Clean Rivers Program
Quality Assurance Project Plan
for the

Red and Canadian River Basins

Revision 1.0

Red River Authority of Texas
P.O. Box 240
Wichita Falls, Texas 76307-0240

Clean Rivers Program
Water Quality Planning Division
Texas Commission on Environmental Quality
P.O. Box 13087, MC 234
Austin, Texas 78711-3087

Effective Period: FY 2012 to FY 2013

Questions concerning this QAPP should be directed to:

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A1 APPROVAL PAGE

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Julie McEntire — Date
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Allen M. Pappas — Date
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Allen M. Pappas 08/15/2011
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Alicia Gill — Date
LCRA Environmental Laboratory Manager

CITY OF SHERMAN

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City of Sherman CRP Project Manager

Nathan Whiddon 8-17-11
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City of Sherman CRP QA Officer

NORTH TEXAS MUNICIPAL WATER DISTRICT

Jerry Allen 08/19/2011
Jerry Allen — Date
NTMWD CRP Project Manager

Wayne Gilliland 8/19/2011
Wayne Gilliland — Date
NTMWD CRP QA Officer

The Red River Authority of Texas will secure written documentation from each sub-tier project participant (e.g., subcontractors, other units of government) stating the organization's awareness of and commitment to requirements contained in this quality assurance project plan and any amendments or added appendices of this plan. The Red River Authority of Texas will maintain this documentation as part of the project's quality assurance records, and will ensure the documentation is available for review. (See sample letter in **Attachment 1** of this document.)

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LIST OF ACRONYMS

AWRL	Ambient Water Reporting Limit
BAC	Basin Advisory Committee
BMP	Best Management Practices
CAP	Corrective Action Plan
CAR	Corrective Action Report
COC	Chain of Custody
COD	Chemical Oxygen Demand
CRP	Clean Rivers Program
CS	City of Sherman
DBMS	Database Management System
DM&A	Data Management and Analysis
DMP	Data Management Plan
DMRG	Data Management Reference Guide
DO	Dissolved Oxygen
DOC	Demonstration of Capability
DQO	Data Quality Objective
EDP	Electronic Data Processing
EPA	United States Environmental Protection Agency
ESD	RRA Environmental Services Division
FY	Fiscal Year
GIS	Geographic Information System
GPS	Global Positioning System
HUA	Hydrologic Unit Area
LAN	Local Area Network
LCRA	Lower Colorado River Authority
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
LIMS	Laboratory Information Management System
LOD	Limit of Detection
LOQ	Limit of Quantitation
mg	Milligrams
mL	Milliliter
NELAP	National Environmental Laboratory Accreditation Program
NTMWD	North Texas Municipal Water District
NTU	Nephalometric Turbidity Units
QA	Quality Assurance
QAO	Quality Assurance Officer
QAPP	Quality Assurance Project Plan
QAS	Quality Assurance Specialist
QC	Quality Control
QM	Quality Manual
QMP	Quality Management Plan
RBP	Rapid Bioassessment Protocol
RL	Reporting Limit
RPD	Relative Percent Difference
RRA	Red River Authority of Texas
RWA	Receiving Water Assessment
SLOC	Station Location
SOP	Standard Operating Procedure
SQL	Structured Query Language
SWQM	Surface Water Quality Monitoring
SWQMIS	Surface Water Quality Monitoring Information System
TCEQ	Texas Commission on Environmental Quality
TDS	Total Dissolved Solids
TMDL	Total Maximum Daily Load
TNI	The NELAC Institute
TOC	Total Organic Carbon
TSS	Total Suspended Solids
TSWQS	Texas Surface Water Quality Standards
TWQI	Texas Water Quality Inventory
µg	Micrograms
USGS	United States Geological Survey
VOA	Volatile Organic Analytes
VSS	Volatile Suspended Solids

A3 DISTRIBUTION LIST

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NTMWD CRP Project Manager
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NTMWD CRP QA Officer
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The Red River Authority of Texas 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 of Texas 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

Allison Woodall
CRP Work Leader
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, corrective actions, 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 TCEQ 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.

Julie McEntire
CRP Project Manager
Responsible for the development, implementation, and maintenance of CRP contracts. Tracks, reviews, and approves 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 Basin Planning Agency audits. Verifies QAPPs are being followed by contractors and that projects are producing data of known quality. Coordinates project planning with the Basin Planning Agency 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.

Nancy Ragland
Team Leader, Data Management and Analysis Team
Participates in the development, approval, implementation, and maintenance of written quality assurance standards (e.g., Program Guidance, SOPs, QAPPs, QMP). Ensures DM&A staff perform data management related tasks, including coordination and tracking of CRP data sets from initial submittal through CRP Project Manager review and approval; ensuring that data is reported following instructions in the *Surface Water Quality Monitoring Data Management Reference Guide* (January 2010, or most current version); running automated data validation checks in SWQMIS and coordinating data verification and error correction with CRP Project Managers; generating SWQMIS

summary reports to assist CRP Project Managers' data review; identifying data anomalies and inconsistencies; providing training and guidance to CRP and Planning Agencies on technical data issues to ensure that data are submitted according to documented procedures; reviewing QAPPS for valid stream monitoring stations, validity of parameter codes, submitting entity code(s), collecting entity code(s), and monitoring type code(s); developing and maintaining data management-related standard operating procedures for CRP data management; and coordinating and processing data correction requests.

Peter Bohls
CRP Data Manager, Data Management and Analysis Team
Responsible for coordination and tracking of CRP data sets from initial submittal through CRP Project Manager review and approval. Ensures that data is reported following instructions in the *Surface Water Quality Monitoring Data Management Reference Guide* (January 2010, or most current version). Runs automated data validation checks in SWQMIS and coordinates data verification and error correction with CRP Project Managers. Generates SWQMIS summary reports to assist CRP Project Managers' data review. Identifies data anomalies and inconsistencies. Provides training and guidance to CRP and Planning Agencies on technical data issues to ensure that data are submitted according to documented procedures. Reviews QAPPs for valid stream monitoring stations. Checks validity of parameter codes, submitting entity code(s), collecting entity code(s), and monitoring type code(s). Develops and maintains data management-related standard operating procedures for CRP data management. Coordinates and processes data correction requests. Participates in the development, implementation, and maintenance of written quality assurance standards (e.g., Program Guidance, SOPs, QAPPs, QMP).

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 and reviews QAPPs in coordination with other CRP staff. Coordinates documentation and implementation of corrective action for the CRP.

<u>Red River Authority of Texas</u>

Allen M. Pappas
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 basin planning agency participants and that projects are producing data of known quality. Ensures that subcontractors are qualified to perform contracted work. Ensures CRP project managers and/or QA Specialists are notified of deficiencies and corrective actions, and that issues are resolved. Responsible for validating that data collected are acceptable for reporting to the TCEQ.

Allen M. Pappas
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 maintaining records of QAPP distribution, including appendices and amendments. Responsible for maintaining written records of sub-tier commitment to requirements specified in this QAPP. Responsible for identifying, receiving, and maintaining project quality assurance records. Responsible for coordinating with the TCEQ QAS to resolve QA-related issues. Coordinates and monitors deficiencies and corrective action. 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.

Glen K. Hite
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. Maintains quality-assured data on the Authority's website.

Michael J. Carlo
Environmental Services Division Manager
Responsible for ensuring that all samples received in the Environmental Services Division Laboratory are within the allotted holding time, and that the chain-of-custody has been properly completed. Ensures that the samples are analyzed in accordance with standard accepted methods as described in the SOP manual. Ensures all analyses results are correctly performed and properly recorded on the laboratory data sheets and in the appropriate analytical log books prior to transmittal to the CRP Quality Assurance Officer.

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 that training records are maintained. Ensure that all field staff are equipped to conduct the necessary monitoring. Ensures that personnel and equipment are available at appropriate times. The Field Supervisor also 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, October 2008 (RG-415).* Serves as CRP Sample Custodian. Coordinates and maintains records of data verification and validation. Assists with monitoring systems audits on project participants to determine compliance with project and program specifications.

Allen M. Pappas
SWQM Data Entry Technician
Responsible for entering quality assured SWQM data into the Authority's water quality database. Assists during data collection events and serves as alternate 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 **Appendix A**, **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 corrective actions, 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 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.

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 laboratory data sheets and in the appropriate analytical log books prior to transmittal to the Quality Assurance Officer.

David Schwartz
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, October 2008 (RG-415).*

North Texas Municipal District

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

Jerry Allen
NTMWD CRP Project Manager and CRP Field Supervisor
Responsible for overall project direction. As CRP Project Manager, is responsible for all CRP related activities conducted by NTMWD. As CRP Field Supervisor, is responsible for ensuring that field samples and measurements are collected and recorded according to methodologies detailed in **Appendix A**, **Table A7.1**. The Field Supervisor role will have primary responsibility for initiating corrective actions in the field in support of data completeness goals of 90%. The Field Supervisor will ensure proper use of CRP Field Data Sheets, field notebooks, proper calibration of equipment and that chain-of-custody forms are correctly completed and received by the laboratory. The Field Supervisor will also oversee submittal of water quality samples to the contract laboratory, as appropriate, and will be responsible for confirming that requested analyses are carried out.

Wayne Gilliland
NTMWD CRP Quality Assurance Officer
Responsible for coordinating the implementation of the CRP QA program. Responsible for maintaining the CRP QAPP and monitoring its implementation. Responsible for maintaining records of QAPP distribution, including appendices and amendments. Responsible for maintaining written records of sub-tier commitment to requirements specified in this QAPP. Responsible for identifying, receiving, and maintaining project quality assurance records. Responsible for coordinating with the TCEQ QAS to resolve QA-related issues. Notifies the CRP Project Manager of particular circumstances which may adversely affect the quality of data. Coordinates with the CRP Project Manager to monitor deficiencies and corrective action. Coordinates and maintains records of data verification and validation. Coordinates the research and review of technical QA material and data related to water quality monitoring system design and analytical techniques. Conducts monitoring systems audits on project participants to determine compliance with project and program specifications, issues written reports, and follows through on findings. Ensures that field staff are properly trained and that training records are maintained

Elizabeth Turner
NTMWD CRP Laboratory Manager
Serves as primary laboratory contact. Responsible for ensuring that all samples received in the NTMWD Environmental 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 laboratory data sheets and in the appropriate analytical log books. Responsible for the implementation of the QA program for the NTMWD Environmental Laboratory. Ensures laboratory staff is properly trained. Responsible for distribution of hardcopy and electronic reports to customers.

Ray Cotton
NTMWD CRP Laboratory Operations Manager
Responsible for ensuring that all samples received in the NTMWD Environmental 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 laboratory data sheets and in the appropriate analytical log books. Responsible for the implementation of the QA program for the NTMWD Environmental Laboratory. Ensures laboratory staff is properly trained. Generates laboratory reports.

Russell Moody
NTMWD CRP Laboratory Quality Assurance / Quality Control Officer
Responsible for coordinating the implementation of the Laboratory QA program. Notifies NTMWD Laboratory Manager of particular circumstances which may adversely affect the quality of data. Coordinates and monitors deficiencies 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 related to laboratory analysis. Responsible for identifying, and maintaining Laboratory quality assurance records. Maintains laboratory training records.

Contract Laboratories

Lower Colorado River Authority Laboratory (LCRA)
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 **Appendix A**, **Table A7.1** that the Authority's laboratory cannot perform in-house.

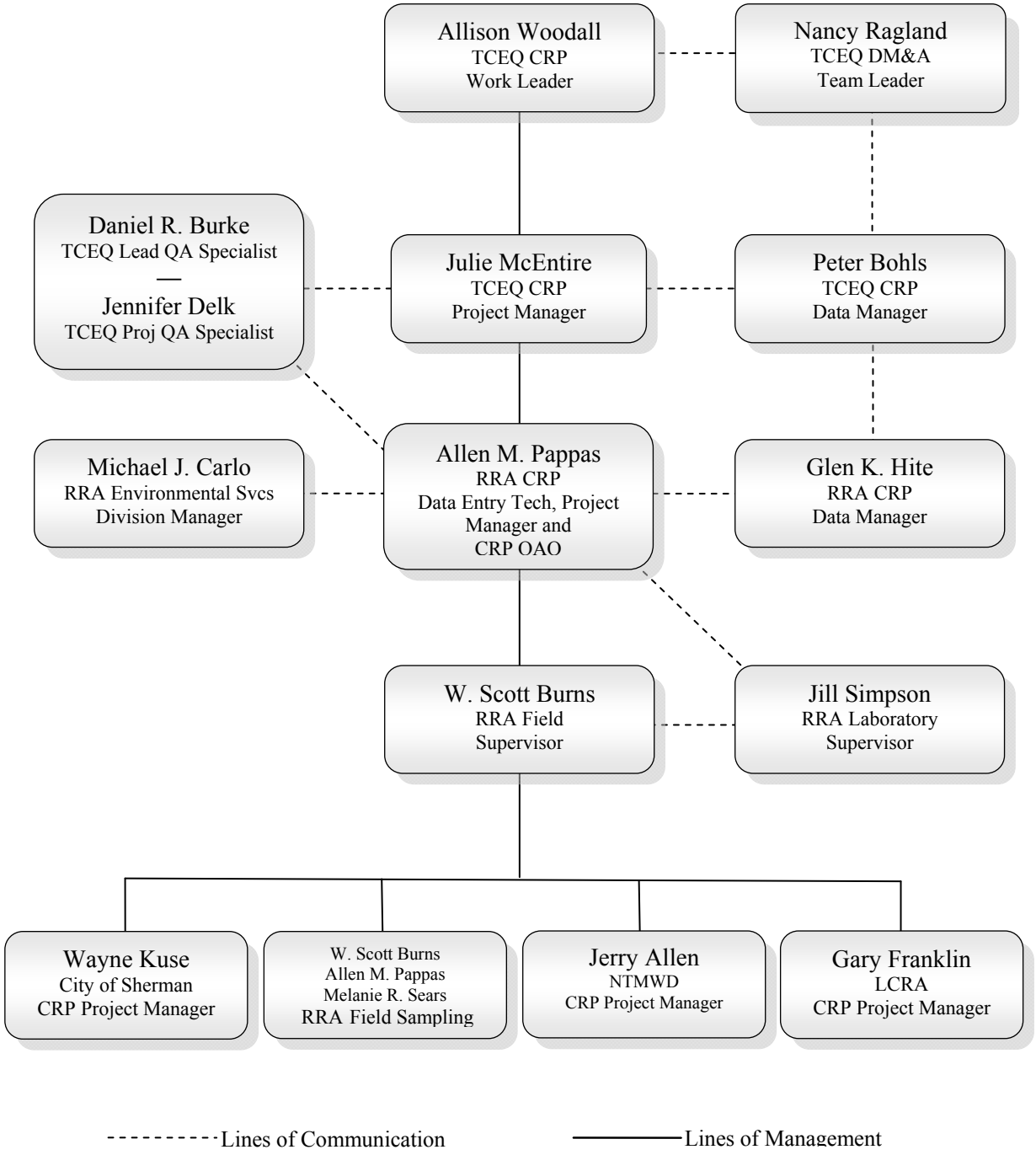
Gary Franklin
LCRA CRP Project Manager
Responsible for implementing and monitoring CRP requirements in contracts, QAPPs, and QAPP amendments and appendices. Ensures internal monitoring systems audits are conducted to ensure that LCRA Environmental Laboratory is producing data of known quality. Ensures CRP project managers and/or QA Specialists are notified of deficiencies and corrective actions, and that issues are resolved. Responsible for validating that data collected are acceptable for reporting to customer or to the TCEQ.

Alicia Gill
LCRA Environmental Laboratory 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.

Hollis Pantalion
LCRA 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.

PROJECT ORGANIZATION CHART

Chart 1 – Organization Chart - Lines of Communication



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 of Texas (Authority and/or RRA) 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 *TCEQ Quality Management Plan* (most recent version).

The purpose of this QAPP is to clearly delineate Authority's 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 SWQMIS have been collected and managed in a way that guarantees its reliability and therefore can be used in water quality assessments, total maximum daily load development, establishing water quality standards, making permit decisions and used by 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 *FY 2012-13* Clean *Rivers Program Guidance and Reference Guide.* The FY 2012 monitoring schedule and QAPP are based on:

- ✓ results from previous Water Quality Assessment Reports,
- ✓ constituents listed on the *2008 Texas Surface Water Quality Inventory*,
- ✓ constituents listed on the *Draft 2010 Texas Water Quality Integrated Report (IR)*,
- ✓ requests received from the Basins Steering Committees, and
- ✓ requirements, as requested from TCEQ.

Primary concerns in both the Canadian and Red River Basins are depressed dissolved oxygen levels, elevated chloride, nutrient, bacteria and chlorophyll *a* levels, and the lack of water quality data. Therefore, the monitoring plan developed by the Authority is designed to accomplish the following:

- ✓ to provide adequate baseline water quality data throughout each basin,
- ✓ to collect data necessary to prove or dispute the *2008 Texas Surface Water Quality Inventory*,
- ✓ to collect data necessary to prove or dispute the *Draft 2010 Texas Water Quality IR*,
- ✓ to consider Basin Steering Committees and stakeholder requests, and
- ✓ to collect data needed to meet the needs of TCEQ.

Figure 1 on page 17 illustrates the vicinity of the Canadian and Red River Basins. **Figures 1-1 through 2-5** located in **Appendix B** identify the Authority's FY 2012 Monitoring Sites. Under the guidance of this QAPP, the City of Sherman, and the North Texas Municipal Water Authority will collect and analyze specific water quality samples from sites in Reach I of the Red River Basin. The data collected is quality assured and submitted to the Authority on a quarterly or more frequent basis prior to the Authority's periodic data submittal to the TCEQ.

Red and Canadian River Basins
Vicinity Map

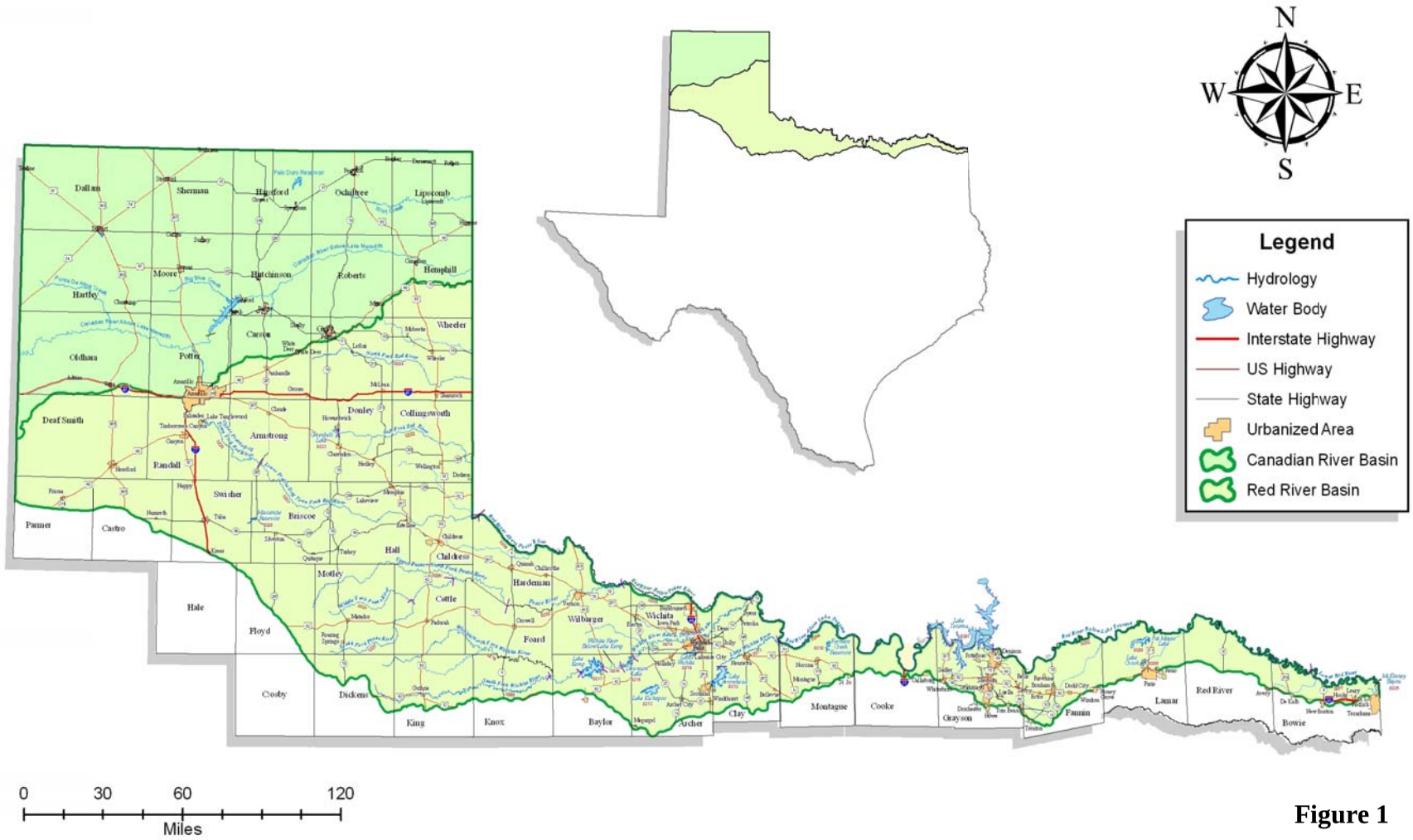


Figure 1

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 Laboratory or LCRA for analysis. The City of Sherman and the North Texas Municipal Water District will collect and analyze water samples in their respective laboratory and/or the Authority's Environmental Laboratory with the data to be submitted to the Authority on a quarterly or more frequent basis under this QAPP. The parameters to be analyzed by each laboratory are shown in **Appendix A**, **Table A7.1**. Depending on the possible sources of contamination and on the primary uses of the water body, annual monitoring will include at a minimum quarterly:

- ✓ field measurements,
- ✓ flow measurements as applicable,
- ✓ indicator bacteria analysis, and
- ✓ conventional parameter analyses.

In order to provide adequate watershed coverage, it was necessary for the Authority to divide both the Red and Canadian River Basins into five reaches or sub-watersheds identified as Red or Canadian Reach I, II, III, IV or V (please refer to basin reach maps located in **Appendix B** of this QAPP). The Reaches were created using natural hydrology composed of classified and unclassified water bodies as described in the *Texas Surface Water Quality Standards (TSWQS)*. This monitoring plan places an emphasis on a different reach each year in both basins so, that by the end of the fifth year, enough data will be collected for the next water quality assessment. The Authority's water quality monitoring plan will:

- ✓ include information from the *2008 Texas Water Quality Inventory*,
- ✓ include information from the *Draft 2010 Texas Water Quality Integrated Report*,
- ✓ include input from monitoring partners, stakeholders and other interested parties,
- ✓ attempt to locate and identify sources of the elevated nutrient and bacteria concerns, and
- ✓ continue collecting surface water data necessary for present and future water quality assessments using a rotational monitoring approach.

Fiscal Year 2012 the Authority's Reaches of Focus will be;

- **Canadian ~ Reach III**
- **Red ~ Reach II**

Fiscal Year 2013 the Authority's Reaches of Focus will be;

- **Canadian ~ Reach IV**
- **Red ~ Reach III**

<u>Canadian River Basin</u>

The Canadian River Basin, with the headwaters beginning in northeastern New Mexico, has a total drainage area of approximately 22,870 square miles. The Canadian River is a tributary of the Arkansas River, which eventually flows into the Mississippi River. There are 13 Hydrologic Unit Areas (HUAs) in the five reaches of the Canadian River Basin along with five classified stream segments, which have

been identified by the TCEQ.

The main water quality concerns within the Canadian River Basin are segments with elevated total dissolved solids (TDS) [chloride and sulfate], followed by those with elevated nutrient, chlorophyll *a* and bacteria 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 elevated nutrient and bacterial concerns generally have origins in both point and nonpoint sources, where the nonpoint sources may be attributed to runoff from areas where wildlife and livestock have been known to congregate.

Red River Basin

The Red River Basin covers a total drainage area of approximately 94,450 square miles of which roughly 24,460 square miles are within Texas. Reach I contains four HUAs with the remaining reaches each containing five HUAs. In addition, there are thirty classified stream segments in the basin, which have been identified by the TCEQ.

One of the main water quality concerns within the Red River Basin is elevated total dissolved solids (TDS) [chloride and sulfate]. One source of the elevated TDS levels are the naturally occurring salt springs found in the western half of the basin. Additionally, oilfield brine from abandoned or improperly plugged wells where the oilfield brines have corroded through old well casings have contaminated both surface and ground water sources.

Other water quality issues in the Red River Basin include segments with elevated nutrient, chlorophyll *a* and bacteria levels. The elevated nutrient and bacterial concerns generally have origins in both point and nonpoint sources, where the nonpoint sources may be attributed to runoff from areas where wildlife and livestock have been known to congregate.

See **Appendix B** for the project-related work plan tasks and **Table B1.1** for the sampling design and monitoring pertaining to this QAPP.

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 CRP Project Manager to the TCEQ's CRP Project Manager electronically. Amendments are effective immediately upon approval by the Authority's CRP Project Manager, the Authority's QAO, the TCEQ's CRP Project Manager, the TCEQ's CRP Lead QA Specialist, the TCEQ's CRP Project QA Specialist, and additional parties affected by the amendment. Amendments are not retroactive. 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 Authority and the TCEQ CRP 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, the Laboratory QAO, the TCEQ CRP Project

Manager, the TCEQ CRP Project QA Specialist, the TCEQ CRP Lead QA Specialist and other TCEQ personnel, as appropriate. Copies of approved QAPPs appendices will be distributed by the 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 that can be used to characterize water quality conditions, identify significant long-term water quality trends, support water quality standards development, support the permitting process, and conduct water quality assessments in accordance with *TCEQs Guidance for Assessing Texas Surface and Finished Drinking Water Quality Data*. These water quality data and data collected by other organizations (e.g., City of Sherman, North Texas Municipal Water District, 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 (e.g., not temporally representative, limited number of samples, biological sampling does not meet the specimen vouchering requirements), 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 Authority will use this information to determine future monitoring priorities. These water quality data and data collected by other organizations (e.g., City of Sherman, North Texas Municipal Water District, etc.), will be subsequently reconciled for use and assessed by the TCEQ.

The City of Sherman and the North Texas Municipal Water District are cooperating partners 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 **Appendix A**, **Table A7.1** and in the text following.

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 **Appendix A**, **Table A7.1** are the program-defined reporting specifications for each analyte and yield data acceptable for the TCEQ's water quality assessment. A full listing of AWRLs can be found at http://www.tceq.state.tx.us/compliance/monitoring/crp/qa/index.html.

The limit of quantitation 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 sample for each analytical batch of CRP Samples 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 **Appendix A.**

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 Samples 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 **Appendix A**.

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 include some data collected

during an index period (March 15 through 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 the **Data Management Plan**, **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 *TNI Volume 1, Module 2, Section 4.5.5* (concerning Review of Requests, Tenders and Contracts).

A9 DOCUMENTS AND RECORDS

The documents and records that describe, specify, report, or certify activities are listed. The list below is limited to documents and records that may be requested for review during a monitoring systems audit.

Table A9.1 Project Documents and Records

Document / Record	Location	Retention (Years)	Format
QAPPs, Amendments and Appendices	TCEQ, RRA	Seven	Paper, Digital
Field SOPs	RRA, SH, NM	Seven	Paper, Digital
Laboratory QA Manuals	RRA, LCRA[1], SH, NM	Seven	Paper, Digital
Laboratory SOPs	RRA, LCRA[1], SH, NM	Seven	Paper, Digital
QAPP Distribution Documentation	RRA, SH, NM	Seven	Paper
Field Staff Training Records	RRA, SH, NM	Seven	Paper
Field Equip. Calibration/Maintenance Logs	RRA, SH, NM	Seven	Paper, Digital
Field Instrument Printouts	RRA, SH, NM	Seven	Paper, Digital
Field Notebooks or Data Sheets	RRA, SH, NM	Seven	Paper
Chain of Custody Records	RRA, LCRA[1], SH, NM	Seven	Paper
Laboratory Calibration Records	RRA, LCRA[1], SH, NM	Seven	Paper, Digital
Laboratory Instrument Printouts	RRA, LCRA[1], SH, NM	Seven	Paper, Digital
Laboratory Data Reports/Results	RRA, LCRA[1], SH, NM	Seven	Paper, Digital
Laboratory Equip. Maintenance Logs	RRA, LCRA[1], SH, NM	Seven	Paper, Digital
Corrective Action Documentation	RRA, LCRA[1], SH, NM	Seven	Paper, Digital

[1] *LCRA document retention is five years.*

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
4. North Texas Municipal Water District (NM)
   P.O. Box 2408
   Wylie, Texas, 75098
   (505 East Brown Street)

Laboratory Test Reports

Test/data reports from the laboratory must document the test results clearly and accurately. Routine data reports should be consistent with the *TNI Volume 1, Module 2, Section 5.10* and include the information necessary for the interpretation and validation of data. The requirements for reporting data and the procedures are provided.

- ✓ 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
- ✓ Units of measurement
- ✓ Sample matrix

- ✓ Dry weight or wet weight (as applicable)
- ✓ Station information
- ✓ Date and time of collection
- ✓ Sample depth
- ✓ Holding time for SM9223 B
- ✓ 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 NELAP compliance

Electronic Data

Data will be submitted electronically to the TCEQ in the Event/Result file format described in the most current version of the TCEQ's *Surface Water Quality Monitoring Data Management Reference Guide* http://www.tceq.texas.gov/waterquality/data-management/dmrg_index.html. Additionally, a completed Data Summary (see **Appendix E**) will be submitted with each data submittal`.

The City of Sherman will submit both field data sheets and laboratory reports for parameters outlined in **Table A7.1** from surface water quality monitoring events on a quarterly or more frequent basis to the Authority in either digital or paper format. Data packets submitted to the Authority will be reviewed for completeness and then entered by the Authority's CRP Data Entry Technician into to the Authority's SWQM Database for submission to TCEQ.

The North Texas Municipal Water District will submit both field data sheets and laboratory reports for parameters outlined in **Table A7.1** from surface water quality monitoring events on a quarterly or more frequent basis to the Authority in either digital or paper format. Data packets submitted to the Authority will be reviewed for completeness and then entered by the Authority's CRP Data Entry Technician into to the Authority's SWQM Database for submission to TCEQ.

The LCRA Environmental Laboratory is utilized as a contract lab. Results from samples submitted to the LCRA Laboratory 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, October 2008 (RG-415) and Volume 2: Methods for Collecting and Analyzing Biological Community and Habitat Data* (*RG-416)*. Additional aspects outlined in **Table B2.1** 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[8]	I	Sodium Thiosulfate, Cool < 6°C	120mL/290 mL	6+2 Hours
Fecal Coliform	I	Sodium Thiosulfate, Cool < 6°C	120mL/290 mL	6+2 Hours
Conventionals and Minerals (Water)				
Alkalinity, Total	P or G	Cool < 6°C	1.0 L	14 Days
Calcium, Dissolved (EDTA)	P or G	HNO3 to pH<2 Field Filtered[5]	250 mL	6 Months
Chloride	P or G	Field Filtered[5], Cool < 6°C	125 mL	28 Days
Nitrate	P or G	Field Filtered[5], Cool < 6°C	125 mL	48 Hours
Solids (TSS and VSS)	P or G	Cool < 6°C	1.0 L	7 Days
Solids, Dissolved (TDS)	P or G	Cool < 6°C	250 mL	7 Days
Sulfate	P or G	Field Filtered[5], Cool < 6°C	125 mL	28 Days
Turbidity	P or G	Cool < 6°C	250 mL	48 Hours
Nutrients (Water)				
Ammonia, Total Phosphorus, TOC and COD	P or G	Cool < 6°C,H2SO4 to pH<2	500 mL	28 Days
Chlorophyll *a* and Pheophytin	P or G Amber[6]	Unfiltered, Dark, Cool < 6°C	500 mL	48 Hours
		Filtered, Dark, Frozen - EPA		24 Days[7]
		Filtered, Dark, Frozen - SM		28 Days[7]
Nitrate +Nitrite	P or G	Cool < 6°C,H2SO4 to pH<2	500 mL	28 Days
Orthophosphate	P or G	Field Filtered[5], Cool < 6°C	125 mL	48 Hours
Total Kjeldahl Nitrogen	P or G	Cool < 6°C,H2SO4 to pH<2	500 mL	28 Days
Metals (Water)				
Hardness, Total	P or G	Cool < 6°C, H2SO4 to pH<2	250 mL	6 Months
Iron, Total	P or G	Cool < 6°C,HNO3 to pH<2	500 mL	6 Months
Manganese, Total	P or G	Cool < 6°C,HNO3 to pH<2	500 mL	6 Months

[1] Glass (G), IDEXX (I) or Polyethylene (P).
[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] Orthophosphate and dissolved calcium samples are field filtered within 15 minutes of sample collection. Individual filters are rinsed with collected sample prior to actual filling of the designated container.

[6] Chlorophyll *a* and Pheophytin will be collected in amber containers.

[7] Holding time for Chlorophyll-*a* was determined to be 24 days. EPA method 445, Section 8.3 states that samples can be analyzed up to 24 days after filtering, as long as they remain frozen. The 48 hours allotted for the samples to be filtered is not part of the 24 day holding time following filtration. NTMWD utilizes SM 10200 H for Chlorophyll-*a* and Pheophytin which has a different holding time compared to EPA method 445/446.

[8] E.coli samples analyzed by SM 9223 B should always be processed as soon as possible and within 8 hours (6 hours transit/2 hours lab preparation) of sample collection. When transport conditions necessitate delays in delivery longer than 6 hours, the holding time may be extended and samples must be processed as soon as possible and within 48 hours.

Sample Containers

The Authority utilizes commercially purchased plastic leak proof sample containers for all conventional parameters. The sample containers are selected based on requirements from 40 CFR 136 and are both chemically and thermally preserved. Commercially purchased pre-sterilized plastic containers in 120 and/or 290 mL with sodium thiosulfate are used for collecting bacteriological samples. Certificates are maintained in a notebook by the Authority or by the laboratory manager. The Authority will provide the City of Sherman with the appropriate sample collection bottles.

NTMWD utilizes commercially purchased disposable plastic leak proof sample containers for the following conventional parameters: Total Organic Carbon and Chemical Oxygen Demand. For all other conventional parameters, NTMWD utilizes reusable plastic leak proof sample containers that have clean in accordance with NTMWD's Labware Cleaning Procedures (36-084). All sample containers are selected based on requirements from 40 CFR 136 and are both chemically and thermally preserved. Commercially purchased pre-sterilized plastic containers in 120 and/or 290 mL with sodium thiosulfate are used by NTMWD for collecting bacteriological samples.

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 one of two Field Data Sheets, as presented in **Appendix C**. The following will be recorded for all visits:

- ✓ Station ID
- ✓ Sampling Date
- ✓ Location
- ✓ Sampling depth
- ✓ Sampling time
- ✓ Sample collector's name and/or initials
- ✓ Values for all field parameters
- ✓ 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 in-stream activities (events impacting water quality, e.g., bridge construction, livestock watering upstream, etc.)
- specific sample information (number of sediments grabs, type/number of fish in a tissue sample, etc.)
- missing parameters (i.e., when a scheduled parameter or group of parameters is not collected)

Recording Data

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

1. 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.

Sampling Method Requirements or Sampling Process Design Deficiencies, and Corrective Action

Examples of sampling method requirements or sample design deficiencies include but are not limited to such things as inadequate sample volume due to spillage or container leaks, failure to preserve samples appropriately, contamination of a sample bottle during collection, storage temperature and holding time exceedance, sampling at the wrong site, etc. Any deviations from the QAPP and appropriate sampling procedures may invalidate resulting data and may require corrective action. Corrective action may include for samples to be discarded and re-collected. It is the responsibility of the Authority's Project Manager, in consultation with the Authority's QAO, to ensure that the actions and resolutions to the problems are documented and that records are maintained in accordance with this QAPP. In addition, these actions and resolutions will be conveyed to the TCEQ CRP Project Manager both verbally and in writing in the project progress reports and by completion of a corrective action plan (CAP).

The definition of and process for handling deficiencies and corrective action are defined in **Section C1**.

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**.

- ✓ Date and time of collection
- ✓ Site identification
- ✓ Sample matrix
- ✓ Number of containers
- ✓ Preservative used
- ✓ Was the sample filtered
- ✓ Analyses required
- ✓ Name of collector
- ✓ Custody transfer signatures and dates and time of transfer
- ✓ Bill of lading (*if applicable*)

Sample Labeling

Samples from the field are collected in containers with prefixed 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:

- ✓ Site identification
- ✓ Date and time of collection
- ✓ Preservative added, if applicable
- ✓ Indication of "field-filtration" *(for metals or Ion Chromatograph samples),* as applicable
- ✓ Sample type (i.e., analysis(es)) to be performed

Sample Handling

Written SOPs have been developed for sample handling, sample receiving, and sample shipping. They 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 a Laboratory ID number. 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.

1. Prior to the scheduled monitoring event(s), sample kits are prepared. The kits include sample containers with or without preservatives as required by the analysis method.

2. Samples are collected under protocols documented in the TCEQ *Surface Water Quality Monitoring Procedures Volume 1: Physical and Chemical Monitoring Methods, October 2008 (RG-415)*. Samples are packed in loose ice in accordance with the preservation (or preserved according to) criteria listed in **Table B2.1** of this QAPP.

3. The date, time and collector information is completed on the sample container labels and the COC.

4. The ice chests containing 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 laboratory 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 the laboratory accessions logbook with the unique laboratory ID number that was assigned in Step 1. Information documented in the accessions logbook includes:

- Date Received
- 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 laboratory 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 for analyses, the samples to be shipped are recorded on a separate COC form with the original COC number written in the comment section. The laboratory'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 insulated shipping container 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.

Sample Tracking Procedure Deficiencies and Corrective Action

All deficiencies associated with COC procedures, as described in this QAPP, are immediately reported to the TCEQ CRP Project Manager. These include such items as delays in transfer, resulting in holding time violations; violations of sample preservation requirements; incomplete documentation, including signatures; possible tampering of samples; broken or spilled samples, etc. The Authority's CRP Project Manager in consultation with the Authority's CRP QAO will determine if the procedural violation may have compromised the validity of the resulting data. Any failures that have reasonable potential to compromise data validity will invalidate data and the sampling event should be repeated. The resolution of the situation will be reported to the TCEQ CRP Project Manager in the Quarterly Progress Report. Corrective Action Plans will be prepared by the Authority's CRP QAO and submitted to TCEQ CRP Project Manager, along with the Quarterly Progress Report.

The definition of and process for handling deficiencies and corrective action are defined in **Section C1.**

B4 ANALYTICAL METHODS

The analytical methods, associated matrices, and performing laboratories are listed in **Appendix A**. 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 must be in accordance with the most recently published edition of the book entitled *Standard Methods for the Examination of Water and Wastewater*, the latest version of the *TCEQ SWQM Procedures as amended*, *40 CFR 136*, or other reliable procedures acceptable to the TCEQ, and in accordance with Chapter 25 of this title." Laboratories collecting data under this QAPP are compliant with the TNI Standards. Copies of laboratory QMs and SOPs are available for review by the TCEQ.

Standards Traceability

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

Analytical Method Deficiencies and Corrective Actions

Deficiencies in field and laboratory measurement systems involve, but are not limited to such things as instrument malfunctions, failures in calibration, blank contamination, quality control samples outside QAPP defined limits, etc. In many cases, the field technician or laboratory analyst will be able to correct the problem. If the problem is resolvable by the field technician or laboratory analyst, then they will document the problem on the field data sheet or laboratory record and complete the analysis. If the problem is not resolvable, then it is conveyed to the Authority's Laboratory Supervisor, who will make the determination and notify the Authority's CRP QAO. If the analytical system failure may compromise the sample results, the resulting data will not be reported to the TCEQ. The nature and disposition of the problem is reported on the data report which is sent to the Authority's CRP Project Manager. The Authority's CRP Project Manager will include this information in the CAP and submit with the Quarterly Progress Report, which is sent to the TCEQ CRP Project Manager. The definition of and process for handling deficiencies and corrective action are defined in **Section C1**.

The TCEQ has determined that analyses associated with the qualifier 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. Additionally, any data collected or analyzed by means other than those stated in the QAPP, or data suspect for any reason should not be submitted for loading and storage in SWQMIS.

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). For other types of samples, they are optional. 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. 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 blanks are collected and analyzed at a minimum of once per every ten samples.

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. Field equipment blanks are collected and analyzed at a minimum of once per every ten samples.

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 and are collected on a 10 % basis or one per sampling event, whichever is more frequent. To the extent possible, field splits prepared and analyzed over the course of the project should be performed on samples from different sites.

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

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

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 LOQ) 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; 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 Quality Control or Acceptability Requirements Deficiencies and Corrective Actions.

Laboratory Measurement Quality Control Requirements and Acceptability Criteria

Batch – A batch is defined as environmental samples that are prepared and/or analyzed together with the same process and personnel, using the same lot(s) of reagents. A **preparation batch** is composed of one to 20 environmental samples of the same NELAP-defined matrix, meeting the above mentioned criteria and with a maximum time between the start of processing of the first and last sample in the batch to be 25 hours. An **analytical batch** is composed of prepared environmental samples (extract, digestates or concentrates) which are analyzed together as a group. An analytical batch can include prepared samples originating from various environmental matrices and can exceed 20 samples.

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, published in **Appendix A**, **Table A7.1** of this QAPP, on each day calibrations are performed. In addition, and LOQ check sample will be analyzed with each analytical batch. Calibrations including the standard at the LOQ will meet the calibration requirements of the analytical method or corrective action will be implemented.

LOQ Check Sample – An LOQ check sample 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 sample is spiked into the sample matrix at a level less than or near the LOQ published in Appendix A, Table A7 for each analyte for each analytical batch of CRP samples run. If it is determined that samples have exceeded the high range of the calibration curve, samples should be diluted or run on another curve. For samples run on batches with calibration curves that do not include the LOQ published in Appendix A, Table A7, a check sample will be run at the low end of the calibration curve.

The LOQ check sample is carried through the complete preparation and analytical process. LOQ check samples are run at a rate of one per analytical batch.

The percent recovery of the LOQ check sample 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 **Appendix A**, **Table A7.1**.

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 multi-peak responses.

The LCS is carried through the complete preparation and analytical process. LCSs are run at a rate of one per preparation batch.

Results of LCSs are calculated by percent recovery (%R), which is defined as 100 times the measured concentration, divided by the true concentration of the spiked sample.

The following formula is used to calculate percent recovery, where %R is percent recovery; SR is the measured result; 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 **Appendix A**, **Table A7.1**.

Laboratory Duplicates – A laboratory duplicate is an aliquot taken from the same container as an original sample 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 preparation batch.

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

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

For bacteriological parameters, precision is evaluated using the results from laboratory duplicates. Bacteriological duplicates are collected on a 10% frequency (or once per sampling run, whichever is more frequent). These duplicates will be collected in sufficient volume (200mL or more) for analysis of the sample and its laboratory duplicate form the same container.

The base-10 logartihms of the result from the original sample and the result from its duplicate will be calculated. The absolute value of the difference between the two logarithms will be cauculated, and that difference will be compared to the precision criterion in appendix A, Table A7.1.

If the difference in logarithms is greater that the precision criterion, the data are not acceptable for use under this project and will not be reported to TCEQ. Results from all samples associated with that failed duplicate (usually a maximum of 10 samples) will be considered to have excessive analytical variability and will be qualified as not meeting project QC requirements.

The precision criterion in Appendix A, Table A7.1 for bacteriological duplicates applies only to samples with concentrations > 10 MPN/100mL. Field splits will not be collected for bacteriological analyses.

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 indicate the effect of the sample on the precision and accuracy of the results generated using the selected method. The frequency of matrix spikes is specified by the analytical method, or a minimum of one per batch, whichever is greater. To the extent possible, matrix spikes prepared and analyzed over the course of the project should be performed on samples from different sites.

The components to be spiked shall be as specified by the mandated analytical method. 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 percent recovery of the matrix spike is calculated using the following equation, where %R is percent recovery, SSR is the concentration measured in the matrix spike, SR is the concentration in the unspiked sample, and SA is the concentration of analyte that was added:

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

Matrix spike recoveries are compared to the acceptance criteria published in the mandated test method. If the matrix spike results are outside established criteria, the data for the analyte that failed in the parent sample is not acceptable for use under this project and will not be reported to TCEQ. The result from the parent sample associated with that failed matrix spike will be considered to have excessive analytical variability and will be qualified by the laboratory as not meeting project QC requirements. Depending on the similarities in composition of the samples in the batch, the Authority may consider excluding all of the results in the batch related to the analyte that failed recovery.

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 blanks are performed at a rate of once per preparation batch. 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. Samples associated with a contaminated blank shall be evaluated as to the best corrective action for the samples (e.g. reprocessing or data qualifying codes). In all cases the corrective action must be documented.

The method blank shall be analyzed at a minimum of one per preparation batch. In those instances for which no separate preparation method is used (example: volatiles in water) the batch shall be defined as environmental 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.

Quality Control or Acceptability Requirements Deficiencies and Corrective Actions

Sampling QC excursions are evaluated by the Authority's CRP Project Manager, in consultation with the Authority's CRP QAO. In that differences in sample results are used to assess the entire sampling process, including environmental variability, the arbitrary rejection of results based on pre-determined limits is not practical. Therefore, the professional judgment of the Authority's CRP Project Manager and QAO will be relied upon in evaluating results. Rejecting sample results based on wide variability is a possibility. Field blanks for trace elements and trace organics are scrutinized very closely. Field blank values exceeding the acceptability criteria may automatically invalidate the sample, especially in cases where high blank values may be indicative of contamination which may be causal in putting a value above the standard. Notations of field split excursions and blank contamination are noted in the Quarterly Progress Report and the final QC Report. Equipment blanks for metals analysis are also scrutinized very closely.

Laboratory measurement quality control failures are evaluated by the laboratory staff. The disposition of such failures and the nature and disposition of the problem is reported to the Authority's Laboratory QAO, who will discuss the problem with the Authority's CRP Project Manager. If applicable, the Authority's CRP Project Manager will include this information in the CAP and submit with the Quarterly Progress Report, which is submitted to the TCEQ CRP Project Manager.

The definition of and process for handling deficiencies and corrective action are defined in **Section C1** of this QAPP.

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, the City of Sherman, and the North Texas Municipal Water District purchase supplies, as needed for their laboratories. 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

The following non-direct measurement source(s) will be used for this project:

USGS gage station data will be used throughout the project to aid in determining gage height and flow. Rigorous QA checks are completed on gage data by the USGS and the data is approved by the USGS and permanently stored at the USGS. This data will be submitted to the TCEQ under parameter code 00061 Flow, Instantaneous or parameter code 74069 Flow Estimate, depending on the proximity of monitoring station to the USGS gage station.

B10 DATA MANAGEMENT

Data Management Process

Water quality data that are generated by the Authority's SWQM staff are manually recorded onto Field Data Sheets (See **Appendix C**) and entered into the Authority's SWQM Database. Water quality data received in electronic format from the City of Sherman and the North Texas Municipal Water District are also manually entered into the Authority's SWQM Database.

Prior to data entry, the Authority's CRP QAO performs a manual/visual quality check of all SWQM data received from the Authority's SWQM staff and other entities monitoring under this QAPP. Following the visual quality check of the SWQM data, the Authority's CRP Data Entry Technician enters the data to the Authority's SWQM Database. The data is formatted, as specified in the most recent version of the TCEQ's *Data Management Reference Guide and Surface Water Quality Monitoring Procedures Manual*. The Authority's CRP Data Manager then performs automated quality control checks to ensure that the SWQM data meets requirements, as specified on the SWQM Data Checklist (See **Appendix C**). Once these checks have been completed and any outliers identified, the Authority's CRP Field Supervisor researches and verifies those outliers. At a minimum 10% of all SWQM data to be submitted is checked against the original Field Data Sheets and laboratory bench sheets. In addition to identifying the outliers, the Authority's CRP Field Supervisor performs a 10% check. The Authority's CRP Data Manager then corrects any errors discovered during the 10% check prior to the data submittal. The Authority's CRP Data Manager performs quality checks on the data utilizing the TCEQ's SWQMIS validation tool. The Authority's CRP Data Manager then electronically submits the datasets, data summaries and the SWQMIS Data Loading Validator Reports to the TCEQ CRP Project Manager. Once the TCEQ CRP Project Manager reviews the data for completeness and approval, he/she notifies the TCEQ CRP Data Manager, who uploads the data to the TCEQ's SWQMIS Database.

Data Dictionary

Terminology and field descriptions are included in the *SWQM Data Management Reference Guide*, January 2010 or 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. **Submitting Entity** specifies the entity responsible for the sampling (Red River Authority of Texas), while **Collecting Entity** 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 this QAPP.

Name of Entity	Tag Prefix	Submitting Entity	Collecting Entity
Red River Authority of Texas	RR	RR	RR
City of Sherman	RR	RR	SH
North Texas Municipal Water District	RR	RR	NM

Data Errors and Loss

Prior to submittal of SWQM data to the TCEQ, automated and manual reviews of the data are performed. Reportable data meeting quality assurance requirements, as specified in the QAPP, but requiring further explanation are described in the Data Summary Report, which is submitted with each SWQM data submittal.

Record Keeping and Data Storage

1. **Archives/Data File Backups**
   Copies of data files are retained on-line with two duplicates of each data file stored off-site. Alternating backups are made daily 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 existing backups. A control duplicate of the CRP data volume contained on the LAN file server 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 and retained indefinitely by the Authority. 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 with a backup copy stored off-site. All data files are retained in their original media and format without modification.

Data Handling, Hardware, and Software Requirements

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, 3.0 GBDDR SDRAM, two 73 GBSCSI Hard drives connected via Hardware Raid 1. Workstation minimum configurations are as follows: Pentium IV class processors running at 2.8 GHz or higher, 80 GB Hard Drive, 500 Mb Ram, Windows XP SP2 OS. The LAN, Server and workstations are maintained by the Authority's IT Administrator 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 2007 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, Microsoft Office Suite versions 2002 and 2007 for general word processing, presentations, graphics and subsidiary data management and analysis. AutoCAD 2012 and ArcMap 9.3.1 are used for high end graphics and the Geographical Information System (GIS). StatSoft Statistica 10 for Windows is the primary statistical analysis software applied to processed data. Microsoft Excel 2007 is utilized as subsidiary analysis software and to maintain compatibility with other entities.

Information Resource Management Requirements

Data will be managed in accordance with the TCEQ *Surface Water Quality Monitoring Data Management Reference Guide* and applicable Basin Planning Agency information resource management policies.

Global Positioning System (GPS) equipment may be used as a component of the information required by the Station Location (SLOC) request process for creating the certified positional data that will ultimately be entered into the TCEQ's SWQMIS database. Positional data obtained by the Clean Rivers Program grantees using a Global Positioning System will follow the TCEQ's OPP 8.11 and 8.12 policy regarding the collection and management of positional data. All positional data entered into SWQMIS will be collected by a GPS certified individual with an agency approved GPS device to ensure that the agency receives reliable and accurate positional data. Certification can be obtained in any of three ways: completing a TCEQ training class, completing a suitable training class offered by an outside vendor, or by providing documentation of sufficient GPS expertise and experience. Contractors must agree to adhere to relevant TCEQ policies when entering GPS-collected data.

In lieu of entering certified GPS coordinates, positional data may be acquired with a GPS and verified with photo interpolation using a certified source, such as Google Earth or Google Maps. The verified coordinates and map interface can then be used to develop a new station location.

C1 ASSESSMENTS AND RESPONSE ACTIONS

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

Table C1.1 - Assessments and Response Actions

Assessment Activity	Approximate Schedule	Responsible Party	Scope	Response Requirements
Status Monitoring Oversight, etc.	Continuous	RRA	Monitoring of the project status and records to ensure requirements are being fulfilled	Report to TCEQ in Quarterly Progress Report
Monitoring Systems Audit of RRA	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 Authority (At least once per contract period)	RRA	Field sampling, handling and measurement; facility review; and data management as they relate to CRP	30 days to respond in writing to the RRA. RRA will report problems to TCEQ in Quarterly 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	RRA	Required to pass two out of three PT's annually to maintain certifications	Proficiency Providers Report results to TCEQ

Corrective Action Process for Deficiencies

Deficiencies are any deviation from this QAPP, SWQM Procedures Manual, SOPs, or Data Management Reference Guide. Deficiencies may invalidate resulting data and may require corrective action. Corrective action may include for samples to be discarded and re-collected. Deficiencies are documented in logbooks, field data sheets, etc. by field or laboratory staff. It is the responsibility of the Authority's CRP Project Manager, in consultation with the Authority's CRP QAO, to ensure that the actions and resolutions to the problems are documented and that records are maintained in accordance with this QAPP. In addition, these actions and resolutions will be conveyed to the TCEQ CRP Project Manager both verbally and in writing in the Quarterly Progress Reports and by completion of a corrective action plan (CAP).

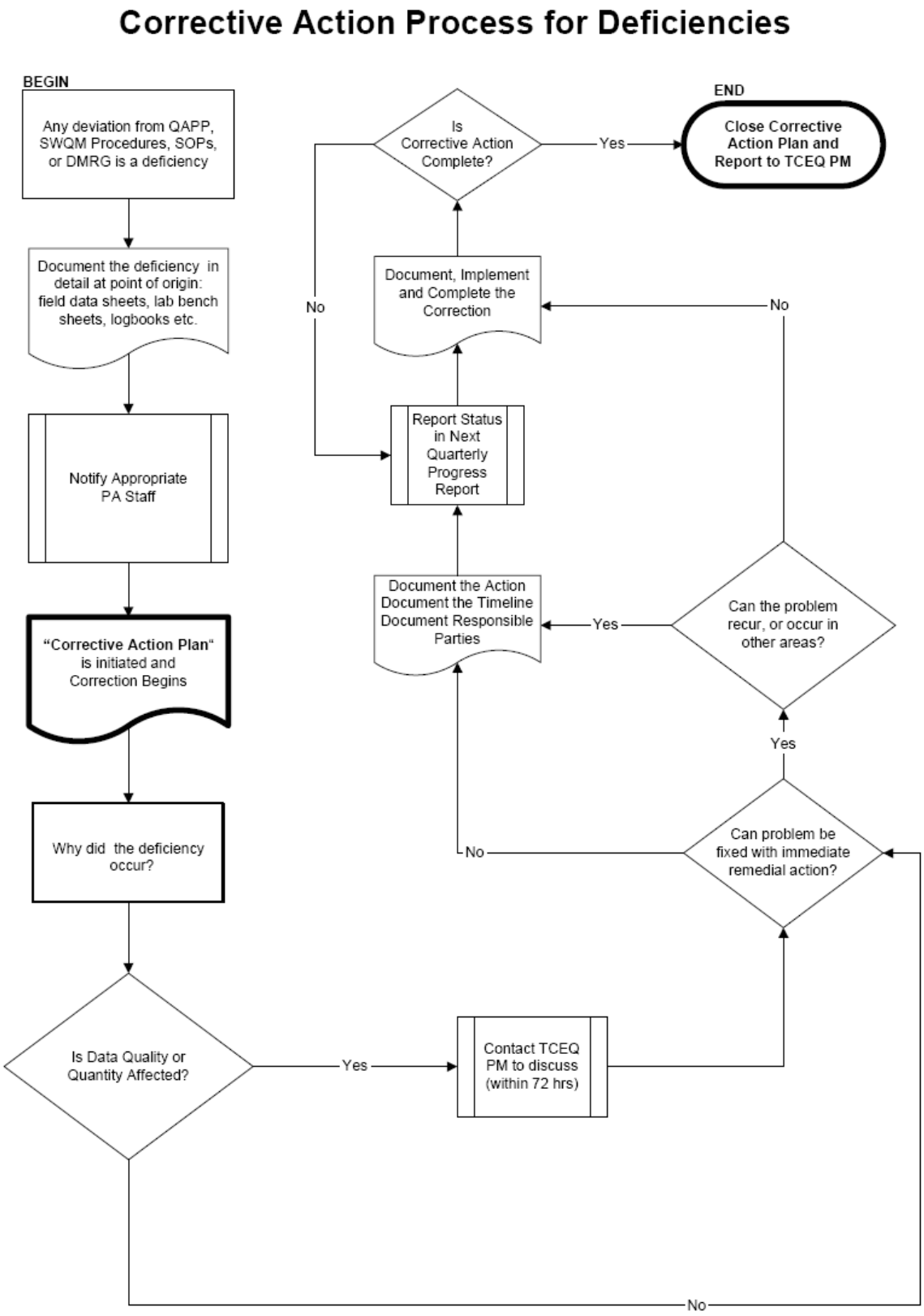
Corrective Action

Corrective Action Plans (CAPs) should:

- ✓ Identify the problem, nonconformity, or undesirable situation
- ✓ Identify immediate remedial actions if possible
- ✓ Identify the underlying cause(s) of the problem
- ✓ Identify whether the problem is likely to recur, or occur in other areas
- ✓ Evaluate the need for Corrective Action
- ✓ Use problem-solving techniques to verify causes, determine solution, and develop an action plan
- ✓ Identify personnel responsible for action
- ✓ Establish timelines and provide a schedule
- ✓ Document the corrective action

To facilitate the process a flow chart has been developed (see **Chart 2: Corrective Action Process for Deficiencies**).

Chart 2 Corrective Action Process for Deficiencies



Status of Corrective Action Plans 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.

The Authority's CRP Project Manager is responsible for implementing and tracking corrective actions. Records of audit findings and corrective actions are maintained by the Authority's CRP Project Manager. Audit reports and corrective action documentation will be submitted to the TCEQ with the Quarterly Progress Report.

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

C2 REPORTS TO MANAGEMENT

Reports to Red River Authority of Texas Project Management

The Authority's CRP 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.

Reports to TCEQ Project Management

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

Quarterly Progress Report - Summarizes the 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 Authority, a report of findings, recommendations and response is sent to the TCEQ in the Quarterly Progress Report.

Data Summary - Contains basic indentifying information about the data set and comments regarding inconsistencies and errors identified during data verification and validation steps or problems with data collection efforts (e.g. deficiencies). The Data Summary is submitted with the data sets to TCEQ.

Reports by TCEQ Project Management

Contractor Evaluation - The 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 to the TCEQ 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 QAPP.

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 staffs are listed in the first two columns 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 the higher level project management to establish the appropriate course of action, or the data associated with the issue are rejected and not reported to the TCEQ for storage in SWQMIS. 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.

The Data Review Checklist (See **Appendix E**) covers three main types of review:

- ✓ data format and structure,
- ✓ data quality review, and
- ✓ documentation review.

The Data Review Checklist is transferred with the water quality data submitted to the TCEQ to ensure that the review process is being performed.

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 CRP Project Manager validates that the data meet the data quality objectives of the project and are suitable for reporting to TCEQ.

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 Authority's CRP Data Manager with the data. This information is communicated to the TCEQ by the Authority in the Data Summary (See **Appendix E**).

Table D2.1 - Data Review Tasks

Data to be Verified	Field Task	Laboratory Task	Lead Organization Data Manager Task
Sample documentation complete; samples labeled, sites identified	1,2,5		
Field QC samples collected for all analytes as prescribed in the TCEQ *SWQM Procedures Manual*	1		
Standards and reagents traceable		2,3,5	
Chain of custody complete/acceptable	1	2,3,5	
NELAP Accreditation is current		2,3,5	
Sample preservation and handling acceptable	1	2,3,5	
Holding times not exceeded	1	2,3,5	
Collection, preparation, and analysis consistent with SOPs and QAPP	1	2,3,5	
Field documentation (e.g., biological, stream habitat) complete	1		
Instrument calibration data complete	1	3	
Bacteriological records complete	1	3	
QC samples analyzed at required frequency		2,3,5	
QC results meet performance and program specifications		2,3,5	
Analytical sensitivity (LOQs / AWRLs) consistent with QAPP		2,3,5	
Results, calculations, transcriptions checked	1	2,3,5	2,4,5
Laboratory bench-level review performed		3	
All laboratory samples analyzed for all scheduled parameters		2,3,5	
Corollary data agree		2,3,5	4
Nonconforming activities documented	1,5	2,3,5	2,4,5
Outliers confirmed and documented; reasonableness check performed			2,4
Dates formatted correctly	1	2,3,5	2,4
Depth reported correctly and in correct units	1		2,4
TAG IDs correct			2,4
TCEQ Station ID number assigned	1		2,4
Valid parameter codes			2,4
Codes for submitting entity(ies), collecting entity(ies), and monitoring type(s) used correctly			2,4
Time based on 24-hour clock	1	2,3,5	2,4
Absence of transcription error confirmed	1	2,3,5	2,4
Absence of electronic errors confirmed			2,4
Sampling and analytical data gaps checked (e.g., all sites for which data are reported are on the coordinated monitoring schedule)	1		2,4
Filed instrument pre and post calibration results within limits			2,4,5
10% of data manually reviewed			2,4

1. Field Staff 2. RRA QAO 3. Laboratory Staff
4. RRA CRP Staff 5. Sub-tier Participant QAO

D3 RECONCILIATION WITH USER REQUIREMENTS

Data produced in this project, and data collected by other organizations (e.g., City of Sherman, North Texas Municipal Water District, 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 Integrated Report* in accordance with TCEQ's *Guidance for Assessing Texas Surface and Finished Drinking Water Quality Data*, and for TMDL development, water quality standards development, 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.

Red River Authority of Texas
Clean Rivers Program

Appendix A:
Measurement Performance Specifications
(Table A7.1)

Measurement performance specifications define the data quality needed to satisfy project objectives. To this end, measurement performance specifications are qualitative and quantitative statements that:

- ✓ clarify the intended use of the data
- ✓ define the type of data needed to support the end use
- ✓ identify the conditions under which the data should be collected

Appendix A of the QAPP addresses measurement performance specifications, including:

- ✓ analytical methodologies
- ✓ AWRLs
- ✓ limits of quantitation
- ✓ bias limits for laboratory control samples
- ✓ precision limits for laboratory control sample duplicates
- ✓ completeness goals
- ✓ qualitative statements regarding representativeness and comparability

The items identified above need to be considered for each type of monitoring activity. The CRP emphasizes that data should be collected to address multiple objectives, if possible, thereby maximizing the expenditure of resources. Caution should be applied when attempting to collect data for multiple purposes because measurement performance specifications may vary according to the purpose. For example, limits of quantitation may differ for data used to assess standards attainment and for trend analysis. When planning projects, first priority should be given to the main use of the project data and the data quality needed to support that use, then secondary goals should be considered.

Table A7.1 should be modified to reflect actual parameters, methods, etc. employed by the Basin Planning Agency and its participants. Alternative methods than those listed in the following table may be used. Procedures for laboratory analysis must be in accordance with the most recently published edition of Standard Methods for the Examination of Water and Wastewater, 40 CFR 136, or otherwise approved independently. Only data collected that have a valid TCEQ parameter code assigned in Table A7.1 are stored in SWQMIS. Any parameters listed in Table A7.1 that do not have a valid TCEQ parameter code assigned will not be stored in SWQMIS.

Based on a general review of available information regarding achievable recoveries of additional parameters, use the following bias limits (percent recovery of the LCS and LOQ Check Sample) in Table A7.1: metals-in solid samples (i.e., sediment and tissue) 60-140%; organics-in-water samples 65-135%; organics-in-solid samples (i.e., sediment and tissue) 40-160%. There may be poor performing analytes within these groups that do not perform well with specific methods and usually recover poorly. Before these compounds are included in the list of analytes to be submitted to the TCEQ, the Basin Planning Agency should discuss the situation with the TCEQ and we will discuss if they are project-specific analytes of concern, if low recoveries are acceptable or alternative methods should be run.

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										
Days Since Last Significant Rain	Days	NA	TCEQ SOP V1	72053	NA[1]	NA	NA	NA	NA	Field
Dissolved Oxygen	mg/L	Water	TCEQ SOP V1, SM 4500-O G	00300	NA[1]	NA	NA	NA	NA	Field
Flow	cfs	Water	TCEQ SOP V1	00061	NA[1]	NA	NA	NA	NA	Field
Flow Estimate	cfs	Water	TCEQ SOP V1	74069	NA[1]	NA	NA	NA	NA	Field
Flow Measurement Method	1 - gage 2 - electric 3 - mechanical 4 - weir/flume 5 - doppler	Water	TCEQ SOP V1	89835	NA[1]	NA	NA	NA	NA	Field
Flow Severity	1 - no flow 2 - low 3 - normal 4 - flood 5 - high 6 - dry	Water	TCEQ SOP V1	01351	NA[1]	NA	NA	NA	NA	Field
pH	Standard Units	Water	TCEQ SOP V1, EPA 150.1	00400	NA[1]	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
Secchi Depth	meters	Water	TCEQ SOP V1	00078	NA[1]	NA	NA	NA	NA	Field
Specific Conductance	μS/cm	Water	TCEQ SOP V1, SM 2510 B, EPA 120.1	00094	NA[1]	NA	NA	NA	NA	Field
Temperature	◦C	Water	TCEQ SOP V1 SM 2550 B	00010	NA[1]	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
Wind Intensity	1 - calm 2 - slight 3 - moderate 4 - strong	NA	NA	89965	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
Water Surface	1 – calm 2 - ripples 3 - waves 4 – white cap	NA	NA	89968	NA	NA	NA	NA	NA	Field
CONVENTIONAL AND BACTERIOLOGICAL PARAMETERS										
Turbidity	NTU	Water	SM 2130 B	82079	0.5	0.5	70-130	20	80-120	RR, SH
			EPA 180.1			0.1				NM
Total Suspended Solids	mg/L	Water	SM 2540 D	00530	4	2.5	NA	20	NA	RR, SH, NM
Total Dissolved Solids, (Dried at 180 Degrees Celsius)	mg/L	Water	SM 2540 C	70300	10	10	NA	20	80-120	RR
Total Dissolved Solids (Calculated)	mg/L	Water	Calculation	70294	NA	NA	NA	NA	NA	RR
Sulfate	mg/L	Water	EPA 300.0	00945	5	10^4	70-130	20	80-120	RR
			EPA 375.2			1				NM
Chloride	mg/L	Water	EPA 300.0	00940	5	10^4	70-130	20	80-120	RR
						1				NM
Chlorophyll-*a*, (Fluorometric Method)	μg/L	Water	EPA 445.0	70953	3	2	NA	20	80-120	LC
Pheophytin, (Fluorometric Method)	μg/L	Water	EPA 445.0	32213	3	2	NA	NA	NA	LC
Chlorophyll-*a*, (Spectrophoto-metric Method) (Backup)	μg/L	Water	EPA 446.0	32211	3	2	NA	20	80-120	LC
Pheophytin, (Spectrophoto-metric Method) (Backup)	μg/L	Water	EPA 446.0	32218	3	2	NA	NA	NA	LC
Chlorophyll-*a*, (Spectrophoto-metric Method)	μg/L	Water	SM 10200 H	32211	3	3	NA	20	80-120	NM
Pheophytin, (Spectrophoto-metric Method)	μg/L	Water	SM 10200 H	32218	3	3	NA	NA	NA	NM
E. coli, IDEXX Colilert[3]	MPN/100 mL	Water	SM 9223 B	31699	1	1	NA	.5[2]	NA	RR
Holding time, *E. coli*, IDEXX Colilert[3]	Hours	Water	NA	31704	NA	NA	NA	NA	NA	RR, SH, NM
E. coli, IDEXX Colilert[3]	MPN/100 mL	Water	Colilert®	31699	1	1	NA	.5[2]	NA	SH, NM
			Colilert®-18							SH
Fecal Coliform, (membrane filtration)	org/100mL	Water	SM 9222-D	31616	1	1	NA	.5[2]	NA	RRA
Ammonia-N, total	mg/L	Water	SM 4500-NH3D	00610	0.1	0.1	70-130	20	80-120	RR
			EPA 350.1							NM
Alkalinity, total	mg/L	Water	SM 2320 B	00410	20	20	NA	20	NA	RR, NM

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
Chemical Oxygen Demand	mg/L	Water	HACH 8000	00335	10	10	70-130	20	80-120	RR, NM
O-Phosphate-P, (Diss. field filter <15 min)	mg/L	Water	EPA 365.3	00671	0.04	0.02	70-130	20	80-120	NM
Total Phosphorus-P	mg/L	Water	SM 4500 P E	00665	0.06	0.06	70-130	20	80-120	RR
			EPA 365.3			0.02				NM
Nitrate + nitrite-N, Total	mg/L	Water	EPA 353.2	00630	0.05	0.05	70-130	20	80-120	NM
Nitrate-N, Total	mg/L	Water	EPA 300.0	00620	0.05	0.04	70-130	20	80-120	RR
						0.05				NM
Organic Carbon, Total	mg/L	Water	SM 5310 B	00680	2	1	70-130	20	80-120	RR
			SM 5310 C			0.1	NA	NA	NA	NM
Volatile Suspended Solids	mg/L	Water	EPA 160.4	00535	4	2.5	NA	NA	NA	RR, NM
Calcium, Dissolved	mg/L	Water	SM 3500 Ca B	00915	0.5	2.0[4]	70-130	20	80-120	RR
Nitrite-N, Total	mg/L	Water	EPA 300.0	00615	0.05	0.02	70-130	20	80-120	NM
Kjeldahl Nitrogen, Total	mg/L	Water	EPA 351.2	00625	0.2	0.2	70-130	20	80-120	NM
METAL PARAMETERS										
Iron, Total	µg/L	Water	EPA 200.8	01045	300	200	70-130	20	80-120	NM
Manganese, Total	µg/L	Water	EPA 200.8	01055	50	1	70-130	20	80-120	NM
Hardness, Total	mg/L	Water	SM 2340 C	00900	5	5	NA	20	80-120	NM

RR – Red River Authority of Texas
LC – Lower Colorado River Authority
SH – City of Sherman
NM – North Texas Municipal Water District

[1] Reporting to be consistent with SWQM guidance and based on measurement capability.
[2] Based on a range statistic as described in Standard Methods, 21st Edition, Section 9020-B, "Quality Assurance/Quality Control – Intra-laboratory Quality Control Guidelines". This criterion applies to bacteriological duplicates with concentrations >10 MPN/100mL or >10 organisms/100mL.
[3] *E. coli* samples analyzed by SM 9223-B should always be processed as soon as possible and within eight hours. When transport conditions necessitate delays in delivery longer than six hours, the holding time may be extended and samples must be processed as soon as possible and within 48 hours.
[4] The LOQ for chloride, sulfate and calcium is higher than the established AWRL since concentrations for these parameters are extremely high in both the Canadian and Red River Basins and values are typically not observed at concentrations below 10 mg/L.

Red River Authority of Texas
Clean Rivers Program

Appendix B:
Task 3 Work Plan and Sampling Process Design and Monitoring Schedule (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, and
- special study, intensive monitoring targeted to:
  - identify sources and causes of pollution,
  - assess priority water quality issues,
  - obtain background water quality information,
  - provide information for setting site-specific permit effluent limits, and
  - evaluate statewide, regional, and site-specific water quality standards.

Task Description: **Monitoring Description** - For FY 2012, the Authority will monitor and collect water quality samples for analysis from a minimum of 66 stations in the Canadian and Red River Basins. 14 of the stations are located in the Canadian River Basin, with one of these a reservoir site. The remaining 52 stations, 10 of which are reservoir sites, are 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 52 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.

In FY 2013, the Authority will monitor at a similar level of effort as in FY 2012. The actual number of sites, location, frequency, and parameters collected for FY 2013 will be based on priorities identified at the Red and Canadian Steering Committee and Coordinated Monitoring Meetings and included in the amended **Appendix B** schedule of the Authority's QAPP.

All monitoring procedures and methods will follow the guidelines prescribed in the Authority QAPP, the TCEQ *Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods for Water, Sediment, and Tissue (RG-415)* and the TCEQ *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.

Quarterly Progress Report - Each Quarterly 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 and Due Dates:

September 1, 2011 through August 31, 2012

A. Conduct water quality monitoring, summarize activities, and submit with Progress Report - December 15, 2011; March 15 and June 15, 2012
B. Coordinated Monitoring Meeting - between March 15 and April 30, 2012 - Date to be announced
C. Coordinated Monitoring Meeting Summary of Changes - May 15, 2012
D. Email notification with Summary of Changes that Coordinated Monitoring Schedule updates are complete - May 31, 2012

September 1, 2012 through August 31, 2013

A. Conduct water quality monitoring, summarize activities, and submit with Progress Report - September 15 and December 15, 2012; March 15 and June 15 and August 31, 2013
B. Coordinated Monitoring Meeting - between March 15 and April 30, 2013 - Date to be announced
C. Coordinated Monitoring Meeting Summary of Changes - May 15, 2013
D. Email notification with Summary of Changes that Coordinated Monitoring Schedule updates are complete - May 31, 2013

Sample Design Rationale FY 2012

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 *Texas Water Quality Integrated Report*, 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 Authority coordinates closely with the TCEQ and other participants to ensure a comprehensive water monitoring strategy within the Red and Canadian Basins watersheds.

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 *2008 Texas Water Quality Inventory* and the *Draft 2010 Texas Water Quality Integrated Report*, a priority list was prepared and presented for discussion at the Authority's Annual Coordinated Monitoring Meeting with the other monitoring entities and the TCEQ. This meeting was based on the need to maximize monitoring efforts in an attempt to expend the limited resources as prudently as possible. This approach enables comprehensive monitoring to occur on a rotational reach basis and completely encompasses the basins within the five-year basin management cycle.

Canadian River Basin

Monitoring efforts for the Canadian River Basin will increase in FY 2012. Although drought and lack of water at non-monitored stations have persisted in previous years, the Authority will be adding three (3) sites. These sites were chosen in order to aid in determining the extent of the concerns and/or impairments in these water bodies. They are as follows:

Site 17045 – Dixon Creek at State Highway 152, East of Borger
Site 10017 – East Amarillo Creek at Amarillo River Road Waste Water Treatment Plant Outfall
Site 21024 – East Amarillo Creek at Loop 335 and US 287 *(New State Monitoring Site)*

Red River Basin

Drought and lack of water at non monitored stations have also persisted in the Red River Basin. However, the Authority and its CRP partners will be greatly increasing the coverage of the basin in FY 2012. The following additions/deletions are noted as follows:

Red River Authority of Texas Monitoring

The Authority will be monitoring twenty (20) additional sites for following reasons; With the acquisition of a new boat, the Authority will monitor additional reservoir/lake sites for needed nutrient criteria. TCEQ Region 3 will not be able to monitor in the Red River Basin in order to aid in monitoring other basins within their area. Therefore, the Authority will add the sites previously monitored by TCEQ Region 3 to continue the routine data collected at those sites. Additionally, the Authority will be adding a new CRP partner, the North Texas Municipal Water District (NTMWD). The City of Sherman will also continue its partnership with the Authority. In addition, sites were chosen in order to aid in determining the extent of the concerns and/or impairments in these water bodies. The Authority will add the following stream sites:

Site 15319 – Mud Creek at US 259 near DeKalb
Site 15036 – Bois D'Arc Creek at FM 898 near Whitewright
Site 21026 – Smith Creek at CR 31700 near Paris *(New State Monitoring Site)*
Site 21027 – Smith Creek at Loop 286 (US 82) *(New State Monitoring Site)*

Site 10096 – Wildhorse Creek at US 277/281
Site 10135 – Red River at State Highway 6
Site 20166 – Groesbeck Creek at State Highway 6
Site 10148 – Wichita River at End of Eastland Lane
Site 10150 – Wichita River at State Highway 240
Site 16036 – Buffalo Creek at Coleman Park Road
Site 10095 – Holliday Creek at Harding Street
Site 21025 – Holliday Creek at Wichita Falls Country Club Golf Course *(New State Monitoring Site)*
Site 10070 – Sweetwater Creek at FM 592
Site 10072 – Sweetwater Creek at US 83

The Authority will add the following reservoir sites:

Site 10139 – Farmer's Creek Reservoir/Lake Nocona near Dam
Site 10142 – Lake Arrowhead Mid-Lake near Dam
Site 10143 – Lake Kickapoo near Mid Dam
Site 10157 – Diversion Lake near Dam
Site 10159 – Lake Kemp near Dam
Site 10160 – Lake Kemp at North Wichita River Headwaters

The Authority will not monitor the following sites in FY 2012, since the NTMWD will be monitoring at equivalent locations:

Site 15445 – Lake Texoma at South End of Denison Dam
Site 20167 – Bois D' Arc Creek at FM 1396

The City of Sherman Monitoring

The City of Sherman will continue to monitor the same sites as in FY 2011. It is their intention to add more conventional parameters as they are able to.

The North Texas Municipal Water District Monitoring

The North Texas Municipal Water District has been monitoring in the Red River Basin for the past several years. Their decision to become a CRP partner will be a great asset. They will monitor the following sites:

Site 21031 – Red River at US 75 *(New State Monitoring Site)*
Site 20167 – Bois D' Arc Creek at FM 1396
Site 21028 – Bois D' Arc Creek at US 82 *(New State Monitoring Site)*
Site 21029 – Bois D' Arc Creek at FM 409 *(New State Monitoring Site)*
Site 21030 – Honey Grove Creek at FM 2770 *(New State Monitoring Site)*
Site 21032 – Lake Bonham near FM 273 *(New State Monitoring Site)*
Site 15388 – Lake Texoma near NTMWD Intake Structure
Site 20545 – Lake Texoma near Intake Structure at South End of Dam

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 SWQMIS 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% of the total reservoir acres, but not more than 5,120 acres.

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 in-stream 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, and 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 and maps for fiscal year 2012 are presented on the following pages.

TABLE B1.1
Sample Design and Schedule
FY 2012

Segment	TCEQ Region	Basin	Site Description	Station ID	Collecting 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 15 M DOWNSTREAM OF CHICKASAW RD 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 NORTH OF PAMPA	10033	RR	RT									4			4	4		4
0101	1	1	DIXON CREEK AT SH 152 WEST OF RR2171 EAST OF BORGER	17045	RR	RT									4			4	4		4
0101	1	1	WHITE DEER CREEK AT JEEP TRAIL CROSSING ON DUNCAN RANCH APPROX 1.30 KM N AND 141 M E OF HUTCHINSON CR 26 AND 15 MI N OF SKELLYTOWN	18195	RR	RT									4			4	4		4
0102	1	1	BIG BLUE CREEK 250 YDS UPSTREAM OF FM 1913 APPROXIMATELY 21 MI SE OF DUMAS	15270	RR	RT									4			4	4		4
0103	1	1	UNNAMED TRIBUTARY OF WEST AMARILLO CREEK AT LOOP 335 EASTBOUND ACCESS ROAD 470 M EAST OF ITS INTERSECTION WITH FM/RM 1061 NORTHWEST OF AMARILLO	17056	RR	RT									4			4	4		4
0103	1	1	EAST AMARILLO CREEK 15 METERS UPSTREAM OF CITY OF AMARILLO RIVER ROAD WWTP OUTFALL	10017	RR	RT									4			4	4		4
0103	1	1	EAST AMARILLO CREEK IMMEDIATELY DOWNSTREAM OF US 287 NORTH OF AMARILLO	10018	RR	RT									4			4	4		4
0103	1	1	EAST AMARILLO CREEK AT LOOP 335 AND US 287 IN AMARILLO	21024	RR	RT									4			4	4		4
0103	1	1	CANADIAN RIVER BRIDGE AT US 87-287 NORTH OF AMARILLO	10054	RR	RT												4	4		4
0103	1	1	THOMPSON PARK LAKE NORTH END OF NORTH LAKE 213 M W OF US 87 FRONTAGE RD AND 1.34 KM NORTH OF NE 24TH ST IN AMARILLO	15775	RR	RT									4			4			4
0104	1	1	WOLF CREEK BRIDGE AT SH 305 NORTH OF LIPSCOMB	10058	RR	RT									4			4	4		4
0104	1	1	WOLF CREEK 50 M UPSTREAM OF FM 1454 APPROXIMATELY 27.4 KM/17 MI EAST OF LIPSCOMB	10059	RR	RT									4			4	4		4
0201	5	2	MUD CREEK AT US 259 3.1 KM NORTH OF DE KALB	15319	RR	RT									4			4	4		4
0202	4	2	RED RIVER AT US 75 NORTH OF DENISON	21031	NM	RT					12				12			12	12		12
0202	4	2	CHOCTAW CREEK AT SH 11 1.6 KM SOUTHEAST OF FM 1417/SH 11 INTERSECTION 7 KM SOUTHEAST OF SHERMAN	10111	SH	RT									4			6	6		6

TABLE B1.1
Sample Design and Schedule
FY 2012

Segment	TCEQ Region	Basin	Site Description	Station ID	Collecting 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
0202	4	2	CHOCTAW CREEK AT LUELLA ROAD 7.3 KM SSE OF SHERMAN FIRST CROSSING UPSTREAM CONFLUENCE WITH POST OAK CREEK	10112	SH	RT									4			6	6		6
0202	4	2	POST OAK CREEK AT FIRST COUNTY ROAD CROSSING DOWNSTREAM SHERMAN WWTP 0.33 KM SOUTH OF E FM 1417/SH 11 INTERSECTION 5.75 KM SE OF SHERMAN	10114	SH	RT									4			6	6		6
0202	4	2	POST OAK CREEK AT FM 1417 0.25 KM WEST OF SH 11/FM 1417 INTERSECTION 5.3 KM SOUTHEAST OF SHERMAN	10115	SH	RT									4			6	6		6
0202	5	2	PINE CREEK AT SOUTHBOUND US 271 APPROX 7.8 KM NORTH OF THE CITY OF PARIS PERMIT WQ001012-000 CAMPBELL SOUP SUPPLY COMPANY	10120	RR	RT									4			4	4		4
0202	5	2	RED RIVER DOWNSTREAM LAKE TEXOMA AT US 259 9.3 KM NORTH OF US 259/FM 114 INTERSECTION 21 KM NORTH OF DEKALB	10125	RR	RT									4			4	4		4
0202	5	2	RED RIVER AT NORTHBOUND US 271 IN ARTHUR CITY 0.75 KM NORTH OF FM 197/US 271 INTERSECTION	10126	RR	RT									4			4	4		4
0202	4	2	RED RIVER AT SH 78 355 M NORTHWEST OF FANNIN CR 200/SH 78 INTERSECTION AT TEXAS STATE LINE 10 KM NORTHEAST OF CITY OF RAVENNA	10127	RR	RT									4			4			4
0202	4	2	SAND CREEK AT SH 56 1.35 KM WEST OF SH 56/US 75 INTERSECTION WEST OF SHERMAN	15446	SH	RT									2			4	4		4
0202	5	2	PECAN BAYOU AT FM 1159 9.62 KM NORTHEAST OF CLARKSVILLE IN RED RIVER COUNTY	16001	RR	RT									4			4	4		4
0202	5	2	SMITH CREEK AT SOUTHBOUND US 271 385 M UPSTREAM OF THE CONFLUENCE WITH PINE CREEK 7 KM NORTH OF CITY OF PARIS	17044	RR	RT									4			4	4		4
0202	5	2	SMITH CREEK AT LAMAR CR 31700 NEAR CITY OF PARIS	21026	RR	RT									4			4	4		4
0202	5	2	SMITH CREEK AT LOOP 286/US 82 IN THE CITY OF PARIS	21027	RR	RT									4			4	4		4
0202	4	2	POST OAK CREEK AT FM 1417 0.95 KM SOUTH OF FM 1417/US 82 INTERSECTION 4.75 KM NORTHWEST OF SHERMAN	17599	SH	RT									2			4	4		4
0202	4	2	CHOCTAW CREEK AT US 82 5.07 KM DOWNSTREAM OF SH 56 EAST OF SHERMAN	18370	SH	RT									4			6	6		6

TABLE B1.1
Sample Design and Schedule
FY 2012

Segment	TCEQ Region	Basin	Site Description	Station ID	Collecting 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
0202	4	2	BOIS DARC CREEK AT FM 898/OAK HILL ROAD 1.4 KM NORTHEAST OF CITY OF WHITEWRIGHT	15036	RR	RT									4			4	4		4
0202	4	2	BOIS D'ARC CREEK AT SH 78 SOUTH OF BONHAM	18652	RR	RT									4			4	4		4
0202	4	2	BOIS D' ARC CREED AT FM 1396 NORTHWEST OF HONEY GROVE	20167	NM	RT					12				12			12	12		12
0202	4	2	BOIS D'ARC CREEK AT US 82 NEAR BONHAM	21028	NM	RT					12				12			12	12		12
0202	4	2	BOIS D'ARC CREEK AT FM 409 NORTHWEST OF HONEY GROVE	21029	NM	RT					12				12			12	12		12
0202	4	2	HONEY GROVE CREEK AT FANNIN CR 2770	21030	NM	RT					12				12			12	12		12
0202	4	2	LAKE BONHAM APPROX 265 METERS NORTH AND 165 METERS EAST OF THE INTERSECTION OF FM 273 AND WESTVIEW DRIVE	21032	NM	RT					12				12			12			12
0203	4	2	LAKE TEXOMA NEAR BIG MINERAL ARM 4.1KM EAST OF US 377/OXFORD DRIVE INTERSECTION 1.5 KM E OF WEST SHORE 15 KM NORTHWEST OF POTTSBORO	10130	RR	RT									4			4			4
0203	4	2	LAKE TEXOMA AT US 377 O.42 KM NORTH OF TEXAS BANK ON US 377 8.05 KM NORTH OF GORDONVILLE	10131	RR	RT									4			4			4
0203	4	2	LAKE TEXOMA-LITTLE MINERAL ARM AT BOAT RAMP AT SIMMONS SHORE IN PRESTON 4.5 KM E OF FM 120 5.5 KM N OF FM 406 12.5 KM NNW OF DENISON	15388	NM	RT					12				12			12			12
0203	4	2	LAKE TEXOMA LITTLE MINERAL ARM SOUTHEAST OF PRESTON SHORE NEAR INTAKE STRUCTURE EQUIDISTANT BETWEEN SHORELINES 1.5 KM EAST OF FM 120	17480	RR	RT									4			4			4
0203	4	2	LAKE TEXOMA 260 METERS DUE WEST FROM LAKE TEXOMA DAM 282 METERS EAST AND 392 METERS NORTH TO THE INTERSECTION OF FM 1310 AND NORTH SH 91 NORTH OF DENISON	20545	NM	RT					12				12			12			12
0204	3	2	RED RIVER AT US 81 2.1 KM NORTH OF US 81/PARR ROAD INTERSECTION 6.5 KM NORTH OF RINGGOLD	10133	RR	RT									4			4	4		4
0204	3	2	RED RIVER AT FM677 NORTHWEST OF SAINT JO	20168	RR	RT									4			4	4		4
0205	3	2	WILDHORSE CREEK AT US 281/277/IH44 3.1 KM NORTHEAST OF BURKBURNETT	10096	RR	RT									4			4	4		4
0205	3	2	RED RIVER BRIDGE ON IH 44/US 277/US 281 313 M NORTHEAST OF TEXAS SHORE NEAR MID BRIDGE 4.0 KM NORTHEAST OF CITY OF BURKBURNETT	10134	RR	RT									4			4	4		4

TABLE B1.1
Sample Design and Schedule
FY 2012

Segment	TCEQ Region	Basin	Site Description	Station ID	Collecting 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
0205	3	2	RED RIVER AT US 183/US 70 N 10.5 KM NORTH NORTHEAST OF OKLAUNION	16733	RR	RT									4			4	4		4
0206	3	2	PRAIRIE DOG TOWN FORK RED RIVER AT SH 6 12.75 KM NORTH OF QUANAH	10135	RR	RT									4			4	4		4
0206	3	2	GROESBECK CREEK AT SH6 NORTH OF QUANAH	20166	RR	RT									4			4	4		4
0207	1	2	LOWER PRAIRIE DOG TOWN FORK RED RIVER AT US 62-83 3.4 KM NORTH OF US 83/RR 2465 INTERSECTION 16 KM NORTH OF CHILDRESS	10136	RR	RT									4			4	4		4
0207	1	2	LOWER PRAIRIE DOG TOWN FORK RED RIVER AT SH 207 10 KM SOUTHWEST OF FM 2272/SH 207 INTERSECTION 30.45 KM SOUTH OF CLAUDE	13637	RR	RT									4			4	4		4
0210	3	2	FARMERS CREEK RESERVOIR/NOCONA LAKE MID LAKE NEAR DAM 1.3 KM SW OF OAK SHORES ROAD/FM 2953 INTERSECTION 0.36 KM SOUTH OF MID DAM	10139	RR	RT									4			4			4
0211	3	2	LITTLE WICHITA RIVER AT FM 2332 0.63 KM UPSTREAM FROM MOUTH AT RED RIVER CONFLUENCE 9.2 KM NORTHWEST OF RINGGOLD	10140	RR	RT									4			4			4
0212	3	2	LAKE ARROWHEAD MID LAKE NEAR DAM 609 M SOUTH OF MID DAM 765 M SE OF LITTLE WICHITA R INTAKE STRUCTURE 14 KM NE OF SCOTLAND	10142	RR	RT									4			4			4
0213	3	2	LAKE KICKAPOO NEAR MID DAM 521 M SOUTH OF NORTH FORK LITTLE WICHITA RIVER INTAKE STRUCTURE 13.8 KM SOUTH OF US 82/SH 25 INTERSECTION	10143	RR	RT									4			4			4
0214	3	2	BUFFALO CREEK AT FM 1814/BELL ROAD 3.6 KM SOUTH OF CITY OF IOWA PARK	10097	RR	RT									4			4	4		4
0214	3	2	BUFFALO CREEK AT COLEMAN PARK ROAD2.95 KM SOUTHWEST OF IOWA PARK 1.7 KM UPSTREAM OF FM 368	16036	RR	RT									4			4	4		4
0214	3	2	WICHITA RIVER AT FM 368 325 M NORTH OF FM 368/FM 1206 INTERSECTION 7.38 KM SOUTHWEST OF CITY OF IOWA PARK 9.15 KM NORTH OF HOLLIDAY	10154	RR	RT									4			4	4		4
0214	3	2	WICHITA RIVER AT SH 25 1.3 KM NORTH OF SH 258/SH 25 INTERSECTION 14.5 KM NORTHWEST OF CITY OF HOLLIDAY	10155	RR	RT									4			4	4		4
0214	3	2	SOUTH CANAL 80 M DOWNSTREAM OF LAKE DIVERSION SPILLWAY NEAR DUNDEE	18831	RR	RT									4			4	4		4

TABLE B1.1
Sample Design and Schedule
FY 2012

Segment	TCEQ Region	Basin	Site Description	Station ID	Collecting 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
0214	3	2	BEAVER CREEK AT FM 2326 2.0 KM SOUTHWEST OF SH 25/FM 2326 INTERSECTION 22 KM NORTHWEST OF HOLLIDAY	15120	RR	RT									4			4	4		4
0214	3	2	BEAVER CREEK AT US 283/US183 2.23 KM SOUTH OF FM 1763/US 283 INTERSECTION 22.1 KM SOUTH SOUTHEAST OF VERNON	15121	RR	RT									4			4			4
0214	3	2	WICHITA RIVER AT FM 810 1.25 KM SOUTH OF FM 1740/FM 810 INTERSECTION 9.65 KM WEST OF BYERS	10145	RR	RT									4			4	4		4
0214	3	2	WICHITA RIVER AT END OF EASTLAND LANE 0.75 KM SE OF RIVER ROAD/EASTLAND LANE INTERSECTION 5.5 KM NORTH NORTHEAST OF WICHITA FALLS	10148	RR	RT									4			4	4		4
0214	3	2	WICHITA RIVER AT SH 240 345 M NORTHWEST OF SH 240/EASTSIDE DRIVE/FRONT STREET INTERSECTION IN WICHITA FALLS	10150	RR	RT									4			4	4		4
0214	3	2	HOLLIDAY CREEK AT HARDING STREET 97 M EAST OF WILLIAMS AVENUE/HARDING STREET INTERSECTION IN WICHITA FALLS	10095	RR	RT									4			4	4		4
0214	3	2	HOLLIDAY CREEK AT WICHITA FALLS COUNTRY CLUB GOLF COURSE APPROX 120 METERS NORTH AND 10 METERS WEST OF THE INTERSECTION OF BRIDWELL STREET AND 30TH STREET IN WICHITA FALLS	21025	RR	RT									4			4	4		4
0215	3	2	DIVERSION LAKE NEAR DAM 0.64 KM NORTHWEST OF SPILLWAY FACE 390 M WEST OF DAM EQUIDISTANT BETWEEN SHORELINES 22.8 KM WEST OF HOLLIDAY	10157	RR	RT									4			4			4
0217	3	2	LAKE KEMP NEAR DAM 0.80 KM SW OF WATER INTAKE STRUCTURE AT WICHITA RIVER 0.72 KM NORTH OF WILLINGHAM LOOP 1.64 KM WEST OF US 283	10159	RR	RT									4			4			4
0217	3	2	LAKE KEMP AT NORTH WICHITA RIVER HEADWATERS 2.6 KM NORTHWEST OF PINE TREE ROAD CIRLCE 16 KM NORTH OF CITY OF SEYMOUR	10160	RR	RT									4			4			4
0219	3	2	LAKE WICHITA NEAR MID DAM 376 M SE OF END OF CITY ACCESS RD IN WICHITA FALLS 2.94KM SW OF SOUTHWEST PKWY/LAKE PARK DR INTERSECTION	10163	RR	RT									4			4			4

TABLE B1.1
Sample Design and Schedule
FY 2012

Segment	TCEQ Region	Basin	Site Description	Station ID	Collecting 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
0220	3	2	PEASE RIVER AT FM 104/RR 104 16.7 KM SOUTH OF KIRKLAND	10167	RR	RT									4			4	4		4
0222	1	2	SALT FORK RED RIVER 80 M DOWNSTREAMM OF US 83 AT SOUTH BANK 11 KM NORTH OF WELLINGTON	10171	RR	RT									4			4	4		4
0224	1	2	MCCLELLAN CREEK AT SH 273 0.22 KM SOUTH OF SH 273/HUDGINS ROAD INTERSECTION 10.5 KM NORTH OF CITY OF MCLEAN	10064	RR	RT									4			4	4		4
0224	1	2	NORTH FORK RED RIVER AT US 83 4.25 KM NORTH OF SHAMROCK	10178	RR	RT									4			4	4		4
0230	3	2	PARADISE CREEK AT US 287 3.75 KM EAST OF VERNON	10094	RR	RT									4			4	4		4
0230	3	2	PEASE RIVER AT US 287 0.91 KM SOUTHEAST OF RR 925/US 287 INTERSECTION 4.6 KM NORTHWEST OF DOWNTOWN VERNON	10166	RR	RT									4			4	4		4
0299	1	2	SWEETWATER CREEK AT RR 592/FM 592 3.33 KM NORTH OF SH 152/RR 592 INTERSECTION 14.15 KM EAST OF WHEELER	10070	RR	RT									4			4	4		4
0299	1	2	SWEETWATER CREEK AT US 83 6.25 KM NORTH NORTHWEST OF WHEELER	10072	RR	RT									4			4	4		4
0299	1	2	SWEETWATER CREEK AT SH 152 4.75 KM SOUTHEAST OF MOBEETIE	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: Description of sampling site
Station ID: TCEQ Station ID numbers

Collecting Entity: Entity conducting surface water quality monitoring

(RR) Red River Authority
(SH) City of Sherman
(NM) North Texas Municipal Water District

Metals Water: Samples to be conducted by NTMWD of iron and magnesium
Conventional: Samples of nutrients, minerals and dissolved calcium collected and analyzed by 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.

Critical vs. non-critical measurements

All data taken for CRP and entered into SWQMIS are considered critical.

Canadian River Basin
Reach I
FY2012

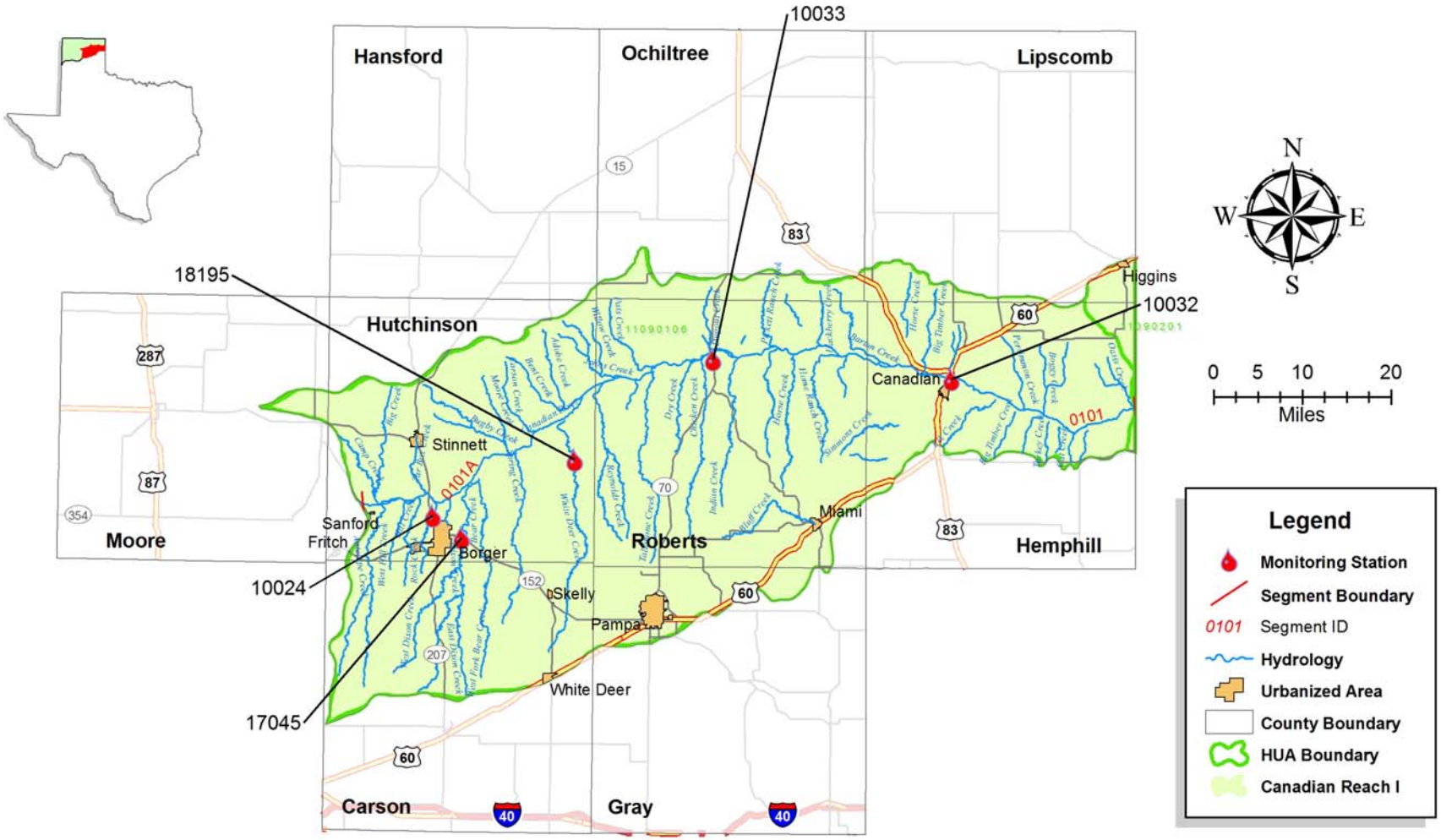


Figure 1-1

Canadian River Basin

Reach II

FY2012

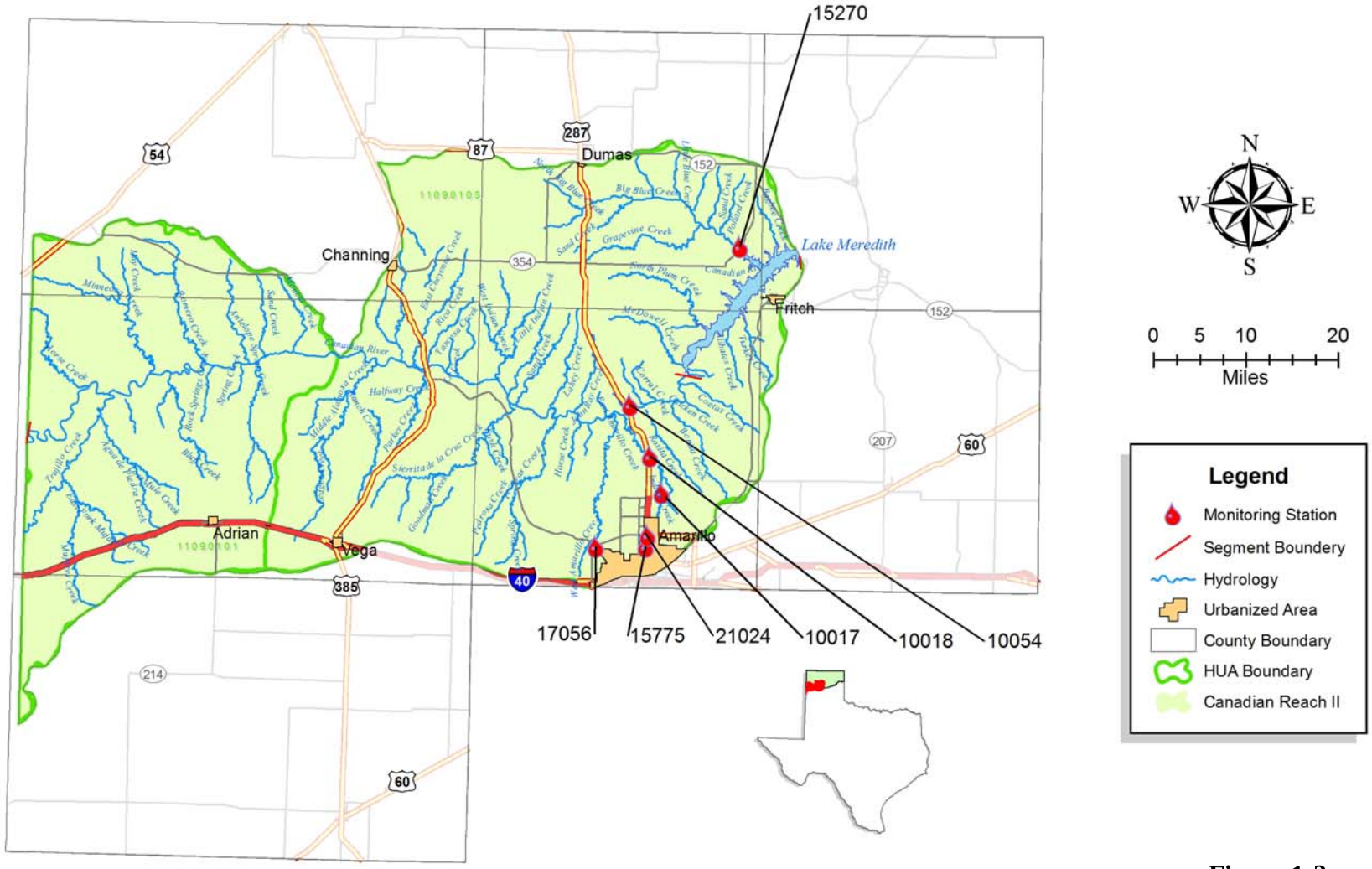
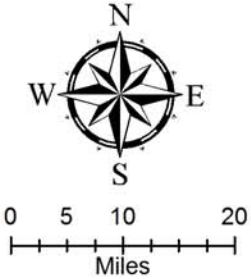


Figure 1-2

Canadian River Basin

Reach III

FY2012



Legend

- Monitoring Station
- Segment Boundary
- 0101 Segment ID
- Hydrology
- Urbanized Area
- County Boundary
- HUA Boundary
- Canadian Reach III

This Reach Monitored by TCEQ Field Office.

Figure 1-3

Canadian River Basin

Reach IV

FY2012

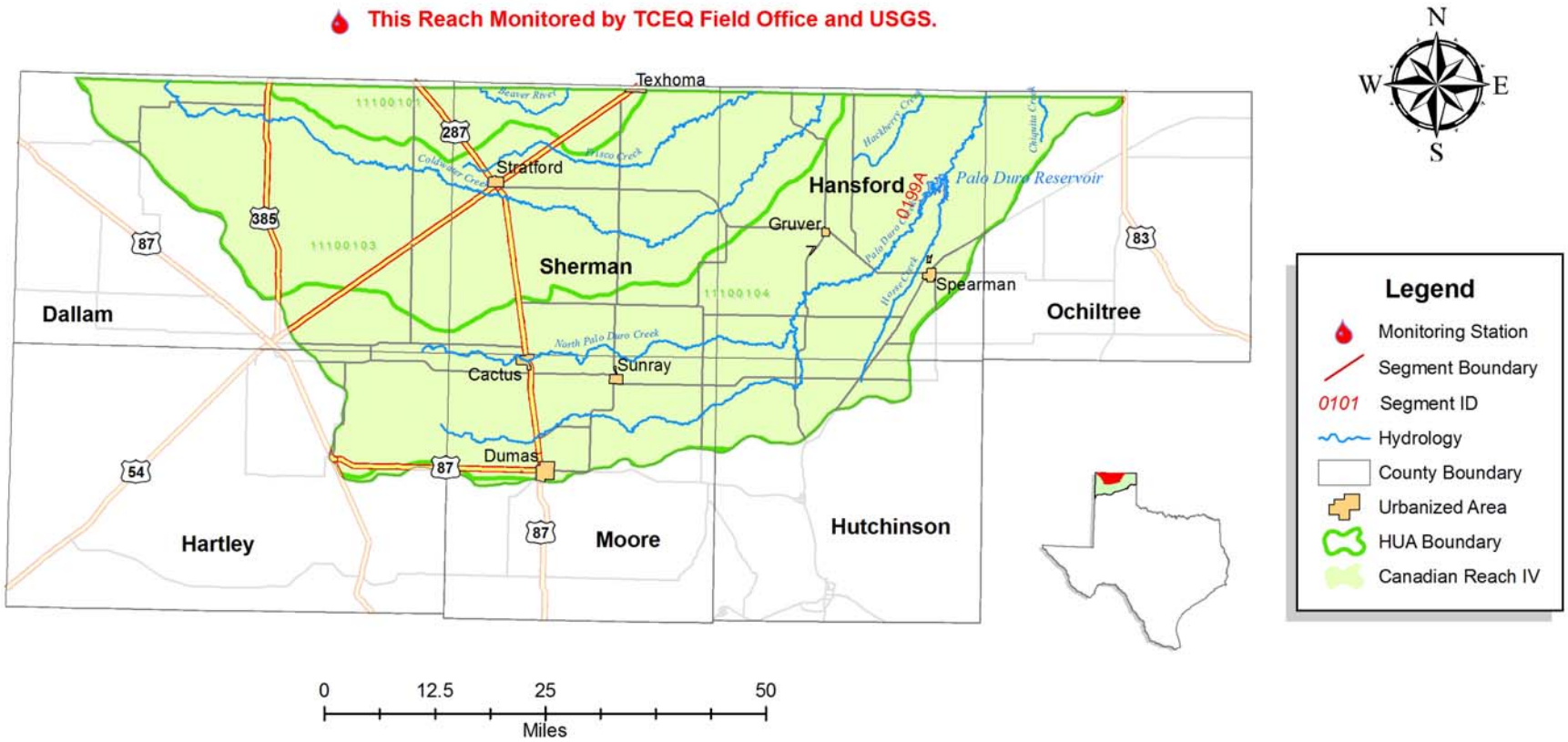


Figure 1-4

Canadian River Basin

Reach V

FY2012

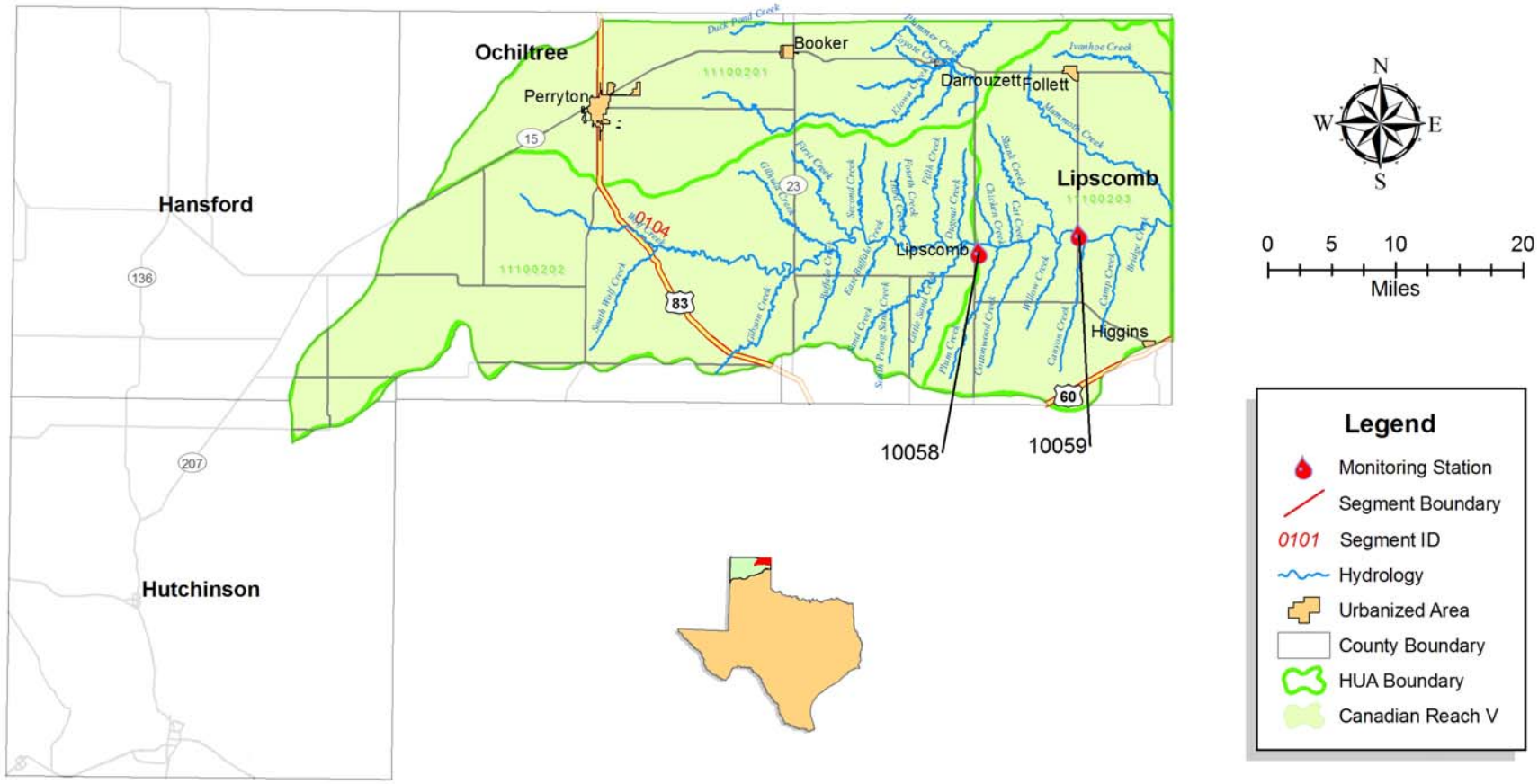
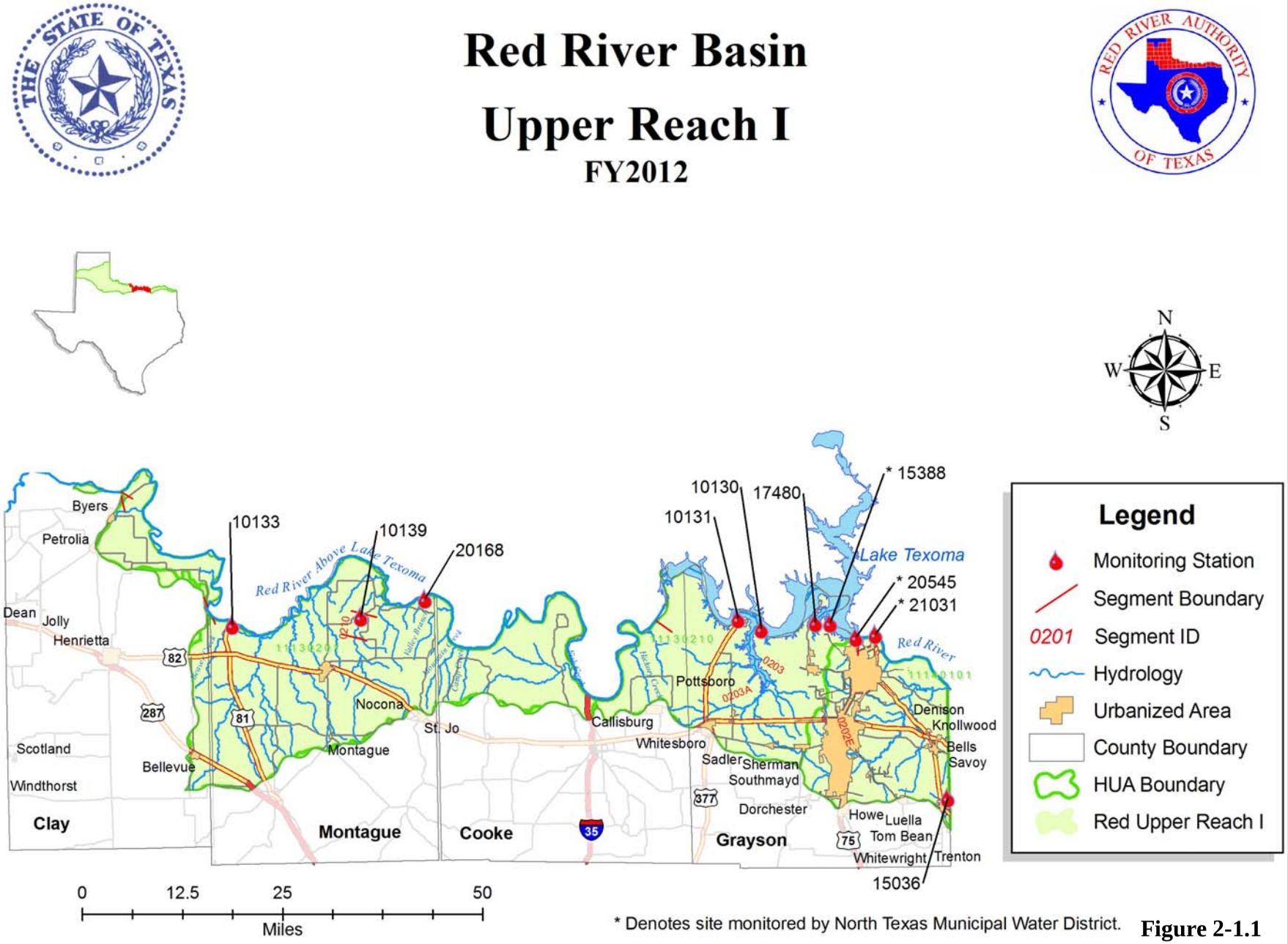


Figure 1-5

Red River Basin

Upper Reach I

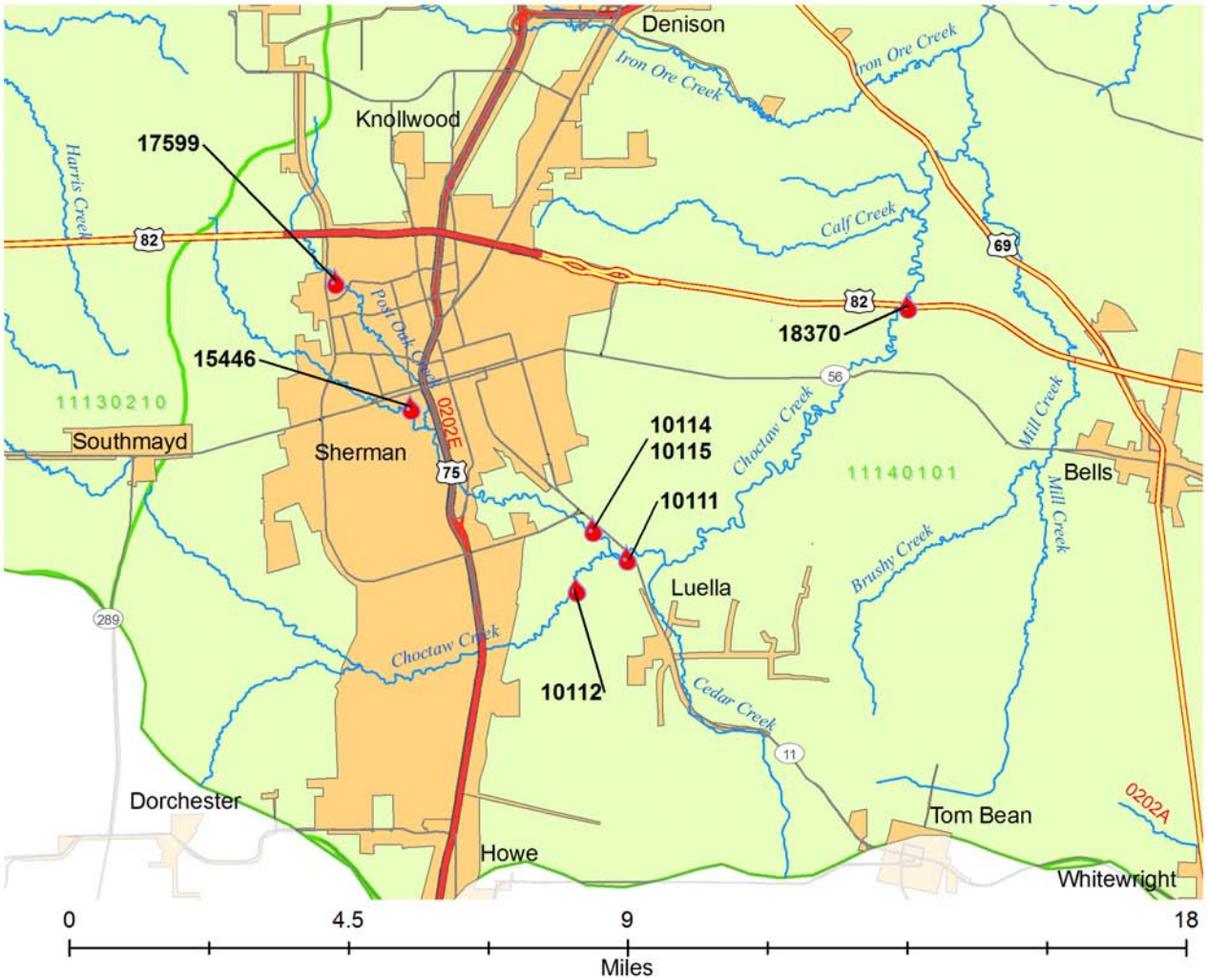
FY2012



* Denotes site monitored by North Texas Municipal Water District.

Figure 2-1.1

Red River Basin
Upper Reach I
(Sites Monitored by City of Sherman)
FY2012



Legend

- Monitoring Station
- Segment Boundary
- 0201 Segment ID
- Hydrology
- Urbanized Area
- County Boundary
- HUA Boundary
- Red Upper Reach I

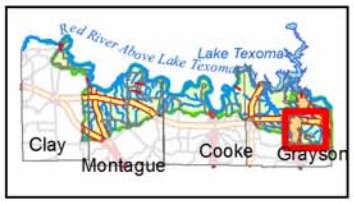
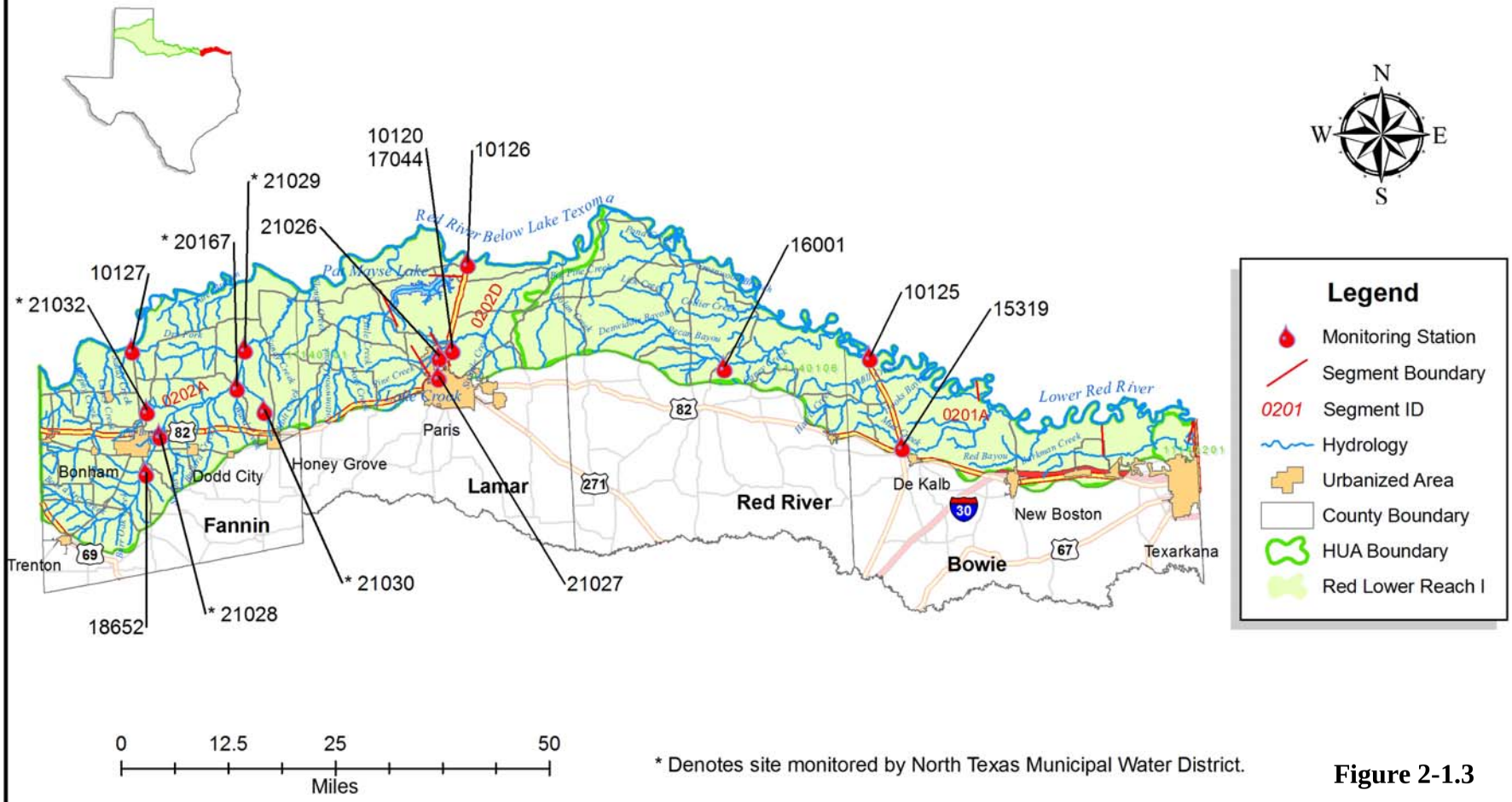


Figure 2-1.2

Red River Basin

Lower Reach I

FY2012



* Denotes site monitored by North Texas Municipal Water District.

Figure 2-1.3

Red River Basin

Reach II

FY2012

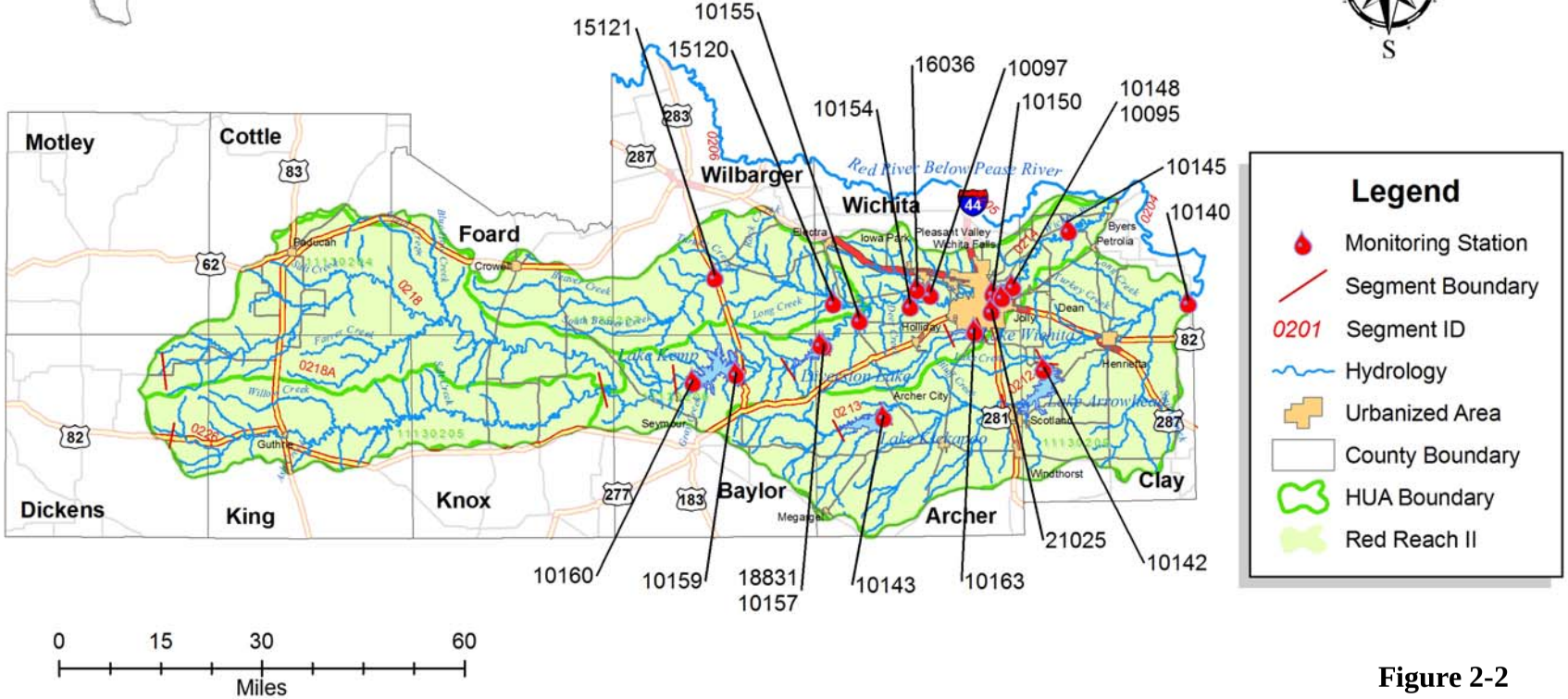


Figure 2-2

Red River Basin

Reach III

FY2012

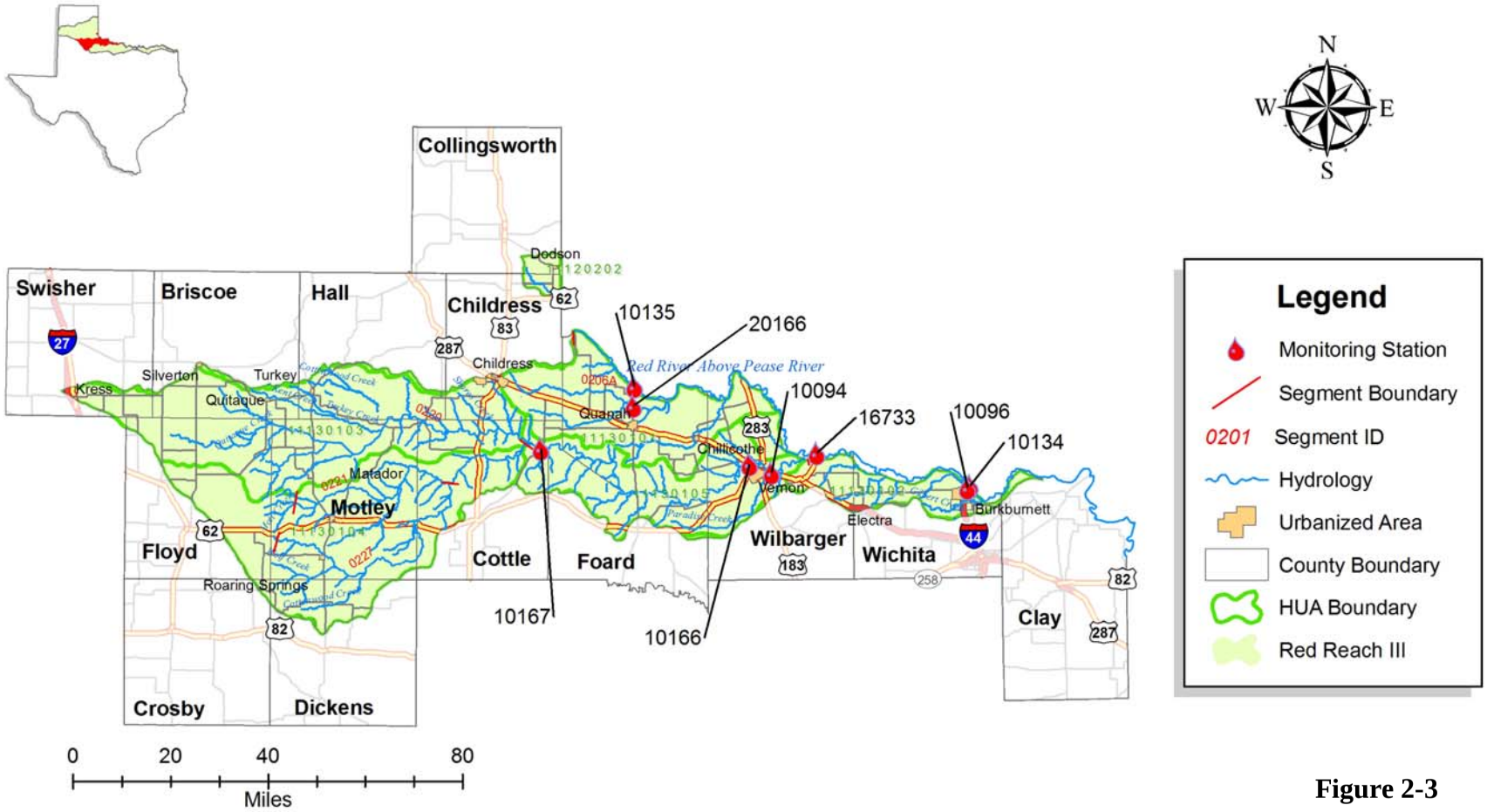


Figure 2-3

Red River Basin

Reach IV

FY2012

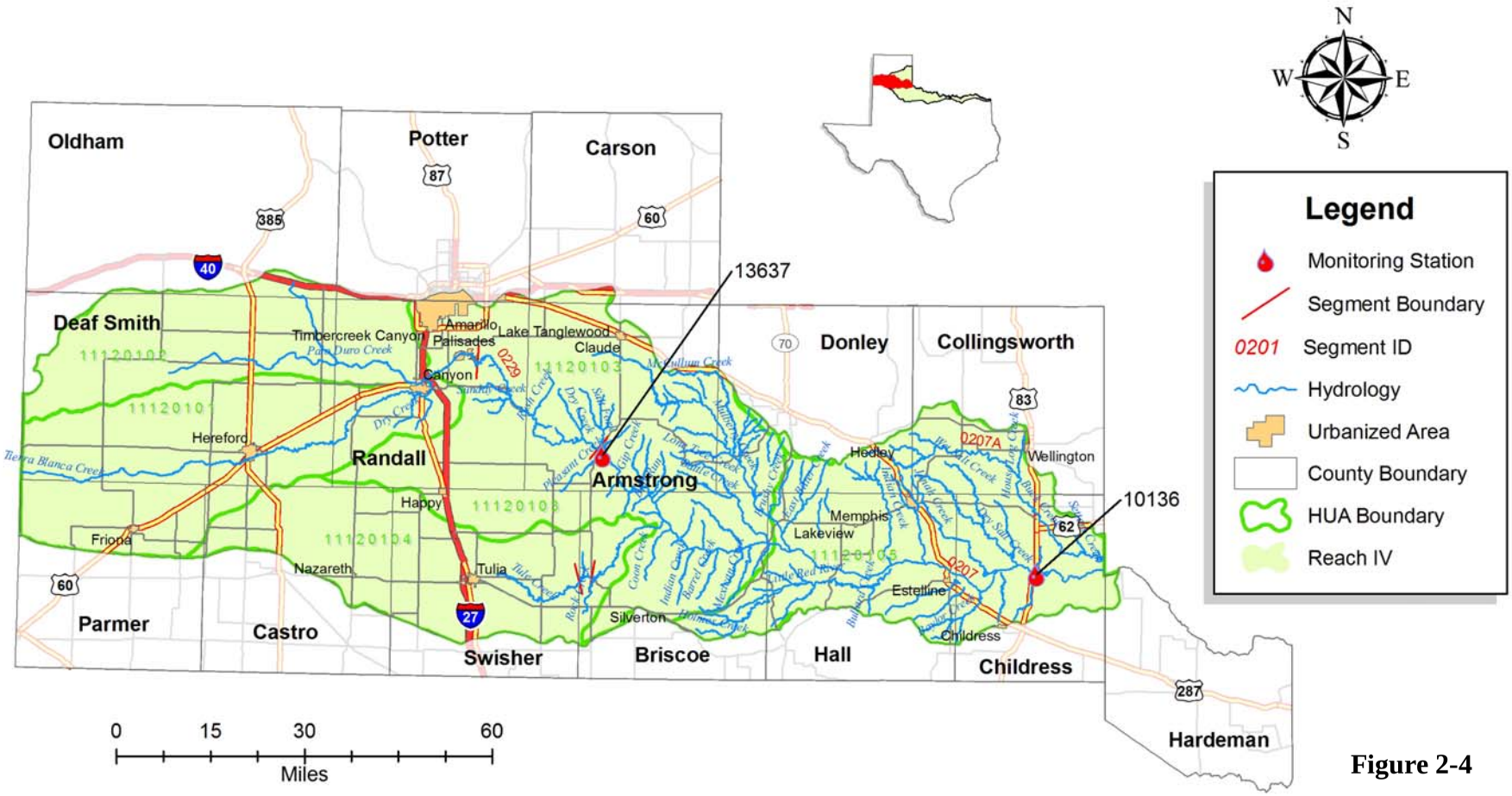


Figure 2-4

Red River Basin

Reach V

FY2012

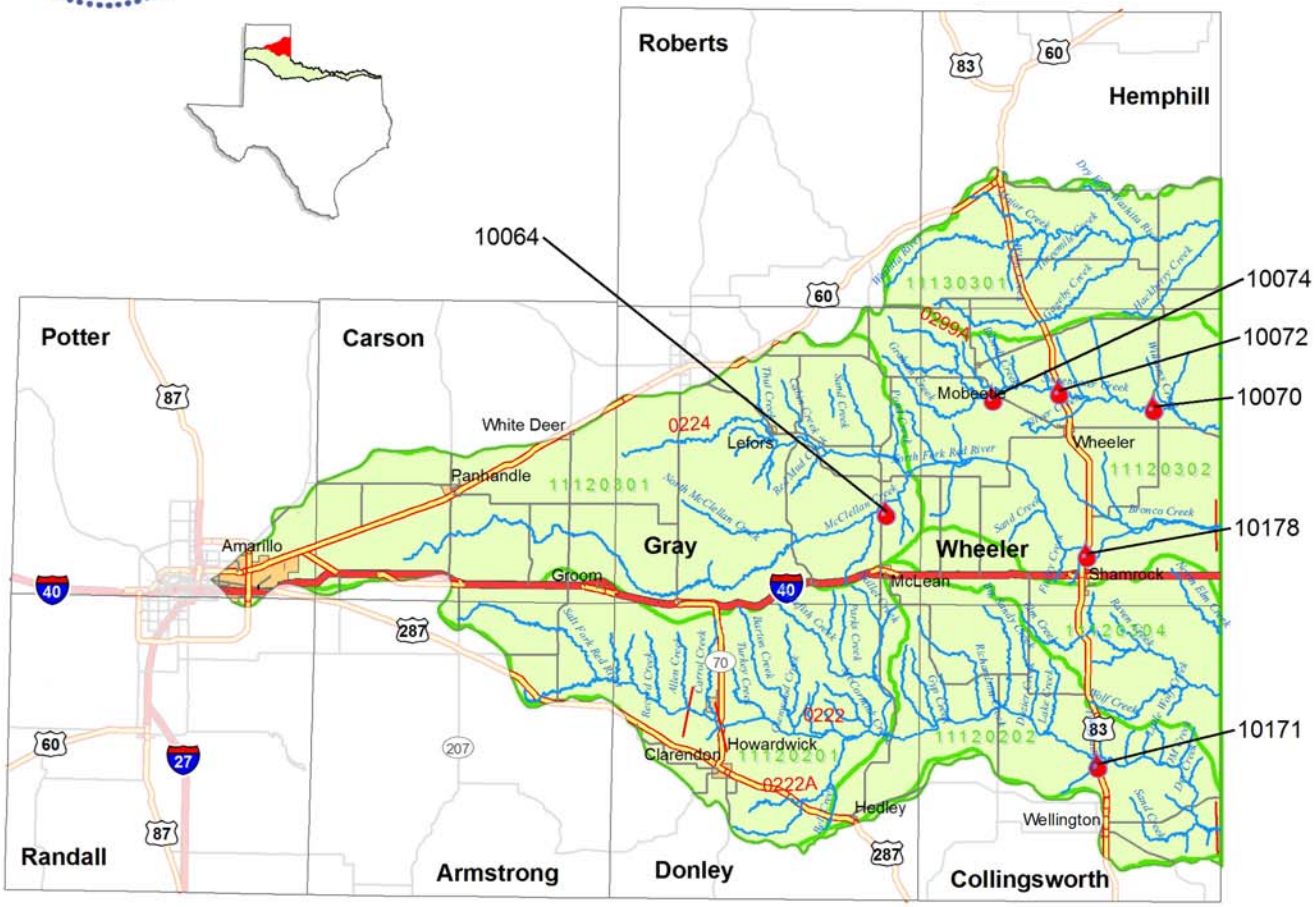


Figure 2-5

Appendix C
Field Data Sheets

RED RIVER AUTHORITY OF TEXAS
LAKE / RESERVOIR
CRP FIELD DATA REPORTING FORM

Date:	**Station Location:**		**TCEQ Site ID:**
Time:	**Basin/Reach/Segment:**	**HUA No.**	**RRA Tag No:**
County:	**Monitoring Type:**	**QAO:**	**DE:**
RRA Lab ID #:		**Total Depth:** (m)	**Total Measurements:**
Chain of Custody #:		**Time Start:**	**Time End:**
Tech(s):			

Parameter Code	Sample Collection Depth _____Meters		Sample Depth (m)	Temp (°C)	pH (s. u.)	D.O. (mg/L)	Conductivity (uS/cm)
00078		Secchi Disk (m)					
89965		Wind Condition 1 – Calm 2 – Slight 3 – Moderate 4 – Strong Direction _____					
89966		Weather 1 – Clear 2 – Partly Cloudy 3 – Cloudy 4 – Rain 5 – Other*					
89968		Water Surface 1 – Calm 2 – Ripple 3 – Wave 4 – Whitecap					
89969		Water Color 1 – Brown 2 – Reddish 3 – Green 4 – Black 5 – Clear 6 - Other*					
89971		Water Odor 1 – Sewage 2 – Oily/Chem 3 – Rotten Eggs 4 – Musky 5 – Fishy 6 – None 7 – Other*					
20424		Water Clarity 1 – Excellent 2 – Good 3 – Fair 4 – Poor 5 – Other*					
72053		Significant Precip. (< or > Days)					
00021		Air Temperature (° Fahrenheit)					
Special Conditions:							

Comments and details/descriptions for parameter codes marked other*:

MEASUREMENT COMMENTS AND FIELD OBSERVATIONS

Biological Activities:

Aquatic Vegetation:

Terrestrial Vegetation:

Aquatic Animals:

Terrestrial Animals:

Aquatic Insects:

Terrestrial Insects:

Left Bank:

Right Bank:

Watershed Activities:

Water Quality/Stream Use:

Specific Sample Info:

Missing Parameters:

Notes: *Lab Turbidity, E. coli, and Fecal Coliform results are reported from RRA's ESD Laboratory Parameter Result Sheet.*

ESD-01 (Revised May 2011)

RED RIVER AUTHORITY OF TEXAS
STREAM
CRP FIELD DATA REPORTING FORM

Date:	**Station Location:**		**TCEQ Site ID:**
Time:	**Basin/Reach/Segment:**	**HUA No.**	**RRA Tag No:**
County:	**Monitoring Type:**	**QAO:**	**DE:**

RRA Lab ID #:	**Stream Width:** (ft)	**Section Width:** (ft)
Chain of Custody #:	**Time Start:**	**Time End:**
Tech(s):		

Parameter Code	Sample Collection Depth _____Meters			Section Midpoint	Section Depth (ft)	Velocity (ft/S)	Discharge (CFS)
			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				
72053		Significant Precip. (< or > Days)	Total Flow in CFS				

Comments and details/descriptions for parameter codes marked other*:

MEASUREMENT COMMENTS AND FIELD OBSERVATIONS

Biological Activities:

Aquatic Vegetation:

Terrestrial Vegetation:

Aquatic Animals:

Terrestrial Animals:

Aquatic Insects:

Terrestrial Insects:

Left Bank:

Right Bank:

Watershed Activities:

Water Quality/Stream Use:

Specific Sample Info:

Missing Parameters:

Notes: *Lab Turbidity, E. coli, and Fecal Coliform results are reported from RRA's ESD Laboratory Parameter Result Sheet.*

ESD-01 (Revised May 2011)

NORTH TEXAS MUNICIPAL WATER DISTRICT
LAKE / RESERVOIR
CRP FIELD DATA REPORTING FORM

Date:	**Station Location:**		**TCEQ Site ID:**
Time:	**Basin/Reach/Segment:**	**HUA No.**	**RRA Tag No:**
County:	**Monitoring Type:**	**QAO:**	**DE:**
RRA Lab ID #:		**Total Depth:** (m)	**Total Measurements:**
Chain of Custody #:		**Time Start:**	**Time End:**
Tech(s):			

Parameter Code	Sample Collection Depth _____Meters		Sample Depth (m)	Temp (°C)	pH (s. u.)	D.O. (mg/L)	Conductivity (uS/cm)
00078		Secchi Disk (m)					
89965		Wind Condition 1 – Calm 2 – Slight 3 – Moderate 4 – Strong Direction _____					
89966		Weather 1 – Clear 2 – Partly Cloudy 3 – Cloudy 4 – Rain 5 – Other*					
89968		Water Surface 1 – Calm 2 – Ripple 3 – Wave 4 – Whitecap					
89969		Water Color 1 – Brown 2 – Reddish 3 – Green 4 – Black 5 – Clear 6 - Other*					
89971		Water Odor 1 – Sewage 2 – Oily/Chem 3 – Rotten Eggs 4 – Musky 5 – Fishy 6 – None 7 – Other*					
20424		Water Clarity 1 – Excellent 2 – Good 3 – Fair 4 – Poor 5 – Other*					
72053		Significant Precip. (< or > Days)					
00021		Air Temperature (° Fahrenheit)					
Special Conditions:							

Comments and details/descriptions for parameter codes marked other*:

MEASUREMENT COMMENTS AND FIELD OBSERVATIONS

Biological Activities:

Aquatic Vegetation:

Terrestrial Vegetation:

Aquatic Animals:

Terrestrial Animals:

Aquatic Insects:

Terrestrial Insects:

Left Bank:

Right Bank:

Watershed Activities:

Water Quality/Stream Use:

Specific Sample Info:

Missing Parameters:

Notes: *Lab Turbidity, E. coli, and Fecal Coliform results are reported from RRA's ESD Laboratory Parameter Result Sheet.*

ESD-01 (Revised May 2011)

NORTH TEXAS MUNICIPAL WATER DISTRICT
STREAM
CRP FIELD DATA REPORTING FORM

Date:	**Station Location:**		**TCEQ Site ID:**
Time:	**Basin/Reach/Segment:**	**HUA No.**	**RRA Tag No:**
County:	**Monitoring Type:**	**QAO:**	**DE:**
RRA Lab ID #:		**Stream Width:** (ft)	**Section Width:** (ft)
Chain of Custody #:		**Time Start:**	**Time End:**
Tech(s):			

Parameter Code	Sample Collection Depth _____Meters			Section Midpoint	Section Depth (ft)	Velocity (ft/S)	Discharge (CFS)
			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				
72053		Significant Precip. (< or > Days)	Total Flow in CFS				

Comments and details/descriptions for parameter codes marked other*:

MEASUREMENT COMMENTS AND FIELD OBSERVATIONS

Biological Activities:

Aquatic Vegetation:

Terrestrial Vegetation:

Aquatic Animals:

Terrestrial Animals:

Aquatic Insects:

Terrestrial Insects:

Left Bank:

Right Bank:

Watershed Activities:

Water Quality/Stream Use:

Specific Sample Info:

Missing Parameters:

Notes: *Lab Turbidity, E. coli, and Fecal Coliform results are reported from RRA's ESD Laboratory Parameter Result Sheet.*

ESD-01 (Revised May 2011)

CITY OF SHERMAN
STREAM
CRP FIELD DATA REPORTING FORM

Date:	**Station Location:**		**TCEQ Site ID:**
Time:	**Basin/Reach/Segment:**	**HUA No.**	**RRA Tag No:**
County:	**Monitoring Type:**	**QAO:**	**DE:**
RRA Lab ID #:		**Stream Width:** (ft)	**Section Width:** (ft)
Chain of Custody #:		**Time Start:**	**Time End:**
Tech(s):			

Parameter Code	Sample Collection Depth _____Meters			Section Midpoint	Section Depth (ft)	Velocity (ft/S)	Discharge (CFS)
			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				
72053		Significant Precip. (< or > Days)	Total Flow in CFS				

Comments and details/descriptions for parameter codes marked other*:

MEASUREMENT COMMENTS AND FIELD OBSERVATIONS

Biological Activities:

Aquatic Vegetation:

Terrestrial Vegetation:

Aquatic Animals:

Terrestrial Animals:

Aquatic Insects:

Terrestrial Insects:

Left Bank:

Right Bank:

Watershed Activities:

Water Quality/Stream Use:

Specific Sample Info:

Missing Parameters:

Notes: *Lab Turbidity, E. coli, and Fecal Coliform results are reported from RRA's ESD Laboratory Parameter Result Sheet.*

ESD-01 (Revised May 2011)

Appendix D
Chain-of-Custody Forms

Chain of Custody Record

0008301

Red River Authority of Texas

Environmental Services Laboratory

PO Box 240, Wichita Falls TX 76307-0240
3000 Hammon Rd, Wichita Falls, TX 76310-7500
Phone: 940-723-1717 · Fax 940-723-6529

ACCREDITED IN ACCORDANCE WITH nelac T104704274-08-TX

Report Information		
Company Name:		
Address:		
City:	State:	Zip:
Contact Name:		
Phone:	Fax:	

Billing Information (If different from above)		
Address:		
City:	State:	Zip:
Contact Name:		
Phone:	Fax:	

Project Information	
Priority: Normal _____	RUSH Needed by: _____
Project Name:	
Project Location:	
Sampler Name:	
PO Number or Reference:	

Matrix Codes: L = Liquid S = Solids O = Other _____
Preservation Codes: 1 = None 2 = HNO_3 3 = H_2SO_4 4 = HCl 5 = NaOH 6 = Ice 7 = Other _____

Analysis Requested

LABORATORY USE ONLY	Sample Description	Date(s) Collected	Time(s) Collected	Matrix	# of Containers	Pres. Code	(C)omp / (G)rab									

RELINQUISHED BY	DATE	TIME	RECEIVED BY	DATE	TIME
RELINQUISHED BY	DATE	TIME	RECEIVED BY	DATE	TIME
RELINQUISHED BY	DATE	TIME	RECEIVED BY	DATE	TIME

Special Instructions / Comments:

NTMWD Chain of Custody Record

Work Order Number: _____

Client: North Texas Municipal Water District
Address: 505 E Brown St
Wylie, TX 75098
Contact Name: Jerry Allen

Sampler Name: _____
Sampler Signature _____

Project: _____

Receiving Temperature °C

Sx. Receipt Info	
Labels Intact	✓ ?
COC Agrees	✓ ?

Sampling Information						Analyses Requested											Container ID & Preservation Required					
Date	Time	Type	Sx. Num	TCEQ ID	Sample Name	Alkalinity	Turbidity	NO2	Orthophosphate	Solids, TSuspended	Solids, VSuspended	Iron	Manganese	Chloride, Bromide	Sulfate	Solids, TDissolved	Hardness	Ammonia-Nitrogen	Nitrate-Nitrite Nitrogen	Total Kjeldahl Nitrogen	Total Phosphate	TOC	E.coli	Phytoplankton	Chlorophyll a	2L HDPE Unpres	2L HDPE Unpres	250mL HDPE Unpres	250mL HDPE Unpres	500mL HDPE Unpres	125 mL HDPE w/HPO4	120 mL sterile plastic	100mL Poly Ziploc	2L HDPE Unpres
			01																															
			02																															
			03																															
			04																															
			05																															
			06																															
			07																															
			08																															
			09																															
			10																															

IR#		
Cooler Info		
#	°C	On Ice
1		
2		
3		
4		
5		
6		

Preservation
Checked By
Items Adjusted
pH <2
2 > pH < 12
pH > 12

Field Data

	Sample Name	Conductivity uS/cm	Dissolved Oxy mg/L	pH SU	Temperature °C	Flow
01						
02						
03						
04						
05						
06						
07						
08						
09						
10						

Relinquished by:	Date	Time	Received by:	Relinquished by:	Date	Time	Received by:
Relinquished by:	Date	Time	Received by:	Relinquished by:	Date	Time	Received by:

Relinquished by:	Date	Time	Received for Laboratory by:	Date	Time	Remarks:

Page 1 of 1

Chain of Custody Record

City of Sherman Utilities Lab	Report Options	Turn Around Time	Customer Comments or Special Instructions
288 Post Oak Road Sherman, Texas 75090 Phone: (903) 892-7287 Fax: (903) 868-2535	☐ Will pick-up results ☐ Please e-mail results ☐ Please phone results ☐ Please fax results ☐ Please mail results	☐ Normal ☐ Expedite _____% ☐ Other: (Specify) _____	

Payment Method		Payment Receipt Information	Chain of Custody #
☐ Submit Invoice	☐ Pay Prior To Analyses With: ☐ Cash ☐ Check ☐ Credit Card	(Lab Use Only)	(Lab Use Only)

Customer Information		Project Information (complete if different than customer information)	
Customer Name:	Contact:	Project Name:	Project #:
Customer Address:		Project Address:	Contact:
City, State, Zip:	Phone #:	City, State, Zip	Phone #:
Fax #:	E-Mail:	Water System ID#:	Wastewater System ID#:

Sample # (Lab Use Only)	Sample Collection Information						Bottle Information		Drinking Water Sampling Information (if applicable)										Analyses Requested											
									Chlorine Results			Type of Sample Collected					Water Source													
	Sample ID	Date Collected	Time Collected	Sample Type	Sample Matrix	Sample Preservation	# of bottles	Type of Bottles	Residual (mg/l)	Free	Total	Distribution	Raw	Special	Construction	Repeat	Well	Surface	Total Coliform / E. coli (P/A)	Fecal Coliform (MF)	E. coli (MPN)	BOD_5	$CBOD_5$	TSS	VSS	NH_3N	Turbidity		Extra Sample Bottle	Subcontract Analyses

Sample Custody Documentation					
Sampler's Name: *(Print/Signature)*		# of bottles collected:	Relinquished by: *(Signature)*	# of bottles relinquished:	Date/Time Relinquished:
Received By: *(Print/Signature)*	Date/Time Received:	# of bottles received:	Relinquished by: *(Signature)*	# of bottles relinquished:	Date/Time Relinquished:
Received By: *(Print/Signature)*	Date/Time Received:	# of bottles received:	Relinquished by: *(Signature)*	# of bottles relinquished:	Date/Time Relinquished:
Received for lab by: *(Print/Signature)*		# of bottles received:	Date/Time Received:	Lab Comments:	

Sample Type(s): **G** - Grab, **TC** - Time Composite, **FC** - Flow Composite

Preservation: **Refrig** - Refrigerated, **Ice** - Iced down, **None** - Ambient, **H_2SO_4** - Sulfuric Acid

Sample Matrix: **W** - Drinking Water, **WW** - Wastewater, **NP** - Non-Potable, **SL** - Sludge

Type of Bottles: **P** - Plastic, **G** - Glass

Revision 1.5 - 06/22/10

Form: COC-01

Appendix E
Data Review Checklist and Summary

DATA REVIEW CHECKLIST

This checklist is to be used by the Planning Agency and other entities handling the monitoring data in order to review data before submitting to the TCEQ. *This table may not contain all of the data review tasks being conducted. Only the Data Summary is required to be submitted with the data sets.*

Data Format and Structure		**✓, ✗, or N/A**
A.	Are there any duplicate *Tag Id* numbers in the Events file?	
B.	Do the *Tag* prefixes correctly represent the entity providing the data?	
C.	Have any *Tag Id* numbers been used in previous data submissions?	
D.	Are TCEQ station location (SLOC) numbers assigned?	
E.	Are sampling *Dates* in the correct format, MM/DD/YYYY with leading zeros?	
F.	Are the sampling *Times* based on the 24 hour clock (e.g. 13:04) with leading zeros?	
G.	Is the *Comment* field filled in where appropriate (e.g. unusual occurrence, sampling problems, unrepresentative of ambient water quality)?	
H.	Are *Submitting Entity, Collecting Entity, and Monitoring Type* codes used correctly?	
I.	Do sampling dates in the *Results* file the same as the one in the *Events* file for each Tag Id?	
J.	Are values represented by a valid parameter code with the correct units?	
K.	Are there any duplicate parameter codes for the same *Tag Id*?	
L.	Are there any invalid symbols in the *Greater Than/Less Than* (*GT/LT*) field?	
M.	Are there any *Tag Ids* in the *Results* file that are not in the *Events* file or vice versa?	
Data Quality Review		**✓, ✗, or N/A**
A.	Are all the "less-than" values reported at the LOQ? **If no, explain in the Data Summary**.	
B.	Have the outliers been verified and a "1" placed in the *Verify_flg* field?	
C.	Have checks on correctness of analysis or data reasonableness been performed? e.g.: Is ortho-phosphorus less than total phosphorus? Are dissolved metal concentrations less than or equal to total metals? Is the minimum 24 hour DO less than the maximum 24 hour DO? Do the values appear to be consistent with what is expected for that site?	
D.	Have at least 10% of the data in the data set been reviewed against the field and laboratory data sheets?	
E.	Are all parameter codes in the data set listed in the QAPP?	
F.	Are all stations in the data set listed in the QAPP?	
Documentation Review		**✓, ✗, or N/A**
A.	Are blank results acceptable as specified in the QAPP?	
B.	Were control charts used to determine the acceptability of field duplicates?	
C.	Was documentation of any unusual occurrences that may affect water quality included in the *Event* table's *Comments* field?	
D.	Were there any failures in sampling methods and/or deviations from sample design requirements that resulted in unreportable data? **If yes, explain in Data Summary**.	
E.	Were there any failures in field and/or laboratory measurement systems that were not resolvable and resulted in unreportable data? **If yes, explain in Data Summary.**	
F.	Was the laboratory's NELAP Accreditation current for analysis conducted?	

✓ = Yes **✗ = No** **N/A** = Not applicable

DATA SUMMARY

Data Set Information

Data Source: _____.

Date Submitted: _____.

Tag_id Range: _____.

Date Range: _____.

Comments:

Please explain in the space below any data discrepancies discovered during data review including:

- Inconsistencies with AWRL specifications or LOQs
- Failures in sampling methods and/or laboratory procedures that resulted in data that could not be reported to the TCEQ (indicate items for which the Corrective Action Process has been initiated).
- Include completed Corrective Action Plans with the applicable Progress Report.

_____

_____

_____

_____

_____

_____

_____

_____

_____

☐ I certify that all data in this data set meets the requirements specified in Texas Water Code Chapter 5, Subchapter R (TWC §5.801 et seq) and Title 30 Texas Administrative Code Chapter 25, Subchapters A & B.

☐ This data set has been reviewed using the Data Review Checklist.

Planning Agency Data Manager: _____.

Date: _____.