Upper Neches River Basin
Surface Water Quality Monitoring Program
Quality Assurance Project Plan

Angelina & Neches River Authority
P.O. Box 387
Lufkin, TX 75902

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

Effective Period: FY 2008 to FY 2009

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

Matt Romig
ANRA Project Manager
P.O. Box 387
Lufkin, TX 75902
(936) 633-6435
mromig@anra.org

A1 APPROVAL PAGE

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Monitoring Operations Division

Patrick Roques, Manager Date
Water Quality Monitoring & Assessment Section

Laurie Curra, Manager Date
Clean Rivers Program

Jennifer Delk Date
Project QA Specialist
Clean Rivers Program

Greg Bryant Date
Project Manager, Clean Rivers Program

Compliance Support Division

Stephen Stubbs Date
TCEQ Quality Assurance Manager

Daniel R. Burke Date
Lead CRP Quality Assurance Specialist
Quality Assurance Section

ANGELINA & NECHES RIVER AUTHORITY

Matt Romig Date	Brian Sims Date
ANRA Project Manager	ANRA Quality Assurance Officer

ANRA LABORATORY

Brian Sims Date	Jeanette Hancock Date
ANRA Laboratory Manager	ANRA Laboratory Quality Assurance Officer

CITY OF TYLER

_____

Mike Norris Date
Water Quality Chemist

LOWER COLORADO RIVER AUTHORITY ENVIRONMENTAL LABORATORY

Alicia Gill Date
LCRA Laboratory Manager

Hollis Pantalion Date
LCRA Laboratory Manager

The Angelina & Neches River Authority 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 Angelina & Neches River Authority 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.)

A2 TABLE OF CONTENTS

LIST OF ACRONYMS

ANRA	**Angelina & Neches River Authority**
AWRL	**Ambient Water Reporting Limit**
BMP	**Best Management Practices**
CAR	**Corrective Action Report**
COC	**Chain of Custody**
CRP	**Clean Rivers Program**
DOC	**Demonstration of Capability**
DQO	**Data Quality Objective**
EPA	**United States Environmental Protection Agency**
FY	**Fiscal Year**
LCRA	**Lower Colorado River Authority**
LCS	**Laboratory Control Sample (formerly Laboratory Control Standard)**
LCSD	**Laboratory Control Sample Duplicate (formerly Laboratory Control Standard Duplicate)**
LOD	**Limit of Detection (formerly Method Detection Limit or MDL)**
LOQ	**Limit of Quantitation (formerly Reporting Limit)**
QA	**Quality Assurance**
QM	**Quality Manual**
QAO	**Quality Assurance Officer**
QAPP	**Quality Assurance Project Plan**
QAS	**Quality Assurance Specialist**
QC	**Quality Control**
QMP	**Quality Management Plan**
RBP	**Rapid Bioassessment Protocol**
RWA	**Receiving Water Assessment**
SOP	**Standard Operating Procedure**
SWQM	**Surface Water Quality Monitoring**
SWQMIS	**Surface Water Quality Monitoring Information System (formerly TRACS)**
TMDL	**Total Maximum Daily Load**
TCEQ	**Texas Commission on Environmental Quality**
TSWQS	**Texas Surface Water Quality Standards**
VOA	**Volatile Organic Analytes**
WMT	**Watershed Management Team**

A3 DISTRIBUTION LIST

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

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Clean Rivers Program
MC-165
(512) 239-6941

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Mike Norris, Water Quality Chemist
(903) 939-8278

LCRA Environmental Laboratory
EL-101
3505 Montropolis Drive
Austin, TX 78744-1417

Alicia Gill, Laboratory Manager
(512) 356-6023

The Angelina & Neches River Authority will provide copies of this project plan and any amendments or appendices of this plan to each person on this list and to each sub-tier project participant, e.g., subcontractors, other units of government. The Angelina & Neches River Authority will document distribution of the plan and any amendments and appendices, maintain this documentation as part of the project's quality assurance records, and will ensure the documentation is available for review.

A4 PROJECT/TASK ORGANIZATION

Description of Responsibilities

TCEQ

Laurie Curra
CRP Manager

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

Daniel R. Burke
CRP Lead Quality Assurance Specialist

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

Greg Bryant
CRP Project Manager

Responsible for the development, implementation, and maintenance of CRP contracts. Tracks deliverables. Participates in the development, approval, implementation, and maintenance of written quality assurance standards (e.g., Program Guidance, SOPs, QAPPs, QMP). Assists CRP Lead QA Specialist in conducting 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.

Eric Reese
CRP Data Manager

Responsible for coordination and tracking of CRP data sets from initial submittal through CRP Project Manager review and approval. Performs automated data validation routines and coordinates error correction. Provides quality assured data sets to TCEQ Information Resources in compatible formats for uploading to the statewide database. Generates reports to assist CRP Project Managers' data review.

Provides training and guidance to CRP and Planning Agencies on technical data issues. Reviews and approves data-related portions of program QMP and project-specific QAPPs. Develops and maintains Standard Operating Procedures for CRP data management.

Jennifer Delk
CRP Project Quality Assurance Specialist

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

ANGELINA & NECHES RIVER AUTHORITY

Matt Romig
ANRA 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 nonconformances, and that issues are resolved. Responsible for validating that data collected are acceptable for reporting to the TCEQ.

Coordinates field sampling and data collection activities. Responsible for field equipment, supplies, data collection and transportation of SWQM program data and samples. Ensures all sampling procedures are followed according to the QAPP and implements field safety measures. Supervises field technicians/interns that assist with the data collection activities.

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. 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.

Matt Romig
ANRA Data Manager

Responsible for ensuring that field data are properly reviewed and verified. Responsible for the transfer of basin quality-assured water quality data to the TCEQ in a format compatible with SWQMIS (formerly the SWQM portion of the TRACS database). Insures access to quality-assured data is available via ANRA or TCEQ internet sites.

Brian Sims
ANRA Quality Assurance Officer

Responsible for coordinating the implementation of the QA program. Responsible for identifying, receiving, and maintaining project quality assurance records. Responsible for coordinating with the TCEQ QAS to resolve QA-related issues. Notifies the ANRA Project Manager of particular circumstances which may adversely affect the quality of data. Coordinates and monitors deficiencies, nonconformances and corrective action. Coordinates the research and review of technical QA material and data related to water quality monitoring system design and analytical techniques.

ANRA Field Technicians/ Interns

Provide assistance to the Monitoring Coordinator and/or Project Manager, as needed, to complete field sampling and data collection.

ANRA LABORATORY

Brian Sims
ANRA Laboratory Manager

Responsible for ensuring adequate training and supervision of all activities involved in generating analytical data for all laboratory personnel having a thorough knowledge of the laboratory QM/QAP and all SOP's specific to the analyses or task performed and/or supervised. Ensures that analytical tests are performed in accordance with approved methods. Ensures that the laboratory maintains adequate Quality Assurance/Quality Control (QA/QC) procedures during the time samples are being analyzed and that all requirements are met and documentation related to the analyses is completely and accurately reported. Enforces corrective action as required.

Jeanette Hancock
ANRA Laboratory QAO

Monitors the implementation of the QA Plan within the laboratory to ensure complete compliance with the QA objectives as defined by the contract and in the QAPP. Conducts in-house audits to identify potential problems and ensures compliance with written SOP's. Responsible for supervising all aspects of the QA/QC in the laboratory. Performs validation and verification of data before the report is sent to the Laboratory Manager.

CITY OF TYLER

Mike Norris
City of Tyler Project Coordinator
Serves as a point of contact for the ANRA CRP staff. Participates in basin planning meetings and coordinates field sampling and data collection activities. Responsible for field equipment, supplies, data collection and transportation of SWQM program data and samples. Ensures all sampling procedures are followed according to the QAPP and implements field safety measures. Supervises field staff that conduct and assist with the data collection activities.

City of Tyler Monitoring Staff

Conduct field data collection activities in accordance with the basin coordinated monitoring schedule and the QAPP. Assist Project Coordinator with the collection and transportation of SWQM program data and samples.

LOWER COLORADO RIVER AUTHORITY

Alicia Gill
LCRA Laboratory Manager

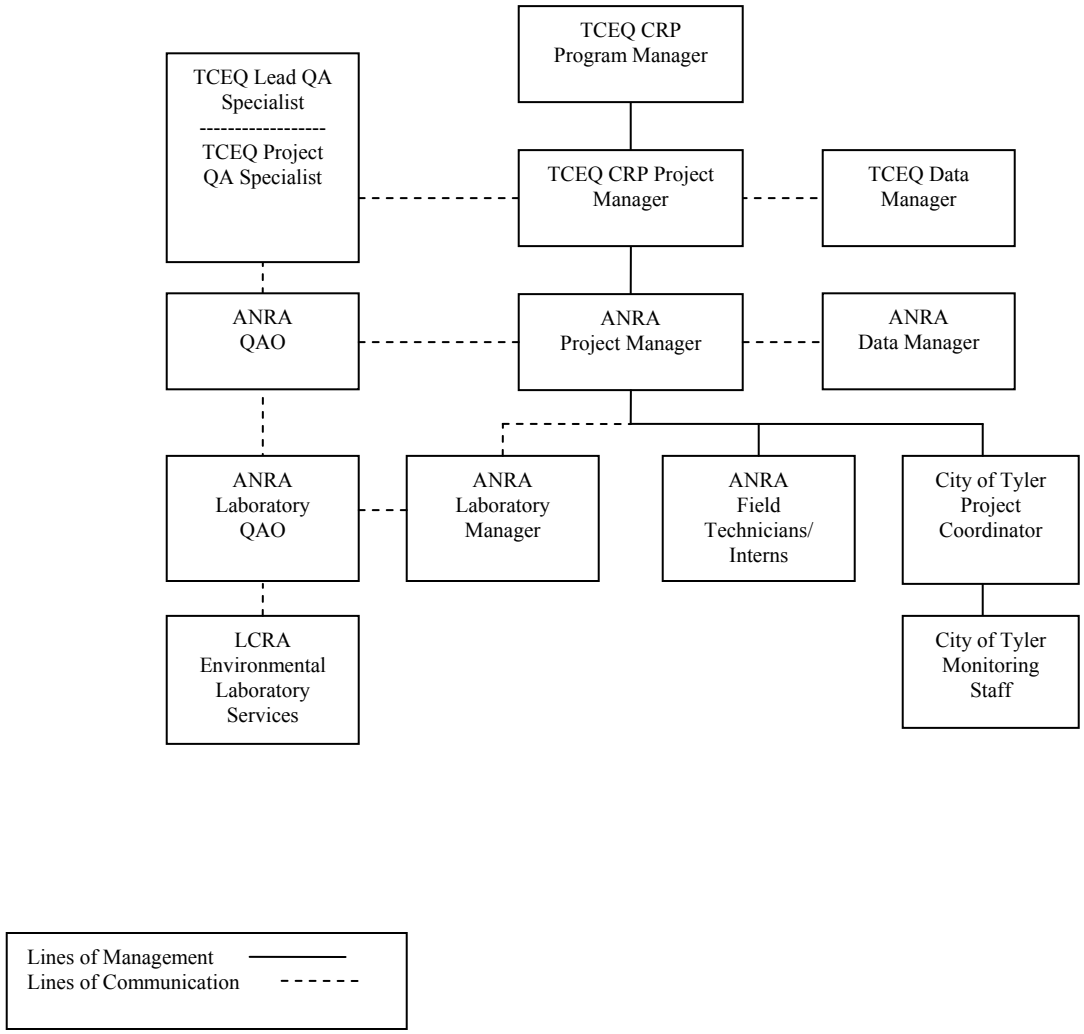
Responsible for ensuring adequate training and supervision of all activities involved in generating analytical data for all laboratory personnel having a thorough knowledge of the laboratory QM/QAP and all SOP's specific to the analyses or task performed and/or supervised. Ensures that analytical tests are performed in accordance with approved methods. Ensures that the laboratory maintains adequate Quality Assurance/Quality Control (QA/QC) procedures during the time samples are being analyzed and that all requirements are met and documentation related to the analyses is completely and accurately reported. Enforces corrective action as required.

Hollis Pantalion
LCRA Laboratory Quality Assurance Manager

Monitors the implementation of the QA Plan within the laboratory to ensure complete compliance with the QA objectives as defined by the contract and in the QAPP. Conducts in-house audits to identify potential problems and ensures compliance with written SOP's. Responsible for supervising all aspects of the QA/QC in the laboratory. Performs validation and verification of data before the report is sent to the Laboratory Manager.

PROJECT ORGANIZATION CHART

Figure A4.1. 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 ANRA and the TCEQ to carry out the activities mandated by the legislation. The QAPP was developed and will be implemented in accordance with provisions of the *Quality Management Plan for the Clean Rivers Program* (most recent version).

The purpose of this QAPP is to clearly delineate the ANRA QA policy, management structure, and procedures which will be used to implement the QA requirements necessary to verify and validate the surface water quality data collected. The QAPP is reviewed by the TCEQ to help ensure that data generated for the purposes described above are scientifically valid and legally defensible. This process will ensure that data collected under this QAPP and submitted to the statewide database have been collected and managed in a way that guarantees its reliability and therefore can be used in water quality assessments and other programs deemed appropriate by the TCEQ. Project results will be used to support the achievement of Clean Rivers Program objectives as contained in the Clean Rivers *Program Guidance and Reference Guide* FY 2008 -2009.

The goal of the Clean Rivers Program is to maintain and improve the quality of water resources within each river basin in Texas. The program utilizes a watershed management approach to identify and evaluate water quality issues, establish priorities for corrective action and work to implement those actions to support the paramount goal of ensuring safe, adequate, and clean water supplies for the future.

In order to meet the goals of the Clean Rivers Program, it is necessary to continuously monitor basin water quality conditions to evaluate background constituent levels, identify areas of adverse water quality, assess point source and non-point source pollutant loadings, prioritize water quality issues, and provide reliable water quality data to the TCEQ and all basin entities for use in regional and state water quality assessments and permitting activities.

The ANRA monitoring program was developed to implement a basin-wide water quality monitoring program to help meet the goals of the Texas Clean Rivers Program. The monitoring program is reviewed annually and includes the following activities:

- Analyzing available water quality data and basin assessment reports to insure proper data collection.
- Coordinating with other monitoring programs in the basin to minimize any duplication of efforts.

- Developing a basin-wide coordinated monitoring schedule with maps to review at annual stakeholder meetings and coordinated monitoring meetings.

A6 PROJECT/TASK DESCRIPTION

During the FY 2008-2009 biennium, ANRA's monitoring program will include routine (RT) and bias to season (BS) monitoring in all areas of the basin. The City of Tyler will continue to monitor at four stations in the upper basin as a sub-tier participant in the Clean Rivers Program. The City of Tyler staff continues to participate in the annual coordinated monitoring meetings. They are responsible for the field monitoring activities. The ANRA laboratory performs the sample analyses, with the exception of chlorophyll-a and pheophytin which are analyzed by the LCRA laboratory. The ANRA Data Manager is responsible for the data generated by the City of Tyler.

See Appendix B for a complete listing of ANRA's most recent Coordinated Monitoring Schedule (Table B.1) and reference maps (Figure B.1, B.2) denoting the locations of monitoring stations in the Upper Neches River Basin.

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

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

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 ANRA Project Manager to the CRP Project Manager electronically. Amendments are effective immediately upon approval by the ANRA Project Manager, the ANRA QAO, the CRP Project Manager, the CRP Lead QA Specialist, and the CRP Project QA Specialist. They will be incorporated into the QAPP by way of attachment and distributed to personnel on the distribution list by the ANRA Project Manager.

Special Project Appendices

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

A7 QUALITY OBJECTIVES AND CRITERIA

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

Systematic watershed monitoring is defined by sampling that is planned for a short duration (1 to 2 years) and is designed to: screen waters that would not normally be included in the routine monitoring program, monitor at sites to check the water quality situation, and investigate areas of potential concern. Due to the limitations regarding these data (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 ANRA will use this information to determine future monitoring priorities. These water quality data, and data collected by other organizations (e.g., USGS, TCEQ, etc.), will be subsequently reconciled for use and assessed by the TCEQ.

The measurement performance specifications to support the project purpose for a minimum data set are specified in Table A7.1 and in the text following.

Table A7.1 - Measurement Performance Specifications

PARAMETER	UNITS	MATRIX	METHOD	PARAMETER CODE	AWRL	Limit of Quantitation (LOQ)	PRECISION (RPD of LCS/LCSD)	BIAS %Rec. of LCS	LOQ CHECK STANDARD %Rec	LAB
Field Parameters										
pH	pH/ units	water	EPA 150.1 and TCEQ SOP, V1	00400	NA*	NA	NA	NA	NA	Field
DO	mg/L	water	SM 4500-O G and TCEQ SOP, V1	00300	NA*	NA	NA	NA	NA	Field
Conductivity	uS/cm	water	EPA 120.1 and TCEQ SOP, V1	00094	NA*	NA	NA	NA	NA	Field
Temperature	B C	water	SM 2550 B and TCEQ SOP V1	00010	NA*	NA	NA	NA	NA	Field
Secchi Depth	meters	water	TCEQ SOP V1	00078	NA*	NA	NA	NA	NA	Field
Days since last significant rainfall	days	NA	TCEQ SOP V1	72053	NA*	NA	NA	NA	NA	Field
Maximum pool width***	meters	water	TCEQ SOP V2	89864	NA*	NA	NA	NA	NA	Field
Maximum pool depth***	meters	water	TCEQ SOP V2	89865	NA*	NA	NA	NA	NA	Field
Pool length***	meters	water	TCEQ SOP, V2	89869	NA*	NA	NA	NA	NA	Field
% pool coverage***	%	water	TCEQ SOP V2	89870	NA*	NA	NA	NA	NA	Field
Total water depth	meters	water	TCEQ SOP V2	82903	NA*	NA	NA	NA	NA	Field
Flow	cfs	water	TCEQ SOP V1	00061	NA*	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*	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*	NA	NA	NA	NA	Field
Flow estimate	cfs	water	TCEQ SOP, V1	74069	NA*	NA	NA	NA	NA	Field
Present Weather	1-clear 2-partly cloudy 3-cloudy 4-rain 5-other	NA	NA	89966	NA	NA	NA	NA	NA	Field

PARAMETER	UNITS	MATRIX	METHOD	PARAMETER CODE	AWRL	Limit of Quantitation (LOQ)	PRECISION (RPD of LCS/LCSD)	BIAS %Rec. of LCS	LOQ CHECK STANDARD %Rec	LAB
Conventional and Bacteriological Parameters										
TSS	mg/L	water	SM 2540 D	00530	4	1	20	80-120	NA	ANRA
TDS, dried at 180 degrees C	mg/L	water	SM 2540C	70300	10	10	20	80-120	NA	ANRA
Sulfate	mg/L	water	Hach 8051	00945	5	5	20	80-120	70-130	ANRA
Chloride	mg/L	water	SM 4500Cl-B	00940	5	5	20	80-120	70-130	ANRA
Chlorophyll-a, spectrophotometric method	ug/L	water	EPA 446.0	32211	3	2	20	80-120	NA	LCRA
Pheophytin, spectrophotometric methodv	ug/L	water	EPA 446.0	32218	3	2	20	80-120	NA	LCRA
E. coli, IDEXX Colilert	MPN/100 mL	water	SM 9223-B	31699	1	1	.5****	NA	NA	ANRA
Ammonia-N, total	mg/L	water	SM 4500NH3-B or SM 4500NH3-D	00610	0.1	0.1	20	80-120	70-130	ANRA
Hardness, total (as CaC03)	mg/L	water	SM 2340 C	00900	5	5	20	80-120	NA	ANRA
Nitrate/nitrite-N, total	mg/L	water	SM 4500-NO_3 E	00630	.05	0.04	20	80-120	70-130	ANRA
O-phosphate-P, field filter <15 min.	mg/L	water	SM 4500-P E	00671	.04	0.04	20	80-120	70-130	ANRA
Total phosphorus-P	mg/L	water	SM 4500-P E	00665	.06	0.06	20	80-120	70-130	ANRA

24-hour Dissolved Oxygen Monitoring Parameters									
Parameter	**Units**	**Method**	**Parameter Code**	**AWRL**	**Limit of Quantitation (LOQ)**	**PRECISION (RPD of LCS/LCSD)**	**Bias % Rec LCS**	**LOQ CHECK STANDARD %Rec**	**Lab*** **
24-Hr D.O. Avg.	mg/l	TCEQ SOP, V1	89857	NA	NA	NA	NA	NA	field
Max Daily DO	mg/l	TCEQ SOP, V1	89856	NA	NA	NA	NA	NA	field
Min Daily DO	mg/l	TCEQ SOP, V1	89855	NA	NA	NA	NA	NA	field
# DO measurements during 24-Hrs	# meas.	TCEQ SOP, V1	89858	NA	NA	NA	NA	NA	field
24-Hr Avg. water Temperature	B Celsius	TCEQ SOP, V1	00209	NA	NA	NA	NA	NA	field
Max Daily water Temperature	B Celsius	TCEQ SOP, V1	00210	NA	NA	NA	NA	NA	field
Min Daily water Temperature	B Celsius	TCEQ SOP, V1	00211	NA	NA	NA	NA	NA	field
# water temp measurements during 24-Hrs.	# meas.	TCEQ SOP, V1	00221	NA	NA	NA	NA	NA	field
24-Hr Avg. Spec Conductance	uS/cm	TCEQ SOP, V1	00212	NA	NA	NA	NA	NA	field
Max Spec Conductance	uS/cm	TCEQ SOP, V1	00213	NA	NA	NA	NA	NA	field
Min Spec Conductance	uS/cm	TCEQ SOP, V1	00214	NA	NA	NA	NA	NA	field
# Spec Conductance measurements during 24-Hrs.	# meas.	TCEQ SOP, V1	00222	NA	NA	NA	NA	NA	field
Max Daily pH	Standard units	TCEQ SOP, V1	00215	NA	NA	NA	NA	NA	field
Min Daily pH	Standard units	TCEQ SOP, V1	00216	NA	NA	NA	NA	NA	field
# pH measurements during 24-Hrs.	# meas.	TCEQ SOP, V1	00223	NA	NA	NA	NA	NA	field

* Reporting to be consistent with SWQM guidance and based on measurement capability.
*** To be routinely reported when collecting data from perennial pools.

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

References for Table A7.1:

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

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

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

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

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

Ambient Water Reporting Limits (AWRLs)

The AWRL establishes the reporting specification at **or below** which data for a parameter must be reported to be compared with freshwater screening criteria. The AWRLs specified in Table A7.1 are the program-defined reporting specifications for each analyte and yield data acceptable for the TCEQ's water quality assessment. The limit of quantitation (formerly known as the reporting limit) is the minimum level, concentration, or quantity of a target variable (e.g., target analyte) that can be reported with a specified degree of confidence. The following requirements must be met in order to report results to the CRP:

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

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

Precision

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

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

Laboratory precision is assessed by comparing replicate analyses of laboratory control samples in the sample matrix (e.g. deioinized water, sand, commercially available tissue)or sample/duplicate pairs in the case of bacterial analysis. Precision results are compared against measurement performance specifications and used during evaluation of analytical performance. Program-defined measurement performance specifications for precision are defined in Table A7.1.

Bias

Bias is a statistical measurement of correctness and includes multiple components of systematic error. A measurement is considered unbiased when the value reported does not differ from the true value. Bias is determined through the analysis of laboratory control samples and LOQ Check Standards prepared with verified and known amounts of all target analytes in the sample matrix (e.g. deioinized water, sand, commercially available tissue) and by calculating percent recovery. Results are compared against measurement performance specifications and used during evaluation of analytical performance. Program-defined measurement performance specifications for bias are specified in Table A7.1.

Representativeness

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

Comparability

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

Completeness

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

A8 SPECIAL TRAINING/CERTIFICATION

New field personnel receive training in proper sampling and field analysis. Before actual sampling or field analysis occurs, they will demonstrate to the ANRA Project Manager (or designee) their ability to properly calibrate field equipment and perform field sampling and analysis procedures. Field personnel training is documented and retained in the personnel file and will be available during a monitoring systems audit.

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

A9 DOCUMENTS AND RECORDS

The documents and records that describe, specify, report, or certify activities are listed in Table A9.1.

Table A9.1 Project Documents and Records

Document/Record	Location	Retention (yrs)	Format
QAPPs, amendments and appendices	ANRA Office/ LCRA Laboratory	Five	Paper, Electronic
Field SOPs	ANRA Office	Five	Paper, Electronic
Laboratory Quality Manuals	ANRA Office/ LCRA Laboratory	Five	Paper, Electronic
Laboratory SOPs	ANRA Office/ LCRA Laboratory	Five	Paper, Electronic
QAPP distribution documentation	ANRA Office	Five	Paper
Field staff training records	ANRA Office	Five	Paper
Field equipment calibration/maintenance logs	ANRA Office	Five	Paper
Field instrument printouts	ANRA Office	Five	Paper
Field notebooks or data sheets	ANRA Office	Five	Paper
Chain of custody records	ANRA Office/ LCRA Laboratory	Five	Paper
Laboratory calibration records	ANRA Office/ LCRA Laboratory	Five	Paper
Laboratory instrument printouts	ANRA Office/ LCRA Laboratory	Five	Paper
Laboratory data reports/results	ANRA Office/ LCRA Laboratory	Five	Paper
Laboratory equipment maintenance logs	ANRA Office/ LCRA Laboratory	Five	Paper
Corrective Action Documentation	ANRA Office	Five	Paper

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 NELAC standards (Section 5.5.10) 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
- LOQ and LOD (formerly referred to as the reporting limit and the method detection limit, respectively), and qualification of results outside the working range (if applicable)
- Certification of NELAC compliance on a result by result basis
- 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); equipment, trip, and field blank results (as applicable); and RL confirmation (% recovery)
- Narrative information on QC failures or deviations from requirements that may affect the quality of results or is necessary for verification and validation of data.

All final ANRA Laboratory reports will be hand delivered to the ANRA Data Manager in a timely manner.

Electronic Data

Data will be submitted electronically to the TCEQ in the Event/Result file format described in the CRP Guidance. A completed Data Summary (see example in Appendix E) will be submitted with each data submittal. The sub-tier participant data is included and processed like all other CRP data once copies of the laboratory reports and field sheets are provided to the ANRA Data Manager. The data from the LCRA Laboratory will be included and processed like all other CRP data once copies of the laboratory reports are provided to the ANRA Data Manager.

B1 SAMPLING PROCESS DESIGN

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

B2 SAMPLING METHODS

Field Sampling Procedures

Field sampling will be conducted according to procedures documented in the *TCEQ Surface Water Quality Monitoring Procedures Volume 1: Physical and Chemical Monitoring Methods for Water, Sediment, and Tissue, 2003.(RG-415) and Volume 2: Methods for Collecting and Analyzing Biological Community and Habitat Data* (*RG-416)*. Additional aspects outlined in Section B below reflect specific requirements for sampling under the Clean Rivers Program and/or provide additional clarification.

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

Table B2.1 Sample Storage, Preservation and Handling Requirements

Parameter	Matrix	Container	Preservation	Sample Volume	Holding Time
TSS	water	PCP or N	Refrigerate @ 4^0C*	500	7 days
TDS	water	PCP or N	Refrigerate @ 4^0C*	500	7 days
Ammonia -N	water	PCP or N	Acidify with H_2SO_4 to pH<2, Refrigerate @ 4^0C*	500	28 days
Nitrate+Nitrite	water	PCP or N	Acidify with H_2SO_4 to pH<2, Refrigerate @ 4^0C*	150	28 days
Phosphorus, total	water	PCP or N	Acidify with H_2SO_4 to pH<2, Refrigerate @ 4^0C*	150	28 days
Orthophosphate	water	PCP or N	Filter in field (<15 minutes) ; Refrigerate @ 4^0C*	150	48 hours
Chlorophyll a	water	PCP or N, brown	Refrigerate @ 4^0C*, keep in dark; filter within 48 hours	500	Frozen filters up to 28 days
E. coli	water	SPS	Refrigerate @ 4^0C*	100	6 Hours
Chloride	water	PCP or N	Refrigerate @ 4^0C*	250	28 Days
Sulfate	water	PCP or N	Refrigerate @ 4^0C*	250	28 Days
Total Hardness	water	CG or PCP	HNO_3 to pH <2, Refrigerate @ 4^0C*	250	6 months

* Preservation performed immediately upon collection (within 15 minutes)

Container Key: C = Cubitainer; A = Amber Glass; B = Borosilicate Glass; VOC = TOC/Volatile Organic Viles; N = Nalgene; CG = Clear Glass; SPS = Sterile Polystyrene; PCP=PreCleaned HDPE/LDPE

Sample Containers
All sample containers will meet the requirements as outlined in Table B2.1. Sample containers (pre-cleaned polyethylene) are purchased pre-cleaned for conventional parameters and are disposable. Sterile Polystyrene (100ml) or Sterile Polyethylene (250ml) bottles with 1% sodium thiosulfate powder are used for bacteriological samples. All non-disposable glassware and plastics are washed and rinsed throughly by the laboratory before reuse. Reusable bottles are washed in a dishwasher using non-phosphate detergents and rinsed with hot tap water. They are final-rinsed by hand with deionized water in the laboratory. A detergent residue test (DRT) is performed on each batch of sample bottles. Results of the DRT are maintained in a log book by the laboratory. Certificates are maintained in a notebook by the ANRA or by the laboratory.

Processes to Prevent Contamination

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

Documentation of Field Sampling Activities

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

1. Station ID
2. Sampling Date
3. Location
4. Sampling depth
5. Sampling time
6. Sample collector's name/signature
7. Values for all field parameters
8. Detailed observational data, including:
    - water appearance
    - weather
    - biological activity
    - unusual odors
    - pertinent observations related to water quality or stream uses (e.g., exceptionally poor water quality conditions/standards not met; stream uses such as swimming, boating, fishing, irrigation pumps, etc.)
    - watershed or instream activities (events impacting water quality, e.g., bridge construction, livestock watering upstream, etc.)
    - specific sample information (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.

Deficiencies, Nonconformances and Corrective Action Related to Sampling Requirements

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

Deficiencies are documented in logbooks, field data sheets, etc. by field or laboratory staff and reported to the cognizant field or laboratory supervisor who will notify the ANRA Project Manager. The ANRA Project Manager will notify the ANRA QAO of the potential nonconformance. The ANRA QAO will initiate a Nonconformance Report (NCR) to document the deficiency.

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

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

B3 SAMPLE HANDLING AND CUSTODY

Sample Tracking

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

A sample is in custody if it is in actual physical possession or in a secured area that is restricted to authorized personnel. The Chain of Custody (COC) form is a record that documents the possession of the

samples from the time of collection to receipt in the laboratory. The following information concerning the sample is recorded on the COC form (See Appendix D). The following list of items matches the COC form in Appendix D.

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

Sample Labeling

Samples from the field are labeled on the container (*or on a label; please specify*) with an indelible marker. Label information includes:

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

Sample Handling

ANRA field data sheets (Appendix C) are supplied to all field personnel prior to initiation of collection procedures. The field data sheets have spaces dedicated to recording of all pertinent field observations and water quality parameters. The field staff has the prime responsibility to insure that all pertinent information is recorded correctly and in the proper units. All field data sheets will be kept on file at ANRA in designated field sheet log books (3-ring binders).

All samples brought to the ANRA Laboratory are examined for proper documentation, holding times, sample temperature, and preservation by the ANRA Sample Custodian. The Sample Custodian accepts delivery by signing the final portion of the official COC submitted with the samples. The accepted samples are assigned a unique laboratory sample identification (ID) number and immediately recorded into the ANRA Laboratory Log Book. The sample information from the COC is then entered into the ANRA Laboratory Computerized Database System. It is the responsibility of the sample custodian to log-in collected water samples in the proper format, and to record the unique laboratory sample ID number on the sample container. The sample container is placed in the proper laboratory refrigerator by the sample custodian.

Samples to be sent to a contract laboratory are relinquished by the sample custodian when they are deemed acceptable after a thorough inspection of the sample documentation, preservation, hold times, and containers. The samples are then packed on ice in a cooler to maintain a 4^{o}C or cooler temperature

and sealed with a custody seal to ensure that samples are not disturbed in transfer. The sealed cooler, containing sample containers and COC forms, is then received by the sample transporter and transported to the contract laboratory, where it is relinquished by the sample transporter. The contract laboratory inspects the custody seal and sample containers to be sure that the samples have not been tampered with. After this examination, the samples are received by the contract laboratory. If the samples are further sent to another contract laboratory, the above process is carried out again until the samples are received and analyzed.

Samples being analyzed by the LCRA Laboratory will be received by the ANRA Laboratory sample custodian who will sign the COC indicating the receipt of the samples. Sample water temperatures are checked to document that the samples have been cooled properly. The samples will be prepared and preserved for shipment to the LCRA Laboratory. The sample custodian will log and monitor the progress of the samples through the analysis stage. The ANRA sample custodian will ship samples to LCRA using a commercial mail carrier. The sampling coordinator requests overnight delivery for the samples. Proper documentation noting transfer of the samples is used at the time of sample drop off and delivery to the LCRA. The preserved samples are shipped in coolers containing ice to assist in the sample preservation. LCRA will verify the documentation of the COC and laboratory staff will sign the COC indicating receipt of the samples. The samples are checked to verify that the samples are properly preserved and that holding times have not been exceeded. If, due to extenuating circumstances, samples are required to be analyzed at a subcontract laboratory, proper chain of custody procedures are followed to show transfer of sample custody.

Proper sample custody is a joint effort of the field sampling staff, the sample transporter, and the laboratory staff. The main documentation of proper sample custody for all events up to the arrival of the sample at the laboratory is the chain-of-custody (COC) form which is provided in Appendix D. If any of the information blanks or signature locations on the COC form are not completely filled out, there is a gap in the documentation of sample custody. In such an event, the laboratory sample custodian will question whether the sample should be accepted. All data acceptance questions are referred to the Laboratory Manager and ANRA Project Manager.
The following procedures outline sample handling from collection to receipt of analytical results:

1. After a sample is transferred into the proper sample container, the container is tightly capped as quickly as possible to prevent the loss of volatile components and to exclude possible oxidation. Where appropriate, samples are preserved and/or split in the field. All samples are placed on ice immediately following field measurements and transported to the laboratory as soon as possible.

2. The container is labeled with the proper laboratory sample identification number (a unique designation) on a label securely affixed to the container. A marker with waterproof ink is used when labeling the sample container and filling out the appropriate COC form.

3. The COC form is filled out completely and accurately.

4. Samples requiring subcontractor lab analysis are delivered to the subcontract laboratory for analysis as soon as possible via ground shipment. These samples are accompanied by the COC form originated in the field and accepted by the ANRA Laboratory. The COC is relinquished by the ANRA Laboratory and is delivered to the sub-contract laboratory personnel authorized to receive samples. The date and time the sample was shipped and received by the ANRA Laboratory must be filled out, along with the ANRA Laboratory custodian relinquishment signature before the

subcontract lab accepts the sample(s). Copies of complete COC forms are returned along with subcontract laboratory analysis information.

5. A copy of the COC form is retained for ANRA records. Copies of COC forms are kept along with the laboratory analysis reports and associated field sheet(s) in the designated Monitoring Report Log Book.

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

Deficiencies are defined as unauthorized deviations from procedures documented in the QAPP or other applicable documents. Nonconformances are deficiencies which affect data quantity and/or quality and render the data unacceptable or indeterminate. Deficiencies related to chain-of-custody include but are not limited to delays in transfer, resulting in holding time violations; incomplete documentation, including signatures; possible tampering of samples; broken or spilled samples, etc.

Deficiencies are documented in logbooks, field data sheets, etc. by field or laboratory staff and reported to the cognizant field or laboratory supervisor who will notify the ANRA Project Manager. The ANRA Project Manager will notify the ANRA QAO of the potential nonconformance. The ANRA QAO will initiate a Nonconformance Report (NCR) to document the deficiencies.

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

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

B4 ANALYTICAL METHODS

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

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

Standards Traceability

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

Deficiencies, Nonconformances and Corrective Action Related to Analytical Methods

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

Deficiencies are documented in logbooks, field data sheets, etc. by field or laboratory staff and reported to the cognizant field or laboratory supervisor who will notify the ANRA Project Manager. The ANRA Project Manager will notify the ANRA QAO of the potential nonconformance. The ANRA QAO will initiate a Nonconformance Report (NCR) to document the deficiency.

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

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

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

B5 QUALITY CONTROL

Sampling Quality Control Requirements and Acceptability Criteria

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

Field 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. If less than ten samples are collected in a month, one set of field splits will be collected per month.

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

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

A 30% RPD criteria will be used to screen field split results as a possible indicator of excessive variability in the sample handling and analytical system. If it is determined that elevated quantities of analyte (i.e., > 5 times the RL) were measured and analytical variability can be eliminated as a factor, than variability in field split results will primarily be used as a trigger for discussion with field staff to ensure samples are being handled in the field correctly. Some individual sample results may be invalidated based on the examination of all extenuating information. The information derived from field splits is generally considered to be event specific and would not normally be used to determine the validity of an entire batch; however, some batches of samples may be invalidated depending on the situation. Professional judgment during data validation will be relied upon to interpret the results and take appropriate action. The qualification (i.e., invalidation) of data will be documented on the Data Summary. Deficiencies will be addressed as specified in this section under Deficiencies, Nonconformances, and Correction Action related to Quality Control.

Laboratory Measurement Quality Control Requirements and Acceptability Criteria

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

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

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

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

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

The percent recovery of the LOQ check standard is calculated using the following equation in which %R is percent recovery, SR is the sample result, and SA is the reference concentration for the check standard:

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

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

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 multipeak responses.

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

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

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

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

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

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

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

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

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

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

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

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

Percent recovery of the known concentration of added analyte is used to assess accuracy of the analytical process. The spiking occurs prior to sample preparation and analysis. Spiked samples are routinely prepared and analyzed at a rate of 10% of samples processed, or one per batch whichever is greater. A batch is defined as samples that are analyzed together with the same method and personnel, using the same lots of reagents, not to exceed the analysis of 20 environmental samples. The information from these controls is sample/matrix specific and is not used to determine the validity of the entire batch. The MS is spiked at a level less than or equal to the midpoint of the calibration or analysis range for each analyte. Percent recovery (%R) is defined as 100 times the observed concentration, minus the sample concentration, divided by the true concentration of the spike.

The results from matrix spikes are primarily designed to assess the validity of analytical results in a given matrix and are expressed as percent recovery (%R). The laboratory shall document the calculation for %R. The percent recovery of the matrix spike is calculated using the following

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

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

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

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

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

Deficiencies, Nonconformances and Corrective Action Related to Quality Control

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

Deficiencies are documented in logbooks, field data sheets, etc. by field or laboratory staff and reported to the cognizant field or laboratory supervisor who will notify the ANRA Project Manager. The ANRA Project Manager will notify the ANRA QAO of the potential nonconformance. The ANRA QAO will initiate a Nonconformance Report (NCR) to document the deficiency.

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

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

B6 INSTRUMENT/EQUIPMENT TESTING, INSPECTION AND MAINTENANCE

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

All laboratory tools, gauges, instrument, and equipment testing and maintenance requirements are contained within laboratory QM(s).

B7 INSTRUMENT CALIBRATION AND FREQUENCY

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

Detailed laboratory calibrations are contained within the QM(s).

B8 INSPECTION/ACCEPTANCE OF SUPPLIES AND CONSUMABLES

No special requirements for acceptance are specified for field sampling supplies and consumables. The laboratory QM will include any special requirements for laboratory-related supplies and consumables.

B9 NON-DIRECT MEASUREMENTS

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

B10 DATA MANAGEMENT

Data Management Process

It is imperative that Clean Rivers Program data and associated applications be maintained and managed in a manner consistent with the development and use of the data. For scientifically valid results, the data, program applications, and reports must be handled in an orderly and consistent manner. Documented quality assurance and quality control checks/procedures are applied to all received data sets, individual data points and data manipulation programs.

Data to be incorporated into the ANRA database is subject to varying levels of review. The QA/QC checks evaluate each data set as a whole, and the validity of individual data points.

Each data set to be processed into the database is evaluated for any problems that might impose a limitation on the use of the data. This check is performed prior to processing/importing to the database. The following information is considered:

a. Credibility of data source
b. Acceptable QA/QC procedures
c. Intended use of the data
d. Frequency of data collection/impact of missed sampling events
e. Sample size
f. Sample collection and preservation methods
g. Field and laboratory test procedures
h. General documentation

Upon passing the evaluation of a data set's limitations, the data is incorporated into the ANRA Database. Initially the data is entered, either manually or electronically, into a set of working directory files that are consistent with the ANRA Database file structures. In the event that a deviation is found in the data set, the corresponding data points will be coded with a "D" in the remarks section of the Results Table.

Electronic data input procedures vary according to the source and format of the data. Manual data input will be made to appropriately structured MS Access tables. Standardized procedures are followed to ensure proper data entry.

The data dictionary has been adopted and maintained to provide information on each data field of each database. The TCEQ data dictionary has been adopted and will be updated as necessary.

After the data/data sets have been input/converted into an appropriate working directory database, the individual data points will be evaluated to determine their reasonableness. Data values that are considered outliers will be discarded or coded prior to entry into the records directory. The criteria for determination of outliers will be based on individual data sets being processed for entry into the TCEQ database. Once the data set is complete, any individual points falling outside the most recent Max/Min range as defined by the TCEQ SWQM Parameters Table will be considered outliers. If an outlier does occur, then it will be noted in the remark section of the database and verified against the original data report, and if necessary, verified by the laboratory. After verification, outliers will either be assigned the appropriate remark code or documented as verified with a 1 in the verify_flg section of the results table.

Once the Data has passed all of the QA/QC checklists specified in this QAPP, it is then transferred from the ANRA Data Clearinghouse to the TCEQ Project Manager using email. Only data entered since the last data transfer, previous data sets not included in a data transfer, and/or revised data sets are transferred. The tag series transferred is documented on the Data Summary (QAPP Appendix E) that is submitted to the TCEQ upon the completion of the data transfer. All QA data sets associated with the data transfer will be submitted in the form of a QA Table. The files are

transferred as pipe delimited text files to the TCEQ Project Manager.

After the Data has been transferred, reviewed, and loaded into the TCEQ Database, the same Data will either be uploaded to the on-line database at www.anra.org, or a link provided to the TECQ's Surface Water Quality Web Reporting Tool at http://www8.tceq.state.tx.us.SwqmisWeb/public/index.faces for public access. Also, electronic and/or hard copies of the data will be available upon request from ANRA.

Data Errors and Loss

To prevent loss of data and minimize errors, all data generated under this QAPP are verified against the appropriate quality assurance checks as defined in the QAPP, including but not limited to chain of custody procedures, field sampling documentation, laboratory analysis results, and quality control data.

The data are also verified by comparing 10% of the data in the database to hard copy reports as a check against transcription errors.

Backup/Disaster Recovery Requirements

All data associated with the CRP database and network files are completely backed-up daily. See record keeping and data storage section below for more details. The IBM Server PC is protected by an Internet Office UPS with battery backup and surge protection to safely work through blackouts and save open network files.

Should the computer system or software fail, ANRA will request the assistance of a Computer/Network Specialist to evaluate the probable cause of the failure, methods to prevent reoccurrence of the problem, and guide recovery of the system. The archived tape backups will allow for complete recovery of the hard disk drive contents.

Record Keeping and Data Storage

A three ring binder will be used as a data set log to track all hard copy data sets associated with the ANRA Database. The database management log will also record the structure of tables, data modifications and updates, and record of dates for all file revisions.

Complete original electronic data sets are archived on 40GB backup tapes via an internal tape drive with MS Windows 2000 Server software. Electronic data are backed up on a daily basis Monday through Friday of each work week. The weekly tapes in use are stored at an off-site location to prevent loss due to a disaster such as fire or flood. These tapes are maintained indefinitely until they are replaced by a new set of backup tapes. The original hard copies of field data sheets and laboratory reports are stored in binders at the ANRA offices for a minimum period of seven years.

Data Handling, Hardware, and Software Requirements

Based upon the needs of CRP data management activities and subject to available CRP resources, ANRA has put into place an electronic data processing system consisting of a network with the following configuration:

Hardware

IBM Server-Pentium III 1.3GHz, (2) 40GB hard drive (mirrored) 256MB RAM, internal tape drive, 3.5"-1.44MB diskette drive, 40x internal CD-ROM drive, 56k internal fax/modem, and 17" SVGA color monitor

Compaq Evo D310 - Pentium 4 1.8 GHz, 256 MB RAM, 40GB hard drive, 3.5"-1.44MB diskette drive, 40x internal CD-ROM drive, 56k internal fax/modem, and 19" SVGA color monitor

HP D330 - Pentium 4 2.4Ghz, 256MB RAM, 40 GB Hard Drive, 3.5"-1.44MB diskette drive, 40x internal CD-ROM drive, 56k internal fax/modem, and 17" SVGA color monitor

HP LaserJet 1320 Printer
Samsung CLP-510N Color Printer
HP Scanjet 5300 Cse Scanner

Software

Network System: MS Windows 2000 Serve
General Software:
Corel WordPerfect Office 2000 - Wordperfect 9, Quattro Pro 9, Paradox 9
Microsoft Office - Word 2002, Excel 2002, Access 2002, Outlook 2002, Publisher 2002, Front Page 2002
GPS/GIS Software: ESRI ArcView 3.2a, ESRI ArcGIS 8.3, Trimble Pathfinder Office 3.0

ANRA utilizes MS Access 2002 as the primary database management software. ANRA's Water Quality Database has been developed according to CRP guidance and database structures in accordance with TCEQ requirements.

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. The Clean Rivers Program grantees do not create TCEQ certified locational data using Global Positioning System (GPS) equipment. GPS equipment may be used as a component of the information required by the Station Location (SLOC) request process, but TCEQ staff are responsible for creating the certified locational data that will ultimately be entered into the TCEQ's Surface Water Quality Monitoring database. Any information developed by Clean Rivers Program grantees using a Geographic Information System (GIS) will be used solely to meet deliverable requirements and will not be submitted to the TCEQ as a certified data set. Because the

Clean Rivers Program grantees do not create certified locational data, TCEQ's OPP 8.11 and 8.12 do not apply.

C1 ASSESSMENTS AND RESPONSE ACTIONS

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

Table C1.1 Assessments and Response Requirements

Assessment Activity	Approximate Schedule	Responsible Party	Scope	Response Requirements
Status Monitoring Oversight, etc.	Continuous	ANRA	Monitoring of the project status and records to ensure requirements are being fulfilled	Report to TCEQ in Quarterly Report
Monitoring Systems Audit of Basin Planning Agency	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 Subparticipants	Dates to be determined by the ANRA One per contract period.	ANRA	Field sampling, handling and measurement; facility review; and data management as they relate to CRP	30 days to respond in writing to the ANRA. PA will report problems to TCEQ in Progress Report.
Laboratory Inspection	Dates to be determined by TCEQ	TCEQ Laboratory Inspector	Analytical and quality control procedures employed at the laboratory and the contract laboratory	30 days to respond in writing to the TCEQ to address corrective actions

Corrective Action

The ANRA Project Manager is responsible for implementing and tracking corrective action resulting from audit findings outlined in the audit report. Records of audit findings and corrective actions are maintained by both the CRP and the ANRA Project Manager. Audit reports and corrective action documentation will be submitted to the TCEQ with the Progress Report.

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

C2 REPORTS TO MANAGEMENT

Reports to ANRA Project Management

The ANRA Project Manager is charged with the responsibility to report the status of implementation and application of the quality assurance procedures described in this QAPP and thereby the status of data quality. It is imperative that the Project Manager is properly informed of any quality assurance problems encountered and assists in the development and implementation of corrective actions. This information will be provided to the Project Manager by the ANRA QAO, Data Manager, Field Personnel and/or any performance auditor through the completion of reports. These reports may include but are not limited to the following: analytical and QC summary reports from the laboratory, field QC results and calibration records, and a data review checklist. These reports will be provided to the Project Manager as requested. The data summary is submitted to the Project Manager before each database transfer to the TCEQ. Other reports may include any corrective action forms, correspondence, etc. describing corrective actions or implementation of new processes to ensure that quality assured data are produced.

Reports to TCEQ Project Management

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

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

Reports by TCEQ Project Management

Contractor Evaluation - The ANRA 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 will be reviewed and verified for integrity and continuity, reasonableness, and conformance to project requirements, and then validated against the project objectives and measurement performance specifications which are listed in Section A7. Only those data which are supported by appropriate quality control data and meet the measurement performance specifications defined for this project will be considered acceptable, and will be reported for entry into SWQMIS.

D2 VERIFICATION AND VALIDATION METHODS

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

Data review, verification, and validation will be performed using self-assessments and peer and management review as appropriate to the project task. The data review tasks to be performed by field and laboratory staff are listed in the first two sections of Table D2.1, respectively. Potential errors are identified by examination of documentation and by manual *(or computer-assisted)* examination of corollary or unreasonable data. If a question arises or an error is identified, the manager of the task responsible for generating the data is contacted to resolve the issue. Issues which can be corrected are corrected and documented. If an issue cannot be corrected, the task manager consults with higher level project management to establish the appropriate course of action, or the data associated with the issue are rejected. Field and laboratory reviews, verifications, and validations are documented.

After the field and laboratory data are reviewed, another level of review is performed once the data are combined into a data set. This review step as specified in Table D2.1 is performed by the ANRA Data Manager and QAO. Data review, verification, and validation tasks to be performed on the data set include, but are not limited to, the confirmation of laboratory and field data review, evaluation of field QC results, additional evaluation of anomalies and outliers, analysis of sampling and analytical gaps, and confirmation that all parameters and sampling sites are included in the QAPP.

Another element of the data validation process is consideration of any findings identified during the monitoring systems audit conducted by the TCEQ CRP Lead Quality Assurance Specialist. Any issues requiring corrective action must be addressed, and the potential impact of these issues on previously collected data will be assessed. After the data are reviewed and documented, the ANRA 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 Basin ANRA Data Manager with the data. This information is communicated to the TCEQ by the ANRA in the Data Summary.

Table D2.1: Data Review Tasks

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

D3 RECONCILIATION WITH USER REQUIREMENTS

Data produced in this project, and data collected by other organizations (e.g., USGS, TCEQ, etc.), will be analyzed and reconciled with project data quality requirements. Data meeting project requirements will be used by the TCEQ for the *Texas Water Quality Inventory and 303(d) List* in accordance with TCEQ's *Guidance for Assessing Texas Surface and Finished Drinking Water Quality Data*, and for TMDL development, stream standards modifications, and permit decisions as appropriate. Data which do not meet requirements will not be submitted to SWQMIS nor will be considered appropriate for any of the uses noted above.

Appendix A:
Task 3 Workplan

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 coordination of 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
- special study, intensive monitoring targeted to:
- Identify sources and causes
- assess priority water quality issues
- obtain background water quality information
- provide information for setting site-specific permit effluent limits
- evaluate & develop statewide, regional, and site-specific water quality standards

Task Description: **Monitoring Description**

In FY 2008, ANRA will monitor a minimum of 22 sites quarterly (4 times per year) for conventional, bacteria (E. coli), flow (stream sites only), and field parameters. ANRA will collect 24 hour dissolved oxygen data at a minimum of 1 site twice per year.

In FY 2009, ANRA will monitor at a similar level of effort as FY 2008. The final number of sites, location, frequency, and parameters collected for FY 2009 will be based on priorities identified at the basin Steering Committee and Coordinated Monitoring meetings and included in the amended Appendix B schedule of the QAPP.

All monitoring procedures and methods will follow the guidelines prescribed in the ANRA FY 08-09 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 - ANRA will hold an annual coordinated monitoring meeting. Qualified monitoring organizations will be invited to attend the working meeting in which monitoring needs and purposes will be discussed segment by segment and station by station. Information from participants and stakeholders will be used to select stations and parameters that will enhance overall water quality monitoring coverage, eliminate duplication of effort, and address basin priorities.The changes to the monitoring schedule will be entered into the statewide database on the Internet (http://cms.lcra.org) and communicated to meeting attendees. Changes to monitoring that occur during the course of the year will be entered into the statewide database on the Internet and communicated to meeting attendees.

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

Permit Support Monitoring
A summary report of permit support flow monitoring will be submitted at the end of each sampling year. The summary report will include a map, photos, a summary of the flow monitoring data, and a summary of other water quality data collected during the flow monitoring event(s). The summary report must include copies of flow monitoring data sheets (see Exhibit 3A of the CRP Guidance). Receiving Water Assessment (RWA) Reports with color photos (see the Biological Data Reporting Packet, Exhibit 3D in the CRP Guidance, for more information) will be submitted no later than six months before the permit renewal date.

Equipment: No new equipment is requested.

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

A. Conduct water quality monitoring, summarize activities, and submit with Progress Report - December 15, 2007; March 15 and June 15, 2008
B. Coordinated Monitoring Meeting - between March 15 and April 30, 2008
C. Email notification with summary of changes that Coordinated Monitoring Schedule updates are complete - May 31, 2008
D. Permit Support Data Report, as applicable - coordinate due date(s) with TCEQ Project Manager

September 1, 2008 through August 31, 2009

A. Conduct water quality monitoring, summarize activities, and submit with Progress Report - September 15 and December 15, 2008; March 15 and June 15 and August 31, 2009
B. Coordinated Monitoring Meeting - between March 15 and April 30, 2009
C. Email notification with summary of changes that Coordinated Monitoring Schedule updates are complete - May 31, 2008
D. Permit Support Data Report, as applicable - coordinate due date(s) with TCEQ Project Manager

ANRA Clean Rivers Program

FY 2008/2009 QAPP - Appendix B Monitoring Schedule for FY 2008

Appendix B Sampling Process Design and Monitoring Schedule (plan)

Sample Design Rationale

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

Comprehensive work plans are developed based upon Steering Committee input, achievable water quality objectives, identification of water quality issues, and available funding resources. Annually, ANRA conducts a coordinated monitoring meeting to develop monitoring plans for the Upper Neches River basin in cooperation with the other basin monitoring entities. Through this annual effort with the TCEQ and other participants, ANRA ensures a comprehensive water monitoring strategy in the basin. ANRA also utilizes the recommendations and conclusions from recent water quality assessments to direct future monitoring efforts. The TCEQ's 2006 Texas Water Quality Inventory and 303(d) List were used to establish current monitoring priorities in the basin and aid in the development of the coordinated monitoring schedule.

In general, ANRA utilizes fixed station or routine monitoring as a baseline study to document long-term water quality conditions and trends over all seasonal and flow conditions. Routine stations are chosen based on pertinent information such as site representativeness, land use, population centers, permitted outfalls, and historical data in an effort to represent natural conditions throughout the entire basin. In the event that a water quality issue is identified through an assessment, ANRA will concentrate efforts in that particular watershed through additional routine and/or bias to season monitoring efforts. In some cases, special studies may be necessary to identify potential sources of pollution. By utilizing this approach of prioritizing issues and coordinating efforts, ANRA can effectively manage the water quality monitoring program in the Upper Neches River Basin.

Site Selection Criteria

This data collection effort involves monitoring routine water quality, using procedures that are consistent with the TCEQ SWQM program, for the purpose of data entry into the statewide database maintained by the TCEQ. To this end, some general guidelines are followed when selecting sampling sites, as basically outlined below, and discussed thoroughly in the TCEQ Surface Water Quality Monitoring Procedures, Volume 1 (RG-415). Overall consideration is given to accessibility and safety. All monitoring activities have been developed in coordination with the CRP Steering Committee and with the TCEQ.

1. Locate stream sites so that samples can be safely collected from the centroid of flow. Centroid is defined as the midpoint of that portion of stream width which contains 50 percent of the total flow. If few sites are available for a stream segment, choose one that would best represent the

water body, and not an unusual condition or contaminant source. Avoid backwater areas or eddies when selecting a stream site.

2. At a minimum for reservoirs, locate sites near the dam (reservoirs) and in the major arms. Larger reservoirs might also include stations in the middle and upper (riverine) areas. Select sites that best represent the water body by avoiding coves and back water areas. A single monitoring site is considered representative of 25 percent of the total reservoir acres, but not more than 5,120 acres.

3. Routine monitoring sites are selected to maximize stream coverage or basin coverage. Very long segments may require more stations. As a rule of thumb, stream segments between 25 and 50 miles long require two stations, and longer than 50 miles require three or more depending on the existence of areas with significantly different sources of contamination or potential water quality concerns. Major hydrological features, such as the confluence of a major tributary or an instream dam, may also limit the spatial extent of an assessment based on one station.

4. Because historical water quality data can be very useful in assessing use attainment or impairment, it may be best to use sites that are on current or past monitoring schedules.

5. All classified segments (including reservoirs) should have at least one routine monitoring site that adequately characterizes the water body., 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 for fiscal year 2008 are presented on the following page.

Monitoring Sites for FY *2008*

The sample design for surface water quality monitoring is shown in the attached table B1.1.

Table B1.1 Sample Design and Schedule, **FY *2008***

ANRA Monitoring Parameters by Category in attachment:

Field - Dissolved oxygen, pH, conductivity, water temperature
Conventional - Sulfate, Chloride, TSS, TDS, Total Phosphorus, Orthophosphate, Total Nitrate+Nitrite, Ammonia-Nitrogen, Chlorophyll-a, Pheophytin
Bacteria - E. coli
Flow - Instream Flow or Flow Estimate
24 Hour - Field Parameters only

The attached basin maps are provided to identify the general locations of all monitoring stations in the FY 2008 schedule presented in the attached monitoring schedule. *(Will be added)*

Critical vs. non-critical measurements

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

Appendix C:
Field Data Sheets

FIELD DATA SHEET

ANGELINA & NECHES RIVER AUTHORITY
P.O. BOX 387 / 210 LUFKIN AVE.
LUFKIN ,TEXAS 75902-0387
(936) 632-7795

Sample Location:_____

Station ID:_____ **Date Collected:**_____

Sample Matrix: **Water** **Time Collected:**_____

Collector(s) Name/Signature:_____

Sample Type:_____ **Sample Depth:**_____

Field Tests and Measurements:			**Parameters Collected**:			
	pH (standard units)	00400		E. Coli		Pheophytin-a
	Water Temperature ^{o}C	00010		TSS		Chloride
	Air Temperature ^{o}C	00020		TDS		Sulfate
	Dissolved Oxygen (mg/L)	00300		Ammonia-N		Other:
	Specific Conductance (µS/cm)	00094		T. NO_3+NO_2		Field Split
	Secchi Depth (meters)	00078		D. Orthophosphate		
	Total Water Depth (meters)	82903		T. Phosphorus		
	Instant. Stream Flow (cfs)	00061		Chlorophyll-a		

Field Observations:	
	01351 - Flow Severity (1-no flow, 2- low, 3-normal, 4-flood, 5-high, 6-dry)
	89835 - Flow measurement method (1-gage, 2-electric, 3-mechanical, 4-weir/flume, 5-doppler)
	72053 - Days since last significant rainfall
	89966 - Present Weather (1-clear, 2-partly cloudy, 3-cloudy, 4-rain, 5-other)
	74069 - Stream Flow Estimate (cfs) **Required measurements to calculate flow estimates
	Stream Width (feet)**
	Average Depth of Stream (feet)**
	Distance Object Travels (feet)**
	Time for Object to Travel Distance (seconds)**
	COMMENTS:

Appendix D:
Chain-of-Custody Forms

ANRA CRP Chain-of-Custody Form will be attached.

Appendix E:

Data Summary

Data Information

Data Source: _____
Date Submitted: _____
Tag_id Range: _____
Date Range: _____

Comments

Please explain in the space below any data discrepancies including:

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

_____

_____

_____

_____

_____

_____

_____

Planning Agency Data Manager:_____

Date:_____

ATTACHMENT 1
Example Letter to Document Adherence to the QAPP

TO: (name)
(organization)

FROM: Angelina Neches River Authority

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

(address)

I acknowledge receipt of the Upper Neches River Basin Surface Water Quality Monitoring Program Quality Assurance Project Plan**,** Revision Date". I understand the document(s) describe quality assurance, quality control, data management and reporting, and other technical activities that must be implemented to ensure the results of work performed will satisfy stated performance criteria.

_____

Signature Date

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

ATTACHMENT 3: Preferred Program Codes

PROGRAM CODE (MONITORING TYPE)

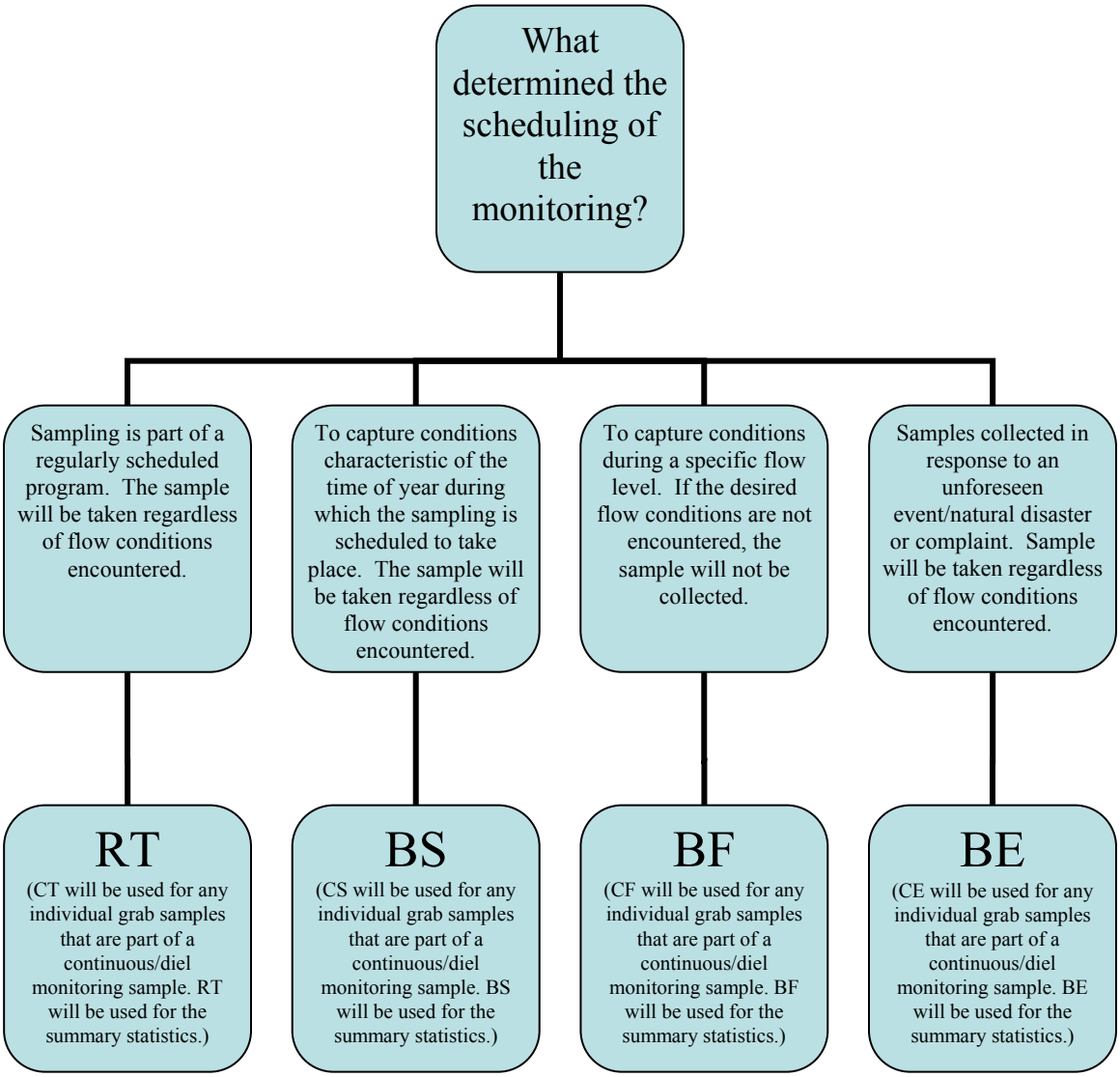
Program Code	Definition
RT	Routine -- Monitoring not intentionally targeted toward any environmental condition or event.
BS	Biased-Season -- Monitoring targeted toward a certain time of year (for example, critical or index period).
BF	Biased-Flow -- Monitoring targeted toward certain flow conditions (for example, runoff events).
BE	Biased-Event -- Monitoring targeted toward a specific event (for example, fish kill or spill).
CT[1]	Continuous-Routine -- Continuous monitoring not intentionally targeted toward any environmental condition (the summary statistics are coded RT).
CS[1]	Continuous-Season -- Continuous monitoring targeted toward a certain time of year (the summary statistics are coded BS).
CF[1]	Continuous-Flow -- Continuous monitoring targeted toward certain flow conditions (the summary statistics are coded BF).
CE[1]	Continuous-Event -- Continuous monitoring targeted toward a specific event (the summary statistics are coded BE).
CQ[1]	Continuous-QA -- Continuous monitoring QA samples.
CD	Continuous Data – data submitted via LEADS (monitoring intent not characterized)
QA	Quality Assurance -- QA samples.

[1]Continuous monitoring samples include CWQMN and the individual grab samples that are collected during continuous sonde deployments such as 24-hr DO monitoring.

The use of the following Program Codes will be discontinued on 9/1/2007: BN, CM, DI, FL, IS, NA, NI, NS, RG, RS, RW, SS, TI, TN, TQ, TS, XS, XR.

The new Program Codes are designed to answer the main question of bias in sampling, so the decision of what code to use is determined by any targeting of the sampling:

- "RT" samples are scheduled in advance without intentionally trying to target any certain environmental condition. The sample is collected regardless of the conditions encountered.
- "BS" samples are scheduled for a certain time of year because the sample is meant to capture the conditions characteristic of that time of year. The sample will be taken regardless of the flow condition encountered.
- "BF" samples cannot be precisely scheduled in advance because they target a certain flow condition that must be present in order for the sample to be taken.
- "BE" samples are not typically scheduled in advance, but are reactive to an emergency condition.



EXAMPLES

RT

- Regularly scheduled (quarterly, monthly, weekly) planned monitoring where the sample will be taken regardless of environmental conditions encountered.
- Sampling to support a certain project AS LONG AS the monitoring is not targeting an environmental or temporal condition.
- Sampling at stations on a rotational or systematic basis AS LONG AS the monitoring is not targeting an environmental or temporal condition.
- The summary statistics of 24hr monitoring that is NOT purposefully scheduled for a certain time of year (for example, scheduled monthly).
- Biological sampling NOT purposefully scheduled for a certain time of year (for example, quarterly).
- Sampling on an intermittently flowing waterbody or spring scheduled for those time periods when flow is likely to be encountered NOT because conditions during those time periods are trying to be captured.
- Routine monitoring on tidal waterbodies.
- Most fish tissue sampling.
- Most sediment sampling.
- Flow monitoring studies with regularly scheduled sampling events.

BS

- The summary statistics of 24hr monitoring that is purposefully scheduled for a certain time of year (for example, critical/index periods). Reporting of the individual grabs that make up the 24hr event would be CS.
- Biological sampling purposefully scheduled for a certain time of year (for example, critical/index periods).
- WLEs/RWAs scheduled to try to capture conditions during the index or critical periods.
- Habitat studies.
- ALA/ALM/UAAs that target the critical period.

BF

- Monitoring under a study designed to collect samples during runoff events.
- A water rights study that targets flows below 7Q2 (that is, the sample is only taken if flow is below 7Q2).
- A study of a tidal waterbody that targeted at specific tidal conditions.

BE – Usually not previously planned

- Fish kill investigation.
- Monitoring in response to a significant natural disaster (for example, hurricane) to capture conditions directly caused by the disaster.
- Sampling spills.
- Complaint investigations.