. Copies of laboratory QMs and SOPs are available for review by the TCEQ.

B4 ANALYTICAL METHODS (continued)

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.

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 quantity and/or 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 Authority CRP Project Manager. The Authority Project Manager will notify the Authority QAO of the potential nonconformance. The Authority QAO will initiate a Nonconformance Report (NCR) to document the deficiency.

The Authority CRP Project Manager, in consultation with Authority 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 Authority Project Manager in consultation with the Authority QAO will determine the disposition of the nonconforming activity or item and necessary corrective action(s); results will be documented by the Authority 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 SWQMIS. Therefore, data with these types of problems should not 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*. Specific requirements are outlined below. Field QC sample results are submitted with the laboratory data report (see Section A9.).

Field blank – Field blanks are required for total metals-in-water samples when collected without sample equipment (i.e., as grab samples. A field blank is prepared in the field by filling a clean container with pure deionized water and appropriate preservative, if any, for the specific sampling activity being undertaken. Field blanks are used to assess the contamination from field sources such as airborne materials, containers, and preservatives. Field blanks for total metals-in-water samples are collected on a 10% basis or one per sampling event, whichever is more frequent.

The analysis of field blanks should yield values lower than the LOQ. When target analyte concentrations are high, blank values should be lower than 5% of the lowest value of the batch.

Field equipment blank - Field equipment blanks are required for metals-in-water samples when collected using sampling equipment. Field equipment blank is a sample of analyte-free media which has been used to rinse common sampling equipment to check the effectiveness of decontamination procedures. It is collected in the same type of container as the environmental sample, preserved in the same manner and analyzed for the same parameter.

The analysis of field equipment blanks should yield values lower than the LOQ, or, when target analyte concentrations are very high, blank values must be less than 5% of the lowest value of the batch, or corrective action will be implemented.

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*. 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. Field splits apply to conventional samples only and are collected on a 10% basis or one per sampling event, whichever is more frequent.

The precision of field split results is calculated by relative percent difference (RPD) using the following equation:

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

A 30% RPD criteria will be used to screen field split results as a possible indicator of excessive variability in the sample handling and analytical system. If it is determined that elevated quantities of analyte (i.e., > 5 times the RL) 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 individual sample results may be invalidated based on the examination of all extenuating information. The information derived from field splits is generally considered to be event specific and would not normally be used to determine the validity of an entire batch.

B5 QUALITY CONTROL (continued)

However, some batches of samples may be invalidated depending on the situation. 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

Method Specific QC requirements – QC samples, other than those specified later this section, are run (e.g., sample duplicates, surrogates, internal standards, continuing calibration samples, interference check samples, positive control, negative control, and media blank) as specified in the methods. The requirements for these samples, their acceptance criteria or instructions for establishing criteria, and corrective actions are method-specific.

Detailed laboratory QC requirements and corrective action procedures are contained within the individual laboratory quality manuals (QMs). The minimum requirements that all participants abide by are stated below.

Limit of Quantitation (LOQ) – The laboratory will analyze a calibration standard (if applicable) at the LOQ on each day Clean Rivers Program samples are analyzed. Calibrations including the standard at the LOQ will meet the calibration requirements of the analytical method or corrective action will be implemented.

LOQ Check Standard – An LOQ check standard consists of a sample matrix (e.g., deionized water, sand, commercially available tissue) free from the analytes of interest spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes. It is used to establish intra-laboratory bias to assess the performance of the measurement system at the lower limits of analysis. The LOQ check standard is spiked into the sample matrix at a level less than or near the LOQ for each analyte for each batch of CRP samples are run.

The LOQ check standard is carried through the complete preparation and analytical process. LOQ Check Standards are run at a rate of one per analytical batch. A batch is defined as samples that are analyzed together with the same method and personnel, using the same lots of reagents, not to exceed the analysis of 20 environmental samples.

The percent recovery of the LOQ 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:

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

Measurement performance specifications are used to determine the acceptability of LOQ Check Standard analyses as specified in **Table A7.1**.

B5 QUALITY CONTROL (continued)

Laboratory Control Sample (LCS) - An LCS consists of a sample matrix (e.g., deionized water, sand, commercially available tissue) free from the analytes of interest spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes. It is used to establish intra-laboratory bias to assess the performance of the measurement system. The LCS is spiked into the sample matrix at a level less than or near the mid point of the calibration for each analyte. In cases of test methods with very long lists of analytes, LCSs are prepared with all the target analytes and not just a representative number, except in cases of organic analytes with multiplex responses.

The LCS is carried through the complete preparation and analytical process. LCSs are run at a rate of one per analytical batch. A batch is defined as samples that are analyzed together with the same method and personnel, using the same lots of reagents, not to exceed the analysis of 20 environmental samples.

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; and SA is the true result:

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

Measurement performance specifications are used to determine the acceptability of LCS analyses as specified in **Table A7.1**.

Laboratory Duplicates – A laboratory duplicate is prepared by taking aliquots of a sample from the same container under laboratory conditions and processed and analyzed independently. A laboratory control sample duplicate (LCSD) is prepared in the laboratory by splitting aliquots of an LCS. Both samples are carried through the entire preparation and analytical process. LCSDs are used to assess precision and are performed at a rate of one per batch. A batch is defined as samples that are analyzed together with the same method and personnel, using the same lots of reagents, not to exceed the analysis of 20 environmental samples.

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.

Measurement performance specifications are used to determine the acceptability of duplicate analyses-as specified in **Table A7.1**. The specifications for bacteriological duplicates in **Table A7.1** apply to samples with concentrations > 10 org./100mL.

B5 QUALITY CONTROL (continued)

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 LOQ. Otherwise, the equipment should not be used.

Matrix spike (MS) –Matrix spikes are prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available. Matrix spikes are used, for example, to determine the effect of the matrix on a method’s recovery efficiency.

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. A batch is defined as samples that are analyzed together with the same method and personnel, using the same lots of reagents, not to exceed the analysis of 20 environmental samples. The information from these controls is sample/matrix specific and is not used to determine the validity of the entire batch. 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 results from matrix spikes are primarily designed to assess the validity of analytical results in a given matrix and are expressed as percent recovery (%R). The laboratory shall document the calculation for %R. 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:

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

Measurement performance specifications for matrix spikes are not specified in this document.

The results are compared to the acceptance criteria as published in the mandated test method. Where there are no established criteria, the laboratory shall determine the internal criteria and document the method used to establish the limits. For matrix spike results outside established criteria, corrective action shall be documented or the data reported with appropriate data qualifying codes.

Method blank –A method blank is a sample of matrix similar to the batch of associated samples (when available) that is free from the analytes of interest and is processed simultaneously with and under the same conditions as the samples through all steps of the analytical procedures, and in which no target analytes or interferences are present at concentrations that impact the analytical results for sample analyses. 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 LOQ. For very high-level analyses, the blank value should be less than 5% of the lowest value of the batch, or corrective action will be implemented.

B5 QUALITY CONTROL (continued)

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 data quantity and/or 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 Authority's Project Manager. The Authority's Project Manager will notify the Authority's QAO of the potential nonconformance. The Authority's QAO will initiate a Nonconformance Report (NCR) to document the deficiency.

The Authority's Project Manager, in consultation with Authority's 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 Authority's Project Manager in consultation with the Authority's QAO will determine the disposition of the nonconforming activity or item and necessary corrective action(s); results will be documented by the Authority's 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*. 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 QM(s).

B7 INSTRUMENT CALIBRATION AND FREQUENCY

Field equipment calibration requirements are contained in the *TCEQ Surface Water Quality Monitoring Procedures*. 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 QM(s).

B8 INSPECTION/ACCEPTANCE OF SUPPLIES AND CONSUMABLES

The Authority, LCRA, and the City of Sherman purchase supplies as needed for their labs. All Participants will follow the guidelines below.

A vendor of testing or analytical supplies and materials is regarded as a resource to and as an extension of the laboratory. The standards of quality imposed on vendors are the same as those imposed on the laboratory.

The vendor is responsible for marking packing slips and containers of reagents, chemicals, and testing supplies with the name of the material, vendor's name and address, vendor's item number, quantity, material specification number, and date. This assures that the material is properly identified. Receiving documents and accompanying certifications are used as part of the receiving control procedures and show information necessary to identify the material being received.

Incoming supplies are unpacked by laboratory personnel and checked against the packing slip and the purchase order. If any items are missing or damaged, the vendor is contacted immediately.

Standards, reagents, and chemicals are marked with the date received, the expiration date, if applicable, and placed in storage. All standards, chemicals, and reagents are logged into the Chemical Log with the lot number, date received, and technician's initials. Supplies are ordered on an "as needed" basis to avoid excessive inventories of reagents and chemicals and are used on a first in, first out" basis.

Packing slips, certifications, and other receiving documents are maintained in a file as a reference of procurement. Chemical logs are maintained as a trace reference for chemicals, standards, and reagents.

B9 NON-DIRECT MEASUREMENTS

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

B10 DATA MANAGEMENT

Data Management Process

See Appendix F - Red River Authority Data Management Plan

Data Errors and Loss

See Appendix F - Red River Authority Data Management Plan

Record Keeping and Data Storage

See Appendix F - Red River Authority Data Management Plan

Data Handling, Hardware, and Software Requirements

See Appendix F - Red River Authority Data Management Plan

Information Resource Management Requirements

Data will be managed in accordance with the *TCEQ Surface Water Quality Monitoring Data Management Reference Guide* and applicable Red River Authority information resource management policies. The Clean Rivers Program grantees do not create TCEQ certified locational data using Global Positioning System (GPS) equipment. GPS equipment may be used as a component of the information required by the Station Location (SLOC) request process, but TCEQ staff are responsible for creating the certified locational data that will ultimately be entered into the TCEQ's Surface Water Quality Monitoring database. Any information developed by Clean Rivers Program grantees using a Geographic Information System (GIS) will be used solely to meet deliverable requirements and will not be submitted to the TCEQ as a certified data set. Because the Clean Rivers Program grantees do not create certified locational data, TCEQ's OPP 8.11 and 8.12 do not apply.

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	Red River Authority	Monitoring of the project status and records to ensure requirements are being fulfilled	Report to TCEQ in Quarterly Report
Monitoring Systems Audit of Red River Authority	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 of Program Sub participants	Dates to be determined by the Red River Authority	Red River Authority	Field sampling, handling and measurement; facility review; and data management as they relate to CRP	30 days to respond in writing to the Red River Authority. PA will report problems to TCEQ in Progress Report.
Laboratory Inspection	Dates to be determined by TCEQ	TCEQ Laboratory Inspector	Analytical and quality control procedures employed at the laboratory and the contract laboratory	30 days to respond in writing to the TCEQ to address corrective actions
Proficiency Testing	Biannually	Red River Authority	Required to pass two out of three PT's annually to maintain certifications	Proficiency Providers Report results to TCEQ
Internal Audits, Oversight, etc.	Quarterly	Red River Authority	Monitoring of the Lab Quality status to ensure requirements are being met	Quarterly Report, in House

Corrective Action

The Red River Authority Project Manager is responsible for implementing and tracking corrective action resulting from audit findings outlined in the audit report. Records of audit findings and corrective actions are maintained by both the CRP and the Red River Authority Project Manager. Audit reports and 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.

C2 REPORTS TO MANAGEMENT

Reports to Red River Authority Project Management

The Authority's Project Manager will be kept apprised of all project status, results of assessments and any significant QA issues as they occur. Additionally, written reports and daily time sheets will contain information regarding daily activities. All reports detailed in this section are contract deliverables and are transferred to the TCEQ in accordance with contract requirements.

Progress Report - Summarizes the Red River Authority'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 Red River Authority, a report of findings, recommendations and response is sent to the TCEQ in the quarterly progress report.

C2 REPORTS TO MANAGEMENT (continued)

Reports by TCEQ Project Management

Contractor Evaluation - The Red River Authority 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, Procurement 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 project objectives and measurement performance specifications which are listed in **Section A7**. Only those data which are supported by appropriate quality control data and meet the measurement performance specifications defined for this project will be considered acceptable, and will be reported for entry into SWQMIS.

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 data review tasks to be performed by field and laboratory staff are listed in the first two sections of **Table D2.1**, respectively. Potential errors are identified by examination of documentation and by manual (*or computer-assisted*) 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 are documented.

After the field and laboratory data are reviewed, another level of review is performed once the data are combined into a data set. This review step as specified in **Table D2.1** is performed by the Authority's Data Manager and QAO. Data review, verification, and validation tasks to be performed on the data set include, but are not limited to, the confirmation of laboratory 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.

Another element of the data validation process is consideration of any findings identified during the monitoring systems audit conducted by the TCEQ CRP Lead Quality Assurance Specialist. Any issues requiring corrective action must be addressed, and the potential impact of these issues on previously collected data will be assessed. After the data are reviewed and documented, the Authority's Project Manager validates that the data meet the data quality objectives of the project and are suitable for reporting to TCEQ.

D2 VERIFICATION AND VALIDATION METHODS (continued)

If any requirements or specifications of the CRP are not met, based on any part of the data review, the responsible party should document the nonconforming activities and submit the information to the Red River Authority Data Manager with the data. This information is communicated to the TCEQ by the Red River Authority in the Data Summary.

Table D2.1 Data Review Tasks

Field Data Review	Responsibility
Field data reviewed for conformance with data collection, sample handling and chain of custody, analytical and QC requirements	Field Supervisors
Post-calibrations checked to ensure compliance with error limits	Field Supervisors
Field data calculated, reduced, and transcribed correctly	Field Supervisors
Laboratory Data Review	Responsibility
Laboratory data reviewed for conformance with data collection, sample handling and chain of custody, analytical and QC requirements to include documentation, holding times, sample receipt, sample preparation, sample analysis, project and program QC results, and reporting	QAOs, Lab Supervisor
Laboratory data calculated, reduced, and transcribed correctly	QAOs, Lab Supervisor
LOQs consistent with requirements for Ambient Water Reporting Limits.	QAOs, Lab Supervisor
Analytical data documentation evaluated for consistency, reasonableness and/or improper practices	QAOs, Lab Supervisor
Analytical QC information evaluated to determine impact on individual analyses	QAOs, Lab Supervisor
All laboratory samples analyzed for all parameters	QAOs, Lab Supervisor
Data Set Review	Responsibility
The test report has all required information as described in Section A9 of the QAPP	RRA Data Manager
Confirmation that field and laboratory data have been reviewed	RRA Data Manager
Data set (to include field and laboratory data) evaluated for reasonableness and if corollary data agree	RRA Data Manager
Outliers confirmed and documented	RRA Data Manager
Field QC acceptable (e.g., field splits and trip, field and equipment blanks)	QAOs, Field Supervisor
Sampling and analytical data gaps checked and documented	RRA Data Manager
Verification and validation confirmed. Data meets conditions of end use and are reportable	RRA Project Manager

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 *Texas Water Quality Inventory and 303(d) List* 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 SWQMIS nor will be considered appropriate for any of the uses noted above.

APPENDIX A

Task 3 Work Plan

TASK 3: WATER QUALITY MONITORING

Objectives: Water quality monitoring will focus on collecting information to characterize water quality in a variety of locations and conditions. These efforts will include a combination of:

- planning and coordinating basin-wide monitoring
- routine, regularly-scheduled monitoring to collect long-term information and support statewide assessment of water quality
- systematic, regularly-scheduled short-term monitoring to screen water bodies for issues
- permit support monitoring to provide information for setting permit effluent limits

Task

Description: **Monitoring Description** - For FY 2008 and FY 2009, the Authority will monitor and collect water quality samples for analysis from a minimum of 43 stations in the Canadian and Red River Basins. Eleven of the stations are located in the Canadian River Basin with the remaining stations located in the Red River Basin. Each site will be visited a minimum of four times per year for the collection of field data along with conventional and indicator bacteria water samples. Flow will be measured at 36 sites. The monitoring schedule will be designed in such a way that a proportionate amount of sites will be visited each month allowing for the monitoring of each site once per season of the year.

All monitoring procedures and methods will follow the guidelines prescribed in the Authority's QAPP, the TCEQ's *Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods for Water, Sediment, and Tissue (RG-415)* and the TCEQ's *Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Community and Habitat Data (RG-416)*.

Coordinated Monitoring Meeting - The Authority will hold an annual coordinated monitoring meeting. Qualified monitoring organizations will be invited to attend the working meeting in which monitoring needs and purposes will be discussed segment by segment and station by station. Information from participants and stakeholders will be used to select stations and parameters that will enhance overall water quality monitoring coverage, eliminate duplication of effort, and address basin priorities. The changes to the monitoring schedule will be entered into the statewide database on the Internet (<http://cms.lcra.org>) and communicated to meeting attendees. Changes to monitoring that occur during the course of the year will be entered into the statewide database on the Internet and communicated to meeting attendees.

Progress Report - Each Progress Report will indicate the number of sampling events and the types of monitoring conducted in the quarter, to include all types of monitoring.

Deliverables

& Dues Dates: September 1, 2007 through August 31, 2008

- A. Conduct water quality monitoring, summarize activities, and submit with Progress Report - December 15, 2007; March 15 and June 15, 2008
- B. Coordinated Monitoring Meeting - between March 15 and April 30, 2008
- C. Email notification with summary of changes that Coordinated Monitoring Schedule updates are complete - May 31, 2008

September 1, 2008 through August 31, 2009

- A. Conduct water quality monitoring, summarize activities, and submit with Progress Report - September 15 and December 15, 2008; March 15 and June 15 and August 31, 2009
- B. Coordinated Monitoring Meeting - between March 15 and April 30, 2009
- C. Email notification with summary of changes that Coordinated Monitoring Schedule updates are complete - May 31, 2009

APPENDIX B

Sampling Process Design and Monitoring Schedule

Appendix B

Sampling Process Design and Monitoring Schedule

Sample Design Rationale

The sample design is based on the legislative intent of the Clean Rivers Program. Under the legislation, the Basin Planning Agencies have been tasked with providing data to characterize water quality conditions in support of the 305(b) assessment, and to identify significant long-term water quality trends. 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 Red River Authority coordinates closely with the TCEQ and other participants to ensure a comprehensive water monitoring strategy within the watershed.

Based on evaluations of previous assessments and screening efforts by the TCEQ and the Authority, the hydrologic subdivisions of each basin have been prioritized according to the level of concern. Utilizing the current Texas Water Quality Inventory (TWQI), a priority list is prepared and presented for discussion at the Authority's Annual Coordinated Monitoring Meeting with the other monitoring entities and the TCEQ. This meeting is based on the need to maximize monitoring efforts in an attempt to expend the limited resources as prudently as possible. The results of the priority ranking are presented for approval at a meeting of the Basin Advisory Committees. This approach enables comprehensive monitoring to occur on a rotational reach basis and completely encompasses the basins within the five-year basin management cycle, limited only by the availability of funds.

Site Selection Criteria

This data collection effort involves monitoring 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 basically outlined below, and discussed thoroughly in the TCEQ Surface Water Quality Monitoring Procedures, Volume 1 (RG-415). Overall consideration is given to accessibility and safety. All monitoring activities have been developed in coordination with the CRP Steering Committee and with the TCEQ

1. Locate stream sites so that samples can be safely collected from the centroid of flow. Centroid is defined as the midpoint of that portion of stream width which contains 50 percent of the total flow. If few sites are available for a stream segment, choose one that would best represent the water body, and not an unusual condition or contaminant source. Avoid backwater areas or eddies when selecting a stream site.
2. At a minimum for reservoirs, locate sites near the dam (reservoirs) and in the major arms. Larger reservoirs might also include stations in the middle and upper (riverine) areas. Select sites that best represent the water body by avoiding coves and back water areas. A single monitoring site is considered representative of 25 percent of the total reservoir acres, but not more than 5,120 acres.

Site Selection Criteria (continued)

3. Routine monitoring sites are selected to maximize stream coverage or basin coverage. Very long segments may require more stations. As a rule of thumb, stream segments between 25 and 50 miles long require two stations, and longer than 50 miles require three or more depending on the existence of areas with significantly different sources of contamination or potential water quality concerns. Major hydrological features, such as the confluence of a major tributary or an instream dam, may also limit the spatial extent of an assessment based on one station.
4. Because historical water quality data can be very useful in assessing use attainment or impairment, it may be best to use sites that are on current or past monitoring schedules.
5. All classified segments (including reservoirs) should have at least one routine monitoring site that adequately characterizes the water body. Data collection should be coordinated with the TCEQ or other qualified monitoring entities reporting routine data to TCEQ.
6. Routine monitoring sites may be selected to bracket sources of pollution, influence of tributaries, changes in land uses, and hydrological modifications.
7. Sites should be accessible. When possible, stream sites should have a USGS or IBWC stream flow gauge. If not, it should be possible to conduct flow measurement during routine visits.

Monitoring Sites

Monitoring Tables for fiscal year 2008 are presented on the following page.

TABLE B1.1
Sample Design and Schedule
FY 2008

Segment	TCEQ Region	Basin	Site Description	Station ID	Sampling Entity	Monitoring Type	24 Hr DO	Aq Hab	Benthics	Nekton	Metals Water	Organics Water	Metals Sed	Organics Sed	Conventional	Amb Tox Water	Amb Tox Sed	Indicator Bacteria	Inst Flow	Fish Tissue	Field
0101	1	1	Rock Creek at Bridge in Electric City near Borger	10024	RR	RT									4			4	4		4
0101	1	1	Canadian River Bridge at US 60-83 at Canadian	10032	RR	RT									4			4	4		4
0101	1	1	Canadian River Bridge on SH 70 N of Pampa	10033	RR	RT									4			4	4		4
0101	1	1	White Deer Creek at Jeep Trail Crossing on Duncan Ranch	18195	RR	RT									4			4	4		4
0102	1	1	Big Blue Creek Approx. 250 yds. Upstream of FM 1913	15270	RR	RT									4			4	4		4
0102	1	1	Unnamed Tributary of West Amarillo Creek at Loop 335	17056	RR	RT									4			4	4		4
0103	1	1	East Amarillo Creek at US 287 N of Amarillo	10018	RR	RT									4			4	4		4
0103	1	1	Canadian River Bridge at US 87-287 N of Amarillo	10054	RR	RT												4	4		4
0103	1	1	Thompson Park Lake North End West Bank	15775	RR	RT									4			4			4
0104	1	1	Wolf Creek Bridge at SH 305 N of Lipscomb	10058	RR	RT									4			4	4		4
0104	1	1	Wolf Creek at FM 1454 27.4 Km (17 Mi) E of Lipscomb	10059	RR	RT									4			4	4		4
0202	4	2	Choctaw Creek at SH 11, SE of Sherman	10111	SH	RT									4			12	12		12
0202	4	2	Choctaw Creek at Unnamed County Rd	10112	SH	RT									4			12	12		12
0202	4	2	Post Oak Creek at First County Rd Crossing below Sherman STP	10114	SH	RT									4			12	12		12
0202	4	2	Post Oak Creek at FM 1417 SE of Sherman	10115	RR	RT									4			4	4		4
0202	4	2	Post Oak Creek at FM 1417 SE of Sherman	10115	SH	RT									4			12	12		12
0202	5	2	Pine Creek at US 271	10120	RR	RT									4			4	4		4
0202	4	2	Red River at SH 78 N of Bonham	10127	RR	RT									4			4			4
0202	4	2	Sand Creek at SH 56 W of Sherman	15446	SH	RT									4			12	12		12
0202	5	2	Pecan Bayou at FM 1159	16001	RR	RT									4			4	4		4
0202	5	2	Smith Creek at US 271	17044	RR	RT									4			4	4		4
0202	4	2	Post Oak Creek at FM 1417 NW of Sherman	17599	SH	RT									4			12	12		12
0202	4	2	Choctaw Creek at US 82	18370	RR	RT									4			4	4		4
0202	4	2	Bois D'Arc Creek at SH 78 S of Bonham	18652	RR	RT									4			4	4		4
0202	4	2	Iron Ore Creek at US 69 SE of Denison	18653	RR	RT									4			4	4		4
0202	4	2	Bois D'Arc Creek at FM 1396	20167	RR	RT									4			4	4		4
0203	4	2	Lake Texoma Big Mineral Arm	10130	RR	RT									4			4			4
0203	4	2	Lake Texoma at US 377 N of Gordonville	10131	RR	RT									4			4			4
0203	4	2	Lake Texoma at South End of Denison Dam	15440	RR	RT									4			4			4
0203	4	2	Lake Texoma Little Mineral Arm	17480	RR	RT									4			4			4
0204	3	2	Red River at US 81, 4.5 Mi N of Ringgold	10133	RR	RT									4			12	12		12
0204	3	2	Red River at FM 677 NW of Saint Jo	20168	RR	RT									4			12	12		12
0205	3	2	Red River Bridge on US 277-281 NE of Burkburnett	10134	RR	RT									4			12	12		12
0207	1	2	Prairie Dog Town Fork Red River Bridge at US 62-83	10136	RR	RT									4			4	4		4
0207	1	2	Lower Prairie Dog Town Fork Red River at SH 207	13637	RR	RT									4			4	4		4
0211	3	2	Little Wichita River Bridge on FM 2332	10140	RR	RT									4			12	12		12
0214	3	2	Buffalo Creek at FM 1814	10097	RR	RT									4			12	12		12
0214	3	2	Wichita River at FM 810 W of Byers	10145	RR	RT									4			12	12		12
0214	3	2	Wichita River at FM 369	10153	RR	RT									4			12	12		12
0214	3	2	Wichita River at SH 25	10155	RR	RT									4			12	12		12
0214	3	2	Beaver Creek at FM 2326, 10.5 Km N of Kamay	15120	RR	RT									4			12	12		12
0214	3	2	Beaver Creek at US 283/183 Approx 18.2 Km S of Vernon	15121	RR	RT									4			12			12
0220	3	2	Pease River Bridge on FM 104 S of Kirkland	10167	RR	RT									4			4	4		4

**TABLE B1.1
Sample Design and Schedule
FY 2008**

Segment	TCEQ Region	Basin	Site Description	Station ID	Sampling Entity	Monitoring Type	24 Hr DO	Aq Hab	Benthics	Nekton	Metals Water	Organics Water	Metals Sed	Organics Sed	Conventional	Amb Tox Water	Amb Tox Sed	Indicator Bacteria	Inst Flow	Fish Tissue	Field
0222	1	2	Salt Fork Red River Bridge at US 83 N of Wellington	10171	RR	RT									4			4	4		4
0224	1	2	McClellan Creek at SH 273 22.5 Km (14 Mi) N Mclean	10064	RR	RT									4			4	4		4
0224	1	2	North Fork Red River Bridge at US 83 N of Shamrock	10178	RR	RT									4			4	4		4
0230	3	2	Paradise Creek at US 287 E of Vernon	10094	RR	RT									4			4	4		4
0230	3	2	Pease River at US 287 Bridge, 3 Mi. NW of Downtown Vernon	10166	RR	RT									4			4	4		4
0299	1	2	Sweetwater Creek SH 152	10074	RR	RT									4			4	4		4

Segment: State river segment where station is located
Region: TCEQ Region where station is located
Basin: (1) Canadian (2) Red
Site Description: Long description of sampling site
Station ID: TCEQ Station ID numbers

Sampling Entity: Entity conducting water quality monitoring
(RR) Red River Authority
(SH) City of Sherman

Monitoring Type: (RT) Routing water quality sampling
Conventional: Samples of nutrients and minerals collected and analyzed by a laboratory
Ind Bact: Indicator Bacteria
Inst Flow: Instantaneous flow measurement at time of sampling
Field: Parameters measured in the field; i.e. temperature, pH, dissolved oxygen, conductivity, etc.

APPENDIX C

Field Data Sheets



RED RIVER AUTHORITY OF TEXAS FIELD DATA REPORTING FORM



Date:		Station Location:			TCEQ Site ID:		
Time:		Basin/Reach/Segment:		HUA No.	RRA Tag No:		
County:		(82903) Monitoring Type:		QAO:	DM:		
Red River ID #:				Stream Width: (ft)		Section Width: (ft)	
Chain of Custody #:				Time Start:		Time End:	
Tech(s):			Section Midpoint	Section Depth	Velocity	Discharge	
Storet Code	Sample Collection Depth _____ Meters		1				
00010		Water Temp (°C)	2				
00094		Conductivity (uS/cm)	3				
00300		Dissolved Oxygen (mg/L)	4				
00400		pH (Standard Units)	5				
01351		Flow Severity 1 - No Flow 2 - Low Flow 3 - Normal 4 - Flood 5 - High 6 - Dry	6				
			7				
00061		Flow (CFS)	8				
89835		Flow Measurement Method 1 - Gauge 2 - Electronic 3 - Mechanical 4 - Weir/Flume 5 - Doppler	9				
			10				
20424		Water Clarity 1 - Excellent 2 - Good 3 - Fair 4 - Poor 5 - Other*	11				
			12				
89969		Water Color 1 - Brown 2 - Reddish 3 - Green 4 - Black 5 - Clear 6 - Other	13				
			14				
89971		Water Odor 1 - Sewage 2 - Oily/Chem 3 - Rotten Eggs 4 - Musky 5 - Fishy 6 - None 7 - Other*	15				
			16				
00021		Air Temperature (° Fahrenheit)	17				
89966		Weather 1 - Clear 2 - Partly Cloudy 3 - Cloudy 4 - Rain 5 - Other*	18				
			19				
89965		Wind Condition 1 - Calm 2 - Slight 3 - Moderate 4 - Strong Direction _____	20				
			Total Flow in CFS				
72053		Significant Precip. (< or > Days)					
Comments:							



RED RIVER AUTHORITY OF TEXAS

E. coli BACTERIA LOG



Date on: _____ **Time on:** _____ **Technician(s):** _____

Expiration Date of Media: _____ **Start Temp:** _____ °C

#	Sample Location	Sample ID No.	mL Used	Small Cells	Large Cells	MPN Table	Dilution Factor	MPN/ 100 mL
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

Date Off: _____ **Time Off:** _____ **End Temp:** _____ °C **Tech(s):** _____

Method Used to Determine Counts: *E. coli* IDEXX MPN Chart

COMMENTS:

MPN / 100 mL = MPN Table * Dilution Factor QAO



RED RIVER AUTHORITY OF TEXAS FECAL COLIFORM BACTERIA LOG



Date on:		Time on:		Technician(s):	
Exp. Date of Media:				Start Temp: °C	
	Sample Location	Sample ID No.	mL Used	Colonies Counted	Fecal Coliform # /100 mL
1	Beginning Blank (#1)	-----			
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20	End Blank (#2)	-----			
Date off:		Time off:		End Temp: °C	
Technician(s):					
Method Used to Count Colonies: 20 – 60					
COMMENTS:					
<input checked="" type="checkbox"/> Filter Manifold: () Autoclaved or () Flamed with reagent alcohol prior to use. Fecal Coliform #/100 = (Colonies Counted / mL Used) * 100					
					QAO



RED RIVER AUTHORITY OF TEXAS TURBIDITY LOG



Date On:			Time On:			
Instrument:		Last Calibration:		Technician:		
Sample Location:		Sample ID #	Reading (NTU)	Dilution Factor	Final (NTU)	RPD or % R
1	Check Standard: ()					
2	Check Standard: ()					
3	DI Standard					
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20	QC Check: ()					
Notes:						
<p>Final=Reading * Dilution Factor RPD – $(X_1 - X_2) / \{(X_1 + X_2) / 2\} * 100$ (where X_1 is the sample and X_2 is the Field Split) %R – $SR / SA * 100$ (where SR = Sample Result and SA = Check Standard or Lab Duplicate)</p>						
						QAO

Red River Authority of Texas

YSI Calibration Log - Instrument:						Date:	Time:	
Site (Where Calibrated):			Technician(s):			Barometric Pressure Uncorrected: (mb)		
Calibration Values	Actual <small>(Read before Calibration) (All Temps °C)</small>		Sonde <small>(Read After Calibration) (All Temps °C)</small>		Post Cal. Values Date: _____ Time: _____		Barometer Reading: (mm/Hg)	
	Temp	Value	Temp	Value	Temp	Value	Calibration Constants and Ranges	Record Constants or Values
Sp. Cond _____ uS/cm							Conductivity Cell (4.5 to 5.5)	
pH 7 (Exp.)							pH 7 (0 to ± 40 mV)	
pH 10 (Exp.)							pH 10 (-180 ± 40 mV)	
DO (mg/L)							DO Charge (25 to 75)	
DO (%)							DO Gain (0.7 to 1.7)	
Battery Voltage							Note: Span between pH 7 and pH 10 should be approx. 170 to 180 mV	
Notes and Comments: (YSI Sonde 600 XLM-O with YSI 650 MDS Logger)						DO Membrane Changed?		Yes No
						(if yes, wait 8 hours before final calibration)		
Equipment Maintenance:								

APPENDIX D

Chain of Custody Forms

APPENDIX E

Data Summary

DATA SUMMARY

Data Information

Data Source: _____

Date Submitted: _____

Tag_id Range: _____

Date Range: _____

Comments

Please explain in the space below any data discrepancies including:

- Inconsistencies with AWRL specifications or Reporting Limits;
- Failures in sampling methods and/or laboratory procedures that resulted in data that could not be reported to the TCEQ; and
- Other discrepancies.

Planning Agency Data Manager: _____

Date: _____

APPENDIX F

Red River Authority of Texas Data Management Plan

DATA MANAGEMENT PLAN

PERSONNEL

Management

Pursuant to the Authority's General Administrative Policy, § 1, 2, 4 and 7; personnel assigned to General Administration are responsible for applying professional management practices and established internal controls to ensure the integrity and safeguard(ing) of all data associated with various Authority business activities. Leadership is provided by key administrative personnel under guidance of the Board Adopted Administrative Policy relevant to each division, department, function or level of interactivity.

Program Organizational Chart

An Organizational Chart depicts the level of administration and responsibility for the operative management of data. Concise guidance and specific component accountability is achieved under the referenced organizational diagram. Revisions of the program are selectively implemented as necessary. Classification of personnel is based on a skill and/or expertise level required to perform the assigned tasks. Refer to Chart 1, in the front of this QAPP, for details of the program organizational chart.

Training

Continual training and instruction is provided, enabling management and staff to expand capacity and enhance skills in an effort to maintain the highest degree of accuracy and performance feasible. Performance is measured both individually and as a group, providing guidance for necessary continuing education programs and the basis for personnel career advancement, which ultimately improves unit efficiency and effectiveness.

The Authority employs an interactive data management team, which is multi-functionally cross-trained to perform under the guidance of the Authority's Administrative Policy and Procedures Manual. All data management personnel are provided continuing education, both formal and informal, to maintain proficiency with dynamic hardware, software and application protocols.

Hardware Considerations

Data management occurs within the framework of a Local Area Network (LAN) utilizing a Windows 2003 Server configured as follows: Dual Intel Xeon Processors 3.06 GHz, 512k Cache, 533Mhz Front Side Bus, 1.0 GBDDR SDRAM, two 73 GBSCSI Hard drives connected via Hardware Raid 1. Workstation minimum configurations are as follows: Pentium III class processors running at 300 MHz or higher, 40 GB Hard Drive, 128 Mb Ram, Windows XP SP2 OS. The LAN, Server and workstations are maintained by the Systems Analyst under the direction of the General Manager.

Software Considerations

The Authority employs a complement of proprietary software applications and support utilities in the accomplishment of data management objectives. Software acquisitions and upgrades follow a defined procedure in that all critical software meets the data management objectives for the intended use, is compatible with other statistical and geographic software applications.

The Authority utilizes Microsoft Access 2003 as its primary database management software application to screen and manage all data entering the data management system. Paradox 7.0 is utilized as an alternate database management system to maintain compatibility with other entities.

Other applications considered essential to the data management system are Corel WordPerfect Office 2002 and Microsoft Office 2003 for general word processing, presentations graphics and subsidiary data management and analysis. AutoCAD 2000 and ArcView 3.2 are used for high end graphics and the Geographical Information System (GIS). StatSoft Statistica 5.5 for Windows is the primary statistical analysis software applied to processed data. Microsoft Excel 2003 is utilized as subsidiary analysis software and to maintain compatibility with other entities.

Data Dictionary

Terminology and field descriptions are included in the SWQM Data Management Reference Guide, most recent version. For the purposes of verifying which source codes are included in this QAPP, a table outlining the codes that will be used when submitting data under this QAPP is included below. Source Code 1 specifies the entity responsible for the sampling (Red River Authority of Texas), while Source Code 2 indicates the actual entity collecting the samples in the field. If needed, this table will be resubmitted with amendments to the QAPP that involve the addition of other monitoring entities under the QAPP.

Name of Monitoring Entity	Source Code 1	Source Code 2
Red River Authority of Texas	RR	RR
City of Sherman	RR	SH

Data Management Plan Implementation

The Data Manager is responsible for implementation of the plan when any new data is received for storage and analysis or when existing data inventories are retrieved for a specific task. The Data Manager provides supervision of all tasks relating to management of data contained in the system, either in hard copy or electronic format. On-line data inventories are maintained on a dedicated volume of the LAN for access by other staff members and technicians performing specialized tasks. Final quality controlled field data sheets or datasets are assembled with the lab reports and chain-of-custody reports for inclusion into a three-ring binder. Custody of the original records and off-line digital copies are maintained in the Data Manager's office.

Data Management Plan Implementation (continued)

There are a minimum of five stages of quality assurance and quality control (QA/QC) that the data is subjected to from the point of entry into the data management processing system through publication and storage. During each stage of QA/QC, the data are visually checked and/or electronically screened in accordance with a detailed QA/QC protocol to ensure that the highest data integrity is maintained. The QA/QC process returns either a pass or fail result in which case the data are returned for corrective actions or passes on to the next processing steps. A QA/QC log and/or report is generated to verify the completed processes applied to the data and show responsibility for the person or persons managing the data in support of each assigned task. The Quality Assurance Officer is responsible for performing all control processes and initializing the completed process. The Data Manager validates the QA/QC process prior to data entry or importation of data in the primary database structure.

Refer to the Quality Assurance Protocols in Sections D1, D2 and D3 of this QAPP and the attached Data Management Schematic for details of the QA/QC stages applied during the processing path of data throughout the Data Management System.

Quality Assurance Quality Control

Refer to Section D1, D2 and D3 of this QAPP.

Migration/Transfer/Conversion

Data to be imported into a database, either from hard copy for manual data entry or in digital format for electronic entry, follows the conversion protocol best suited for the application and to comply with the structure of the host database design. In most cases, ASCII delimited text is the common migration format of choice.

Any new data for entry in the database management system (DBMS) not already in an acceptable format is converted to ASCII delimited text for importation. ASCII is the common medium for data archival and security and is utilized to maintain compatibility with all other format types, especially as new databases are introduced. An ASCII text editor is utilized to read the datafile and determine its basic format, remove dead space, and arrange the fields in the most desirable edit order. These steps are accomplished in the data screening and preparatory processing stages where individual specifications are prepared for each different dataset to be included in the DBMS. Working with a copy of the datafile, the conversion processing stage consists of the following defined procedures:

1. Separate datafile into subsidiary blocks by predefined table specifications;
2. Normalize the table(s) by key field group relationships;
3. Set form and table assignments;
4. Arrange field order per table;
5. Add field and record delimiters as needed; and
6. Apply QA/QC review and log.

Table blocks may then be arranged to comply with the host database structure configuration to facilitate importation without error. Preferred field/record delimiters are installed and a test import to the host database structure is performed with a sampling of actual data for QA/QC review purposes.

BACKUP/DISASTER RECOVERY

1. Archives/Datafile Backups

Copies of data files are retained on-line for comparison and edification with two duplicates of each datafile stored off-site on 4mm data tape. The copies are logged with one remanded to a fireproof vault and the other is remanded to senior staff members for off-site storage until they are one month old. They are then stored in a fireproof safe located on-site until they are rotated through recycling of the backup data tape. Alternating tape backups are made weekly and stored off-site for safety against hazards that may affect the Authority's offices.

2. Disaster Recovery

Restoration of individual data files and source programs may be obtained from duplicates contained on tape and stored off-line. A control duplicate of the CRP data volume contained on the LAN file server is stored on CD(s) that may be restored to any workstation or server upon recovery of the system.

3. Archives/Data Retention

Complete original data sets are archived on permanent media; tape backup, CD-ROM, and retained indefinitely on-site by the Authority and off-site for a retention period specified in the original QAPP document.

The Authority applies the rules of Generally Accepted Accounting Principles for internal controls and custody of funds in maintaining its data security and storage. That is, all software applications, source programs and archived data are retained in original form together with a backup copy and kept off-line, off premises, and in a secure environment. All data files are retained in their original media and format without modification. Copies are utilized for initial conversion, formatting and importation to the interim database structure for continued processing.

INFORMATION DISSEMINATION

1. Public Access

Multimedia editorials and educational programs to be distributed throughout the watersheds will be made available through the information resources library and the Authority's Internet site as funds permit. Final quality assured data contained in the primary database structure is linked to the website for ready access of the most current data available. The Data Management Program is flexible enough to provide a vast amount of relevant information through other public information programs produced by the Authority for use in public schools and the general public through public forums and meetings.

2. Internet

An Internet Web Site is hosted by the Authority and dedicated to the CRP to provide the public with timely updates of Authority projects and programs. Select datasets and other products are also made available. This site is in a continuous state of modification to provide the most current information available. The CRP home page provides current information on the assessment process and over five years of water quality monitoring data. This information may be retrieved by county, basin reach, hydrologic unit area, segment, or by station number. An information repository is being expanded to include technical

INFORMATION DISSEMINATION (continued)

summaries, intensive survey reports, priority watershed studies and other publications relevant to the CRP that may also be of interest to the general public. Data links are maintained to other similar sites of interest.

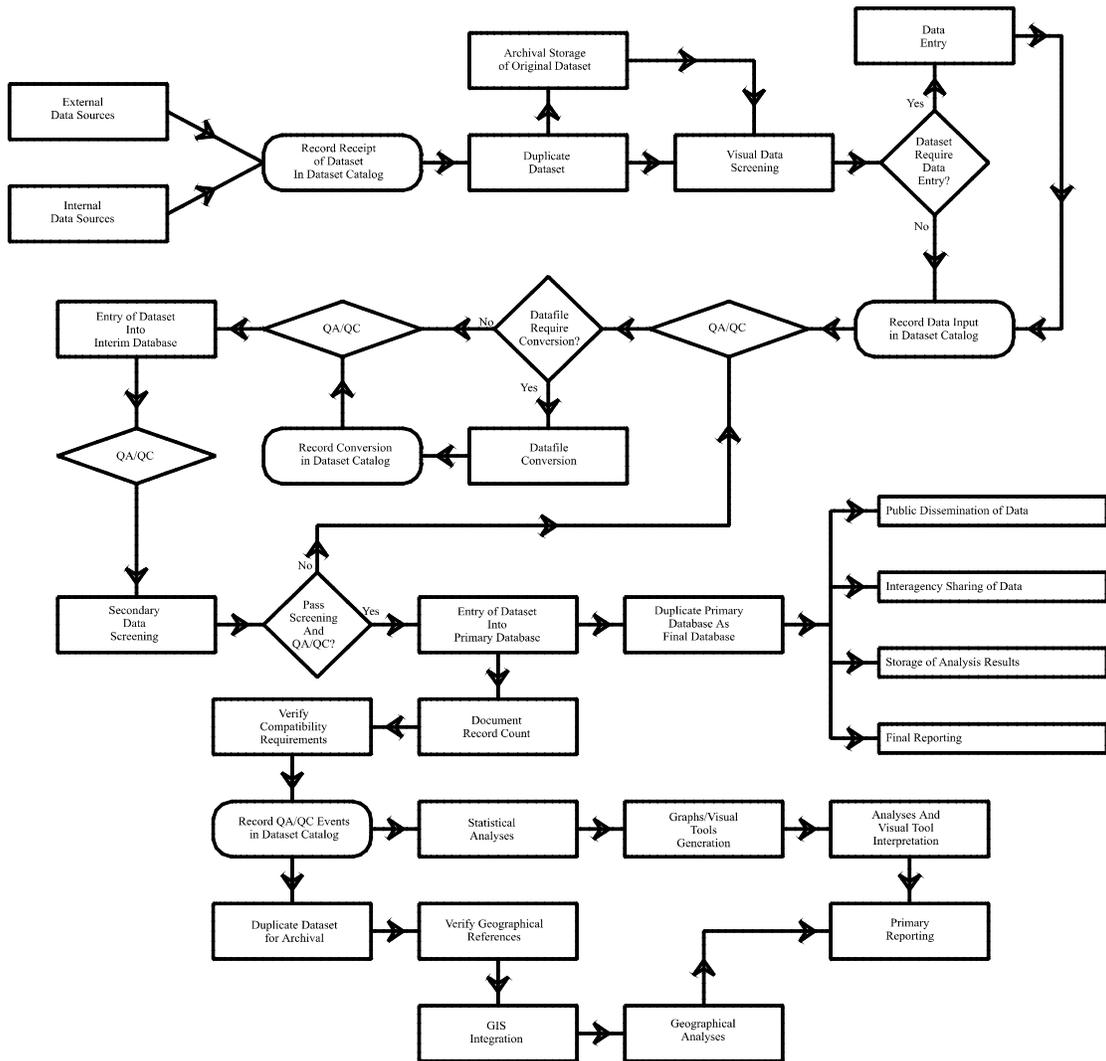
3. Reporting

The Authority produces externally available reports, such as the Biennial Regional Assessment of Water Quality, Annual Financial Report, Project Summary Reports, newsletters, and Program Reports relevant to all major programs or projects to which the Authority is engaged. Summaries of published CRP reports are made available on the Authority's website in the Public Information Repository section.

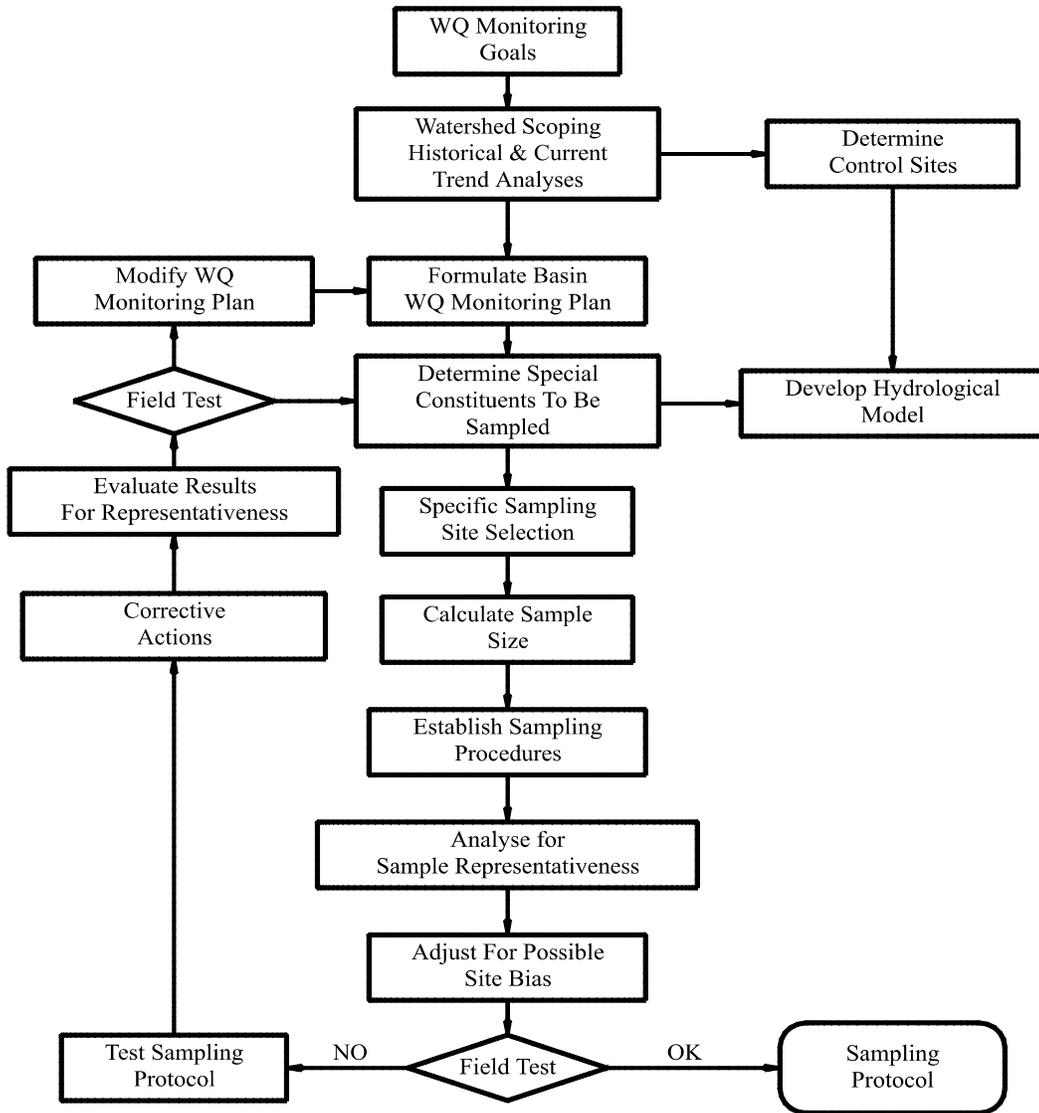
INTER-AGENCY DATA SHARING

Software packages today provide features and conversion utilities that allow nearly universal translation of digital data files. The Authority keeps on hand a number of software products with extensive data translation functions to ensure that any user request for data in nearly any format can be met.

Data Management Schematic Data Path Profile Chart 2



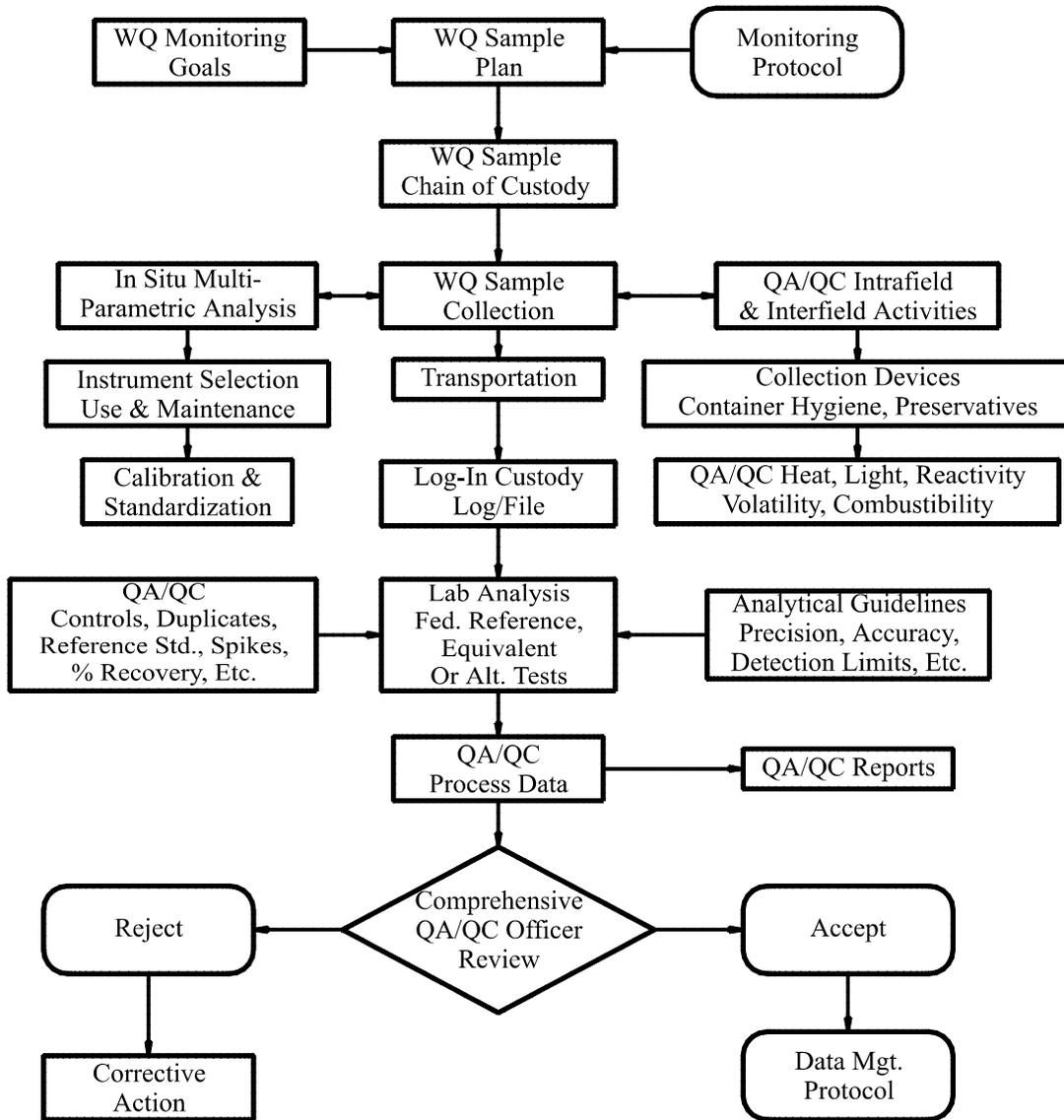
WATER QUALITY MONITORING
Monitoring Protocol
Chart 3



WATER QUALITY MONITORING

Sampling Protocol

Chart 4



ATTACHMENT 1

Example Letter to Document Adherence to the QAPP

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 “QAPP Title, Revision Date”. 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

Copies of the signed forms should be sent by the Red River Authority to the TCEQ CRP Project Manager within 60 days of TCEQ approval of the QAPP.