Instructions for Using
the Clean Rivers Program
Quality Assurance Project Plan Shell Document

The attached shell document was developed for use by Clean Rivers Program Basin Planning Agencies in preparing Quality Assurance Project Plans (QAPPs) covering **fiscal years ~~2010 and 2011~~2012 and 2013.** Instructions for preparation of the QAPPs are provided throughout the document.

This QAPP shell does not apply to and should not be used for data collection for federally funded programs or projects. A standalone QAPP should be developed and approved by the appropriate TCEQ staff.

The shell language is to be used by Basin Planning Agencies in their QAPPs only to the extent that the language accurately and completely depicts Basin Planning Agency organizational structures, project responsibilities, project background, and project requirements, activities, and procedures. *Italicized text* in the shell provides instructions or information to QAPP preparers and should be deleted from the QAPP before submission to TCEQ. Highlighted text indicates titles or other language that must be replaced (e.g., name and address of the Basin Planning Agency, name of Basin Planning Agency Project Manager, etc.).

The *Clean Rivers Program Guidance and Reference Guide* provides additional information concerning QAPP preparation and submission. Questions concerning QAPP requirements may be directed to TCEQ Clean Rivers Program Project Managers and the TCEQ Quality Assurance Specialist.

NAME OF PROJECT
Quality Assurance Project Plan

Basin Planning Agency
Address
City, Texas Zip Code

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

Effective Period: FY ~~2010 to FY 2011~~2012 to FY 2013

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

Name (Basin Planning Agency Representative)
Title
Address
City, Texas Zip Code
(XXX) XXX-XXXX
email@address

A1 APPROVAL PAGE

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Water Quality Planning Division

Laurie Curra, Manager Date
Water Quality Monitoring & Assessment Section

Allison Woodall, Work Leader Date
Clean Rivers Program

Jennifer Delk Date
Project QA Specialist
Clean Rivers Program

Name Date
Project Manager, Clean Rivers Program

Nancy Ragland, Team Leader Date
Data Management and Analysis

~~Compliance~~ Field Operations Support Division

Stephen Stubbs Date
TCEQ Quality Assurance Manager

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

NAME OF BASIN PLANNING AGENCY

Name Date	Name Date
Basin Planning Agency Project Manager	Basin Planning Agency Quality Assurance Officer

NAME OF LABORATORY

Name Date	Name Date
Laboratory Manager	Laboratory Quality Assurance Officer

The Basin Planning Agency 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 Basin Planning Agency 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

AWRL	**Ambient Water Reporting Limit**
BMP	**Best Management Practices**
CAP	**Corrective Action Plan**
COC	**Chain of Custody**
CRP	**Clean Rivers Program**
DOC	**Demonstration of Capability**
DMRG	**Data Management Reference Guide**
DM&A	**Data Management and Analysis**
DQO	**Data Quality Objective**
EPA	**United States Environmental Protection Agency**
FY	**Fiscal Year**
GIS	**Geographical Information System**
GPS	**Global Positioning System**
LCS	**Laboratory Control Sample**
LCSD	**Laboratory Control Sample Duplicate**
LIMS	**Laboratory Information Management System**
LOD	**Limit of Detection**
LOQ	**Limit of Quantitation**
~~NELAC~~NELAP	**National Environmental Lab Accreditation ~~Conference~~Program**
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**
SLOC	**Station Location**
SOP	**Standard Operating Procedure**
SWQM	**Surface Water Quality Monitoring**
SWQMIS	**Surface Water Quality Monitoring Information System**
TMDL	**Total Maximum Daily Load**
TCEQ	**Texas Commission on Environmental Quality**
TNI	**The NELAC Institute**
TSWQS	**Texas Surface Water Quality Standards**
VOA	**Volatile Organic Analytes**
XXXX	**Acronyms for River Authority and Subparticipants**

A3 DISTRIBUTION LIST

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

Name, Project Manager
Clean Rivers Program
MC-234
(512) 239-XXXX

Daniel R. Burke
Lead CRP Quality Assurance Specialist
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(512) 239-0011

Nancy Ragland
Team Leader, Data Management and Analysis ~~Group~~
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(512) 239-6546

Basin Planning Agency
Street
City, Texas Zip

Name, Project Manager
(XXX) XXX-XXXX

Name, Quality Assurance Officer
(XXX) XXX-XXXX

Laboratory
Street
City, Texas Zip

Name, Manager
(XXX) XXX-XXXX

Name, Quality Assurance Officer
(XXX) XXX-XXXX

The Basin Planning Agency 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 Basin Planning Agency 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

Allison Woodall
CRP ~~Group~~ Work Leader

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

Daniel R. Burke
CRP Lead Quality Assurance Specialist

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

Name
CRP Project Manager

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

Nancy Ragland
Team Leader, Data Management and Analysis Team
Participates in the development, approval, implementation, and maintenance of written quality assurance standards (e.g., Program Guidance, SOPs, QAPPs, QMP). Ensures DM&A staff perform data management related tasks, including coordination and tracking of CRP data sets from initial submittal through CRP

Project Manager review and approval; ensuring that data is reported following instructions in the *Surface Water Quality Monitoring Data Management Reference Guide* (January 2010, or most current version); running automated data validation checks in SWQMIS and coordinating data verification and error correction with CRP Project Managers; generating SWQMIS summary reports to assist CRP Project Managers' data review; identifying data anomalies and inconsistencies; providing training and guidance to CRP and Planning Agencies on technical data issues to ensure that data are submitted according to documented procedures; reviewing QAPPS for valid stream monitoring stations, validity of parameter codes, submitting entity code(s), collecting entity code(s), and monitoring type code(s); developing and maintaining data management-related standard operating procedures for CRP data management; and coordinating and processing data correction requests.

~~Maria Rafiuly~~Peter Bohls
CRP Data Manager, Data Management and Analysis ~~Group~~Team
Responsible for coordination and tracking of CRP data sets from initial submittal through CRP Project Manager review and approval. Ensures that data is reported following instructions in the *Surface Water Quality Monitoring Data Management Reference Guide* (~~February 2009~~January 2010, or most current version). Runs automated data validation checks in SWQMIS and coordinates data verification and error correction with CRP Project Managers. Generates SWQMIS summary reports to assist CRP Project Managers' data review. Identifies data anomalies and inconsistencies. Provides training and guidance to CRP and Planning Agencies on technical data issues to ensure that data are submitted according to documented procedures. Reviews QAPPS for valid stream monitoring stations. Checks validity of parameter codes, submitting entity code(s), collecting entity code(s), and monitoring type code(s). Develops and maintains data management-related standard operating procedures for CRP data management. Coordinates and processes data correction requests. Participates in the development, implementation, and maintenance of written quality assurance standards (e.g., Program Guidance, SOPs, QAPPs, QMP).

Jennifer Delk
CRP Project Quality Assurance Specialist

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

BASIN PLANNING AGENCY

Name
Basin Planning Agency Project Manager

Responsible for implementing and monitoring CRP requirements in contracts, QAPPs, and QAPP amendments and appendices. Coordinates basin planning activities and work of basin partners. Ensures monitoring systems audits are conducted to ensure QAPPs are followed by basin planning agency participants and that projects are producing data of known quality. Ensures that subcontractors are qualified to perform contracted work. Ensures CRP project managers and/or QA Specialists are notified of

deficiencies and corrective actions, and that issues are resolved. Responsible for validating that data collected are acceptable for reporting to the TCEQ.

Name
Basin Planning Agency Quality Assurance Officer

Responsible for coordinating the implementation of the QA program. Responsible for writing and maintaining the QAPP and monitoring its implementation. Responsible for maintaining records of QAPP distribution, including appendices and amendments. Responsible for maintaining written records of sub-tier commitment to requirements specified in this QAPP. Responsible for identifying, receiving, and maintaining project quality assurance records. Responsible for coordinating with the TCEQ QAS to resolve QA-related issues. Notifies the Basin Planning Agency Project Manager of particular circumstances which may adversely affect the quality of data. Coordinates and monitors deficiencies and corrective action. Coordinates and maintains records of data verification and validation. Coordinates the research and review of technical QA material and data related to water quality monitoring system design and analytical techniques. Conducts 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.

Name
Basin Planning Agency Data Manager

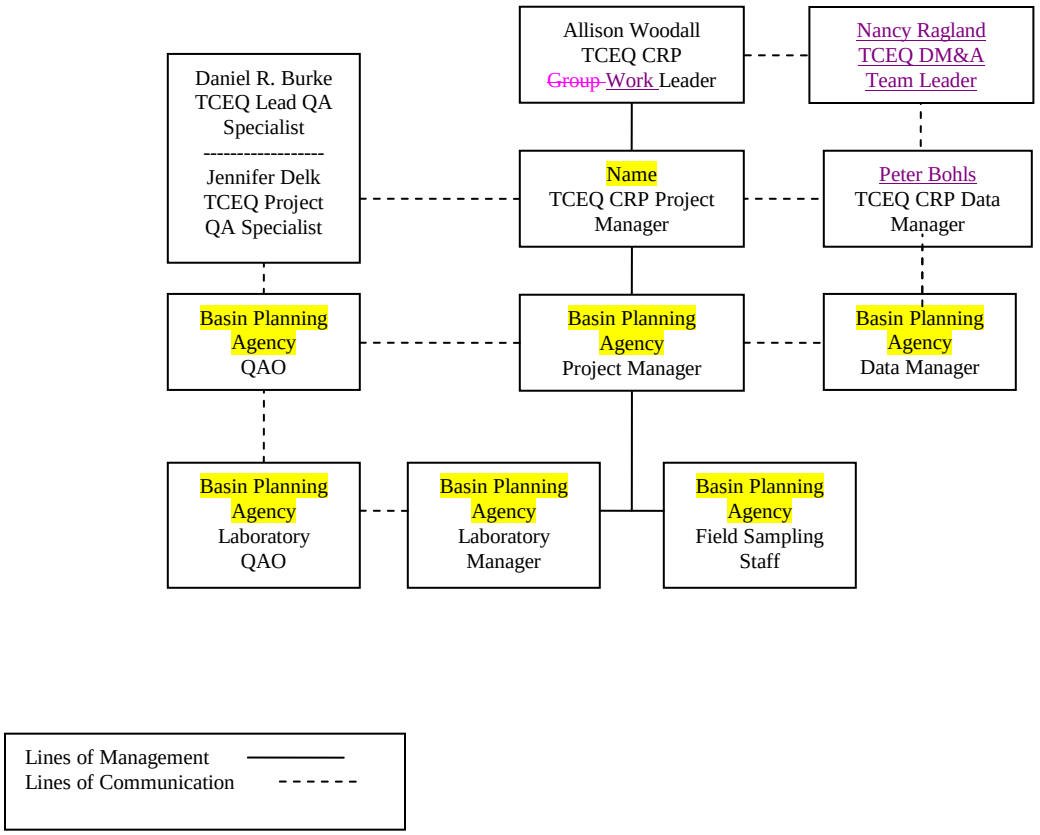
Responsible for ensuring that field data are properly reviewed and verified. Responsible for the transfer of basin quality-assured water quality data to the TCEQ in a format compatible with SWQMIS. Maintains quality-assured data on basin planning agency internet sites.

Other key participants (e.g., contractors/participants, field sampling supervisors, laboratories) must be listed and the project duties of each should be summarized.

PROJECT ORGANIZATION CHART

Figure A4.1. Organization Chart - Lines of Communication

Note: This organization chart will vary from project to project, particularly below the level of Basin Planning Agency Project Manager. This chart should be used as a guideline to develop an organizational chart specific to the project, showing lines of communication and organization for all personnel listed in the Description of Responsibilities.



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

The purpose of this QAPP is to clearly delineate Basin Planning Agency QA policy, management structure, and procedures which will be used to implement the QA requirements necessary to verify and validate the surface water quality data collected. The QAPP is reviewed by the TCEQ to help ensure that data generated for the purposes described above are scientifically valid and legally defensible. This process will ensure that data collected under this QAPP and submitted to SWQMIS have been collected and managed in a way that guarantees its reliability and therefore can be used in water quality assessments, total maximum daily load development, establishing water quality standards, making permit decisions and used by other programs deemed appropriate by the TCEQ. Project results will be used to support the achievement of Clean Rivers Program objectives as contained in the Clean Rivers *Program Guidance and Reference Guide* ~~FY 2010 – 2011~~FY 2012 -2013.

Summarize specific historical information that directly shapes the monitoring program described in this QAPP for the period of coverage.

A6 PROJECT/TASK DESCRIPTION

Summarize the work to be performed and the schedule for implementation. In some cases, project/task descriptions are laid out ***in detail*** *in contractual/subcontractual workplans. If the workplan addresses the following information,* ***in detail****, then the contractual/subcontractual workplan should be attached and referenced. For assistance in describing work to be performed see Task 3 of the Clean Rivers Program Guidance and Reference Guide for types of monitoring.*

See Appendix ~~A~~ B for the project-related work plan tasks and schedule of deliverables for a description of work defined in this QAPP. *Attach work plan tasks pertaining to 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 Basin Planning Agency Project Manager to the CRP Project Manager electronically. Amendments are effective immediately upon approval by the Basin Planning Agency Project Manager, the Basin Planning Agency QAO~~, the Laboratory~~, the CRP Project Manager, the CRP Lead QA Specialist, ~~and~~ the CRP Project QA Specialist, and additional parties affected by the amendment. Amendments are not retroactive. They will be incorporated into the QAPP by way of attachment and distributed to personnel on the distribution list by the Basin Planning Agency Project Manager. *Note: The Basin Planning Agency 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 each amendment to the QAPP. The Basin Planning Agency will maintain this documentation as part of the project's quality assurance records, and ensure that the documentation is available for review.*

Special Project Appendices

Projects requiring QAPP appendices will be planned in consultation with the Basin Planning Agency and the TCEQ Project Manager and TCEQ technical staff. Appendices will be written in an abbreviated format and will reference the Basin QAPP where appropriate. *Note: In some circumstances, special project appendices should be written in a "stand-alone" format. This should be discussed during project planning.* Appendices will be approved by the Basin Planning Agency Project Manager, the Basin Planning Agency QAO, the Laboratory, 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 Basin Planning Agency to project participants before data collection activities commence. *Note: The Basin Planning Agency 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 each special project appendix to the QAPP. The Basin Planning Agency will maintain this documentation as part of the project's quality assurance records, and ensure that the documentation is available for review.*

A7 QUALITY OBJECTIVES AND CRITERIA

The purpose of routine water quality monitoring is to collect surface water quality data that can be used to characterize water quality conditions, identify significant long-term water quality trends, support water quality standards development, support the permitting process, and conduct water quality assessments in accordance with TCEQs Guidance for Assessing Texas Surface and Finished Drinking Water Quality Data. These water quality data, and data collected by other organizations (e.g., USGS, TCEQ, etc.), will be subsequently reconciled for use and assessed by the TCEQ.

~~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 Basin Planning Agency 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 above statements regarding the purpose and use of the data apply to routine and systematic water quality monitoring. However, if this project involves permit support or special studies monitoring, then the above sentences do not apply and project-specific purposes and objectives must be addressed in individual Appendices. If ~~any~~ additional monitoring (e.g., aquatic life monitoring, diel monitoring, metals in water) applicable to the monitoring strategy will occur, ~~of the parameters in Attachment 2 are applicable to the monitoring strategy,~~ the objective should be discussed in this section ~~(e.g., aquatic life monitoring, diel monitoring, metals in water)~~.

The measurement performance specifications to support the project purpose for a minimum data set are specified in Appendix A Table A7.1 and in the text following. ~~*Measurement performance specifications define the data quality needed to satisfy project objectives. To this end, measurement performance specifications are qualitative and quantitative statements that:*~~

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

~~*Section A7 of the QAPP addresses measurement performance specifications, including:*~~

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

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

~~*Table A7.1 should be modified to reflect actual parameters, methods, etc. employed by the Basin Planning Agency and its participants. Alternative methods than those listed in the following table may be used. Procedures for laboratory analysis must be in accordance with the most recently published edition of Standard Methods for the Examination of Water and Wastewater, 40 CFR 136, or otherwise approved independently. Additional parameters and suggested methods are provided in Attachment 2 of this*~~

~~*document; if any of those parameters and methods are applicable to the project, they should be moved to Section A7 and inserted into Table A7.1. Only data collected that have a valid TCEQ parameter code assigned in Table A7.1 are stored in SWQMIS. Any parameters listed in Table A7.1 that do not have a valid TCEQ parameter code assigned will not be stored in SWQMIS.*~~

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

Table A7.1 – Measurement Performance Specifications

PARAMETER	UNITS	MATRIX	METHOD	PARAMETER CODE	AWRL	Limit of Quantitation (LOQ)	LOQ CHECK STANDARD %Rec	PRECISION (RPD of LCS/LCSD)	BIAS %Rec. of LCS	LAB
Field Parameters										
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
Salinity	ppt, marine only	water	SM 2520 and TCEQ SOP, V1	00480	NA*	NA	NA	NA	NA	Field
Chlorine residual**	mg/L	water	SM 4500-Cl G and TCEQ SOP, V1	50060	.1	NA	NA	NA	NA	Field
Temperature	◦ 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

PARAMETER	UNITS	MATRIX	METHOD	PARAMETER CODE	AWRL	Limit of Quantitation (LOQ)	LOQ CHECK STANDARD %Rec	PRECISION (RPD of LCS/LCSD)	BIAS %Rec. of LCS	LAB
Conventional and Bacteriological Parameters										
TSS	mg/L	water	SM 2540 D	00530	4		NA	20	80-120	
TDS, dried at 180 degrees C	mg/L	water	SM 2540C	70300	10		NA	20	80-120	
TDS,calculated	mg/L	water	calculation	70294	NA		NA	NA	NA	
Sulfate	mg/L	water	EPA 300.0, Rev. 2.1 (1993)	00945	5		70-130	20	80-120	
Chloride	mg/L	water	EPA 300.0 Rev. 2.1 (1993)	00940	5		70-130	20	80-120	
Chlorophyll a, spectrophotometric method	ug/L	water	EPA 446.0	32211	3		NA	20	80-120	
E. coli, IDEXX Colilert	MPN/100 mL	water	SM 9223-B*****	31699	1		NA	0.5****	NA	
holding time, E. coli, IDEXX Colilert	hours	water	NA	31704	NA	NA	NA	NA	NA	Lab
Enterococcus, IDEXX Enterolert	MPN/100 mL	water	ASTM D-6503	31701	1		NA	0.5****	NA	
Fecal coliform, membrane filtration	org/100mL	water	Std. Methods 9222-D	31616	1		NA	0.5****	NA	
Ammonia-N, total	mg/L	water	EPA 350.1 Rev. 2.0 (1993)	00610	0.1		70-130	20	80-120	
Fluoride, total	mg/L	water	EPA 300.0 Rev. 2.1 (1993)	00951	0.5		70-130	20	80-120	
Hardness, total (as CaC03)	mg/L	water	SM 2340 B or C	00900	5		NA	20	80-120	
Total Kjeldahl N	mg/L	water	SM 4500-Norg B or C and SM 4500-NH3 B	00625	0.2		70-130	20	80-120	
Nitrate-N, total	mg/L	water	EPA 300.0 Rev. 2.1 (1993)	00620	.05		70-130	20	80-120	
Nitrate/nitrite-N, total	mg/L	water	SM 4500-NO_3 E	00630	.05		70-130	20	80-120	
O-phosphate-P, field filter <15 min.	mg/L	water	EPA 365.3	00671	.04		70-130	20	80-120	
O-phosphate-P filter >15 min.	mg/L	water	EPA 365.3	70507	.04		70-130	20	80-120	
Total phosphorus-P	mg/L	water	EPA 365.3	00665	.06		70-130	20	80-120	

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

** Chlorine residual to be collected downstream of chlorinated outfalls.

*** 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.

***** E.coli samples analyzed by SM 9223-B should always be processed as soon as possible and within 8 hours. When transport conditions necessitate delays in delivery longer than 6 hours, the holding time may be extended and samples must be processed as soon as possible and within 48 hours.

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, 2008 (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 Appendix A Table A7.1 are the program-defined reporting specifications for each analyte and yield data acceptable for the TCEQ's water quality assessment. A full listing of AWRLs can be found at http://www.tceq.state.tx.us/compliance/monitoring/crp/qa/index.html. The limit of quantitation is the minimum level, concentration, or quantity of a target variable (e.g., target analyte) that can be reported with a specified degree of confidence. The following requirements must be met in order to report results to the CRP:

Note: While the AWRL is the highest acceptable level that can be reported for a given parameter, Basin Planning Agencies should consider all possible uses of the data and specify the limit of quantitation (LOQ) accordingly. The requirement for running an LOQ check ~~standard~~ sample replaces the method for demonstrating the laboratory's ability to quanititate at the reporting limit in previous QAPPs. This requirement is more stringent than ~~NELAC~~NELAP which requires that the LOQ be verified annually for each quality system matrix, method and analyte.

- **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~~ sample for each analytical batch of CRP Samples analyzed.**

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

Precision

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

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

Laboratory precision is assessed by comparing replicate analyses of laboratory control samples in the sample matrix (e.g. ~~deioinized~~deionized water, sand, commercially available tissue) or sample/duplicate pairs in the case of bacterial analysis. Precision results are compared against measurement performance specifications and used during evaluation of analytical performance. Program-defined measurement performance specifications for precision are defined in Appendix A~~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~~ Samples prepared with verified and known amounts of all target analytes in the sample matrix (e.g. deio~~i~~nized water, sand, commercially available tissue) and by calculating percent recovery. Results are compared against measurement performance specifications and used during evaluation of analytical performance. Program-defined measurement performance specifications for bias are specified in Appendix A~~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 include~~s~~ 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 the Data Management Plan Section B10.

Completeness

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

A8 SPECIAL TRAINING/CERTIFICATION

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

The requirements for Global Positioning System (GPS) certification are located in Section B10, Data Management.

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~~TNI Volume 1 Module 2, Section 4.5.5 (concerning Review of Requests, Tenders and Contracts).

A9 DOCUMENTS AND RECORDS

The documents and records that describe, specify, report, or certify activities are listed. *The list below is limited to documents and records that may be requested for review during a monitoring systems audit. Add other types of project documents and records as appropriate.*

Table A9.1 Project Documents and Records

Document/Record	Location	Retention (yrs)	Format
QAPPs, amendments and appendices	Basin Planning Agency		*(Specify all media, e.g., paper, electronic, etc.*)
Field SOPs	Basin Planning Agency		*(Specify*)
Laboratory Quality Manuals	Basin Planning Agency/ Laboratory(ies)		*(Specify*)
Laboratory SOPs	Basin Planning Agency/ Laboratory(ies)		*(Specify)*
QAPP distribution documentation	Basin Planning Agency		*(Specify)*
Field staff training records	Basin Planning Agency		*(Specify)*
Field equipment calibration/maintenance logs	Basin Planning Agency		*(Specify*)
Field instrument printouts	Basin Planning Agency		*(Specify)*
Field notebooks or data sheets	Basin Planning Agency		*(Specify)*
Chain of custody records	Basin Planning Agency		*(Specify)*
Laboratory calibration records	Laboratory		*(Specify)*
Laboratory instrument printouts	Laboratory		*(Specify)*
Laboratory data reports/results	Basin Planning Agency/ Laboratory		*(Specify)*
Laboratory equipment maintenance logs	Laboratory		*(Specify*)
Corrective Action Documentation	Basin Planning Agency/ Laboratory		*(Specify*)

Note: Document and record retention times may vary. Be specific in documenting where documents and records are located and for how long. If records are handled variably among the participants, this needs to be specified. The Quality Management Plan for the Clean Rivers Program for FY 2009 specifies that Basin Planning Agencies retain their project ***documents*** *(e.g., QAPPs, field and laboratory SOPs, copies of laboratory QMs, etc.) for a minimum of 5 years after the close of the project; project* ***records*** *(e.g., QAPP distribution documentation, field notebooks and data sheets, laboratory data reports/results, etc.)*

must be retained for a minimum of 2 years after the close of the project. Laboratory Records must be retained in accordance with the ~~NELAC standards~~ TNI Standards

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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~~ *TNI Volume 1 Module 2 Section 5.10* ~~(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.

Note: The NELAC Standard provides for some flexibility in regard to the elements required in a test report. From the Clean Rivers Program perspective, it is important that data are reported unambiguously, are accurate, and that the necessary information for the review, verification, validation, and interpretation of data is included. Because of the large number and varying types of procedures that have been worked out among the Clean Rivers Program partners, a test report format is not provided in this shell document. Please detail exactly what information and data are included in a test report. If reports are only generated upon request, please state this explicitly. At the very minimum, test reports (regardless of whether they are hard copy or electronic) should include the following:

- *Sample results*
- *Units of measurement*
- *Sample matrix*
- *Dry weight or wet weight (as applicable)*
- *Station information*
- *Date and time of collection*
- *Sample depth*
- *Holding time for SM9223-B*
- *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~~ NELAP compliance ~~on a result by result basis~~*

The information in test reports should be consistent with the information that is needed to prepare data submittals to TCEQ.

Otherwise, reports should be consistent with the ~~NELAC standards~~TNI Standards and should include any additional information critical to the review, verification, validation, and interpretation of data. This should be based on the process that has been worked out with the Basin Planning Agency and is documented in Section D1 and D2 of this document.

Please provide the laboratory's process for reporting data under the Clean Rivers Program or attach relevant portions of the laboratory's SOP or quality manual.

Electronic Data

Data will be submitted electronically to the TCEQ in the Event/Result file format described in the most current version of the *Surface Water Quality Monitoring Data Management Reference Guide* (http://www.tceq.state.tx.us/compliance/monitoring/water/quality/data/wdma/dmrg_index.html). A completed Data Review Checklist and Data Summary (see Appendix E) will be submitted with each data submittal. *Note: This section, as applicable, should detail how and in what form data will be sent from sub-tier participants to the Basin Planning Agency.*

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, 2008.(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. *Other SOPs may apply and should be listed. Do not attach field SOPs to this document or rewrite them for inclusion in this section unless there are significant items to be brought to the TCEQ's attention.*

Sample volume, container types, minimum sample volume, preservation requirements, and holding time requirements. *List every parameter that is specified in Section A7. Some parameters such as metals or chlorinated pesticides may be grouped as appropriate, depending on holding time or preservation requirements.*

Table B2.1 Sample Storage, Preservation and Handling Requirements

Parameter	Matrix	Container	Preservation	Sample Volume	Holding Time

*E.coli samples analyzed by SM 9223-B should always be processed as soon as possible and within 8 hours. When transport conditions necessitate delays in delivery longer than 6 hours, the holding time may be extended and samples must be processed as soon as possible and within 48 hours.

Sample Containers *Include language as appropriate.*

Sample containers (cubitainers) are purchased pre-cleaned for conventional parameters and are disposable. ~~Whirl-pak bags are~~Sample containers used for bacteriological samples ~~and~~ may have 1% sodium thiosulfate tablets added. Amber glass bottles are used routinely for chlorophyll samples. The sample containers for metals are new, certified glass or plastic bottles, or glass or plastic bottles cleaned and documented according to EPA method 1669. Sample containers for organics are purchased pre-cleaned and certified. Certificates are maintained in a notebook by the Basin Planning Agency or by the laboratory *(please specify).*

Pre-cleaned sample containers are commercially available, are convenient to use, and may have preservatives pre-added. A way to handle acid safely in the field is by use of commercially available acid preservation ampules.

If bottles are re-used, then bottle washing/autoclaving procedures must be described in this section. Note that good laboratory practices dictate that bottle washing procedures should provide for a tracking system and some type of QC check (e.g., laboratory equipment blanks) to assure that no contamination results from the washing procedure.

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 (*or actual name of the documents used to record field data*) as presented in Appendix C. *Flow worksheets, aquatic life use monitoring checklists, habitat assessment forms, field biological assessment forms, and records of bacteriological analyses (if applicable) are part of the field data record.* 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.

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

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

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

B3 SAMPLE HANDLING AND CUSTODY

Sample Tracking

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

A sample is in custody if it is in actual physical possession or in a secured area that is restricted to authorized personnel. The Chain of Custody (COC) form is a record that documents the possession of the samples from the time of collection to receipt in the laboratory. The following information concerning the sample is recorded on the COC form (See Appendix D). The following list of items matches the COC form in Appendix D. *All COC forms to be used in the project should be included in Appendix D for the TCEQ's review.*

1. Date and time of collection
2. Site identification
3. Sample matrix
4. Number of containers
5. Preservative used
6. Was the sample 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~~ Indication of field-filtration ~~of "field-filtered"~~ *(for metals)* as applicable
5. Sample type (i.e., analysis(es)) to be performed

Sample Handling

This section should be used to ***comprehensively*** *describe (or reference and attach) how samples are handled from collection though delivery to the laboratory. The discussion should incorporate the procedures used by all the participants and include information on how samples are moved from laboratory to lab, if applicable. Include details concerning how the samples are logged in at the laboratory, how they are examined for documentation and preservation, how holding times are insured, etc. A discussion of sample shipping should be included if applicable.*

Internal sample handling, custody, and storage procedures for laboratories are typically described in laboratory Quality Manuals (QM). This information can be cited in lieu of writing a description.

Sample Tracking Procedure Deficiencies and Corrective Action

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

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

B4 ANALYTICAL METHODS

The analytical methods, associated matrices, and performing laboratories are listed in Appendix A ~~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 must be in accordance with the most recently published edition of the book entitled Standard Methods for the Examination of Water and Wastewater, the TCEQ Surface Water Quality Monitoring Procedures as amended, 40 CFR 136, or other reliable procedures acceptable to the commission, and in accordance with chapter 25 of this title.*~~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 *SWQM Procedures, Volume 1: Physical Methods for Water, Sediment, and Tissue*, 40 CFR 136, or other reliable procedures acceptable to the Executive Director.~~"

Laboratories collecting data under this QAPP are compliant with the ~~NELAC standards~~TNI Standards. Copies of laboratory QMs and SOPs are available for review by the TCEQ. *It is the Basin Planning Agency's responsibility to confirm the completeness, adequacy, and consistency of QMs and analytical SOPs falling under this QAPP.*

Standards Traceability

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

Analytical Method Deficiencies and Corrective Actions

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

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

The TCEQ has determined that analyses associated with the qualifier codes (e.g."holding time exceedance", "sample received unpreserved", "estimated value", etc...) may have unacceptable measurement uncertainty associated with them. This will immediately disqualify analyses from submittal to SWQMIS. Therefore, data with these types of problems should not be reported to the TCEQ. Additionally, any data collected or analyzed by means other than those stated in the QAPP, or data suspect for any reason should not be submitted for loading and storage in SWQMIS.

B5 QUALITY CONTROL

Sampling Quality Control Requirements and Acceptability Criteria

The minimum Field QC Requirements are outlined in the *TCEQ Surface Water Quality Monitoring Procedures.* Specific requirements are outlined below. Field QC sample results are submitted with the

laboratory data report (see Section A9.). *Field QC sample requirements in this section are specific to routine water quality monitoring for TSWQS use attainment determinations.*

Field blank –
Field blanks are required for total metals-in-water samples when collected without sample equipment (i.e., as grab samples). *For other types of samples, they are optional*. A field blank is prepared in the field by filling a clean container with pure deionized water and appropriate preservative, if any, for the specific sampling activity being undertaken. Field blanks are used to assess the contamination from field sources such as airborne materials, containers, and preservatives. *The frequency requirement for field blanks for total metals-in-water samples is specified in the SWQM Procedures. Provide a statement as to the frequency in which these samples will be collected.*

If field blanks will be collected for other than total metal samples, the frequency of collection should be specified. If field blanks will not be collected, this section should be removed.

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

Field equipment blank - Field equipment blanks are required for metals-in-water samples when collected using sampling equipment. Field equipment blank is a sample of analyte-free media which has been used to rinse common sampling equipment to check the effectiveness of decontamination procedures. It is collected in the same type of container as the environmental sample, preserved in the same manner and analyzed for the same parameter. *The frequency requirement for field equipment blanks is specified in the SWQM Procedures. Provide a statement as to the frequency in which these samples will be collected. If field equipment blanks will not be collected, this section should be removed.*

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

Field Split - A field split is a single sample subdivided by field staff immediately following collection and submitted to the laboratory as two separately identified samples according to procedures specified in the *SWQM Procedures*. Split samples are preserved, handled, shipped, and analyzed identically and are used to assess variability in all of these processes. Field splits apply to conventional samples only. To the extent possible, field splits prepared and analyzed over the course of the project should be performed on samples from different sites. *The frequency requirement for field splits is specified in the SWQM Procedures. Provide a statement as to the frequency in which these samples will be collected.*

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

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

A 30% RPD criteria will be used to screen field split results as a possible indicator of excessive variability in the sample handling and analytical system. If it is determined that elevated quantities of analyte (i.e., > 5 times the LOQ) were measured and analytical variability can be eliminated as a factor, than variability in field split results will primarily be used as a trigger for discussion with field staff to ensure samples are

being handled in the field correctly. Some individual sample results may be invalidated based on the examination of all extenuating information. The information derived from field splits is generally considered to be event specific and would not normally be used to determine the validity of an entire batch; however, some batches of samples may be invalidated depending on the situation. Professional judgment during data validation will be relied upon to interpret the results and take appropriate action. The qualification (i.e., invalidation) of data will be documented on the Data Summary. Deficiencies will be addressed as specified in this section under Quality Control or Acceptability Requirements Deficiencies and Corrective Actions.

Trip blank - Trip blanks are required for volatile organic analyses (VOA) only. VOA trip blanks are samples prepared in the laboratory with laboratory pure water and preserved as required. A trip blank is submitted with each ice chest of VOA samples submitted to the laboratory. They are transported to the sampling site, handled like an environmental sample, and returned to the laboratory for analysis. Trip blanks are not opened in the field. Their purpose is to check contamination of the sample through leaching of the septum. The analysis of trip blank should yield values less than the LOQ. When target analyte concentrations are very high, blank values should be less then 5% of the lowest value of the batch, or corrective action will be implemented. *If trip blanks will not be collected under this QAPP, this section should be removed.*

Laboratory Measurement Quality Control Requirements and Acceptability Criteria

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

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

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

Limit of Quantitation (LOQ) – The laboratory will analyze a calibration standard (if applicable) at the LOQ published in Appendix A, Table A7 on each day calibrations are performed. In addition, an~~d~~ LOQ check ~~standard~~ sample will be analyzed with each analytical batch. Calibrations including the standard at the LOQ will meet the calibration requirements of the analytical method or corrective action will be implemented.

LOQ Sediment and Tissue Samples – When considering LOQs for solid samples and how they apply to results, two aspects of the analysis are considered: (1) the LOQ of the sample, based on the "real-world" in which moisture content and interferences affect the result and (2) the LOQ in the QAPP which is a value less than or equal to the AWRL based on an idealized sample with zero % moisture.

The LOQ for a solid sample is based on the lowest non-zero calibration standard (as are those for water samples), the moisture content of the solid sample, and any sample concentration or dilution factors resulting from sample preparation or clean-up.

To establish solid-phase LOQs to be listed in Appendix A Table A7.1 of the QAPP, the laboratory will adjust the concentration of the lowest non-zero calibration standard for the amount of sample extracted, the final extract volume, and moisture content (assumed to be zero % moisture). Each calculated LOQ will be less than or equal to the AWRL on the dry-weight basis to satisfy the AWRL requirement for sediment and tissue analyses. When data are reviewed for consistency with the QAPP, they are evaluated based on this requirement. Results may not "appear" to meet the AWRL requirement due to high moisture content, high concentrations of non-target analytes necessitating sample dilution, etc. These sample results will be submitted to the TCEQ with an explanation on the data summary as to why results do not appear to meet the AWRL requirement.

LOQ Check ~~Standard~~ Sample – An LOQ check ~~standard~~ sample consists of a sample matrix (e.g., deionized water, sand, commercially available tissue) free from the analytes of interest spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes. It is used to establish intra-laboratory bias to assess the performance of the measurement system at the lower limits of analysis. The LOQ check ~~standard~~ sample is spiked into the sample matrix at a level less than or near the LOQ published Appendix A, Table A7 for each analyte for each analytical batch of CRP samples run. If it is determined that samples have exceeded the high range of the calibration curve, samples should be diluted or run on another curve. For samples run on batches with calibration curves that do not include the LOQ published in Appendix A, Table A7, a check sample will be run at the low end of the calibration curve.

The LOQ check ~~standard~~ sample is carried through the complete preparation and analytical process. LOQ Check ~~Standards~~ Samples are run at a rate of one per analytical batch.

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

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

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

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

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

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

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

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

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

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

For most parameters except bacteria, precision is evaluated using the relative percent difference (RPD) between duplicate LCS 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, X1 and X2, the RPD is calculated from the following equation: *(If other formulas apply, adjust appropriately.)*

$$RPD = |(X1 - X2)/\{(X1+X2)/2\} * 100|$$

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

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

If the difference in logarithms is greater than the precision criterion, the data are not acceptable for use under this project and will not be reported to TCEQ. Results from all samples associated with that failed

duplicate (usually a maximum of 10 samples) will be considered to have excessive analytical variability and will be qualified as not meeting project QC requirements.

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

~~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: *(If other formulas apply, adjust appropriately.)*~~

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

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

The components to be spiked shall be as specified by the mandated analytical method. The results from matrix spikes are primarily designed to assess the validity of analytical results in a given matrix, and are expressed as percent recovery (%R).

The percent recovery of the matrix spike is calculated using the following equation, where %R is percent recovery, SSR is the concentration measured in the matrix spike, SR is the concentration in the unspiked sample, and SA is the concentration of analyte that was added:

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

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

~~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 preparation batch whichever is greater. The information from these controls is sample/matrix specific and is not used to determine the validity of the entire batch. To the extent possible, matrix spikes prepared and analyzed over the course of the project should be performed on samples from different sites. 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.*~~

~~*Please include laboratory measurement performance specifications for matrix spikes….*~~

~~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 blanks are performed at a rate of once per preparation batch The method blank is used to document contamination from the analytical process. The analysis of method blanks should

yield values less than the LOQ. For very high-level analyses, the blank value should be less then 5% of the lowest value of the batch, or corrective action will be implemented. Samples associated with a contaminated blank shall be evaluated as to the best corrective action for the samples (e.g. reprocessing or data qualifying codes). In all cases the corrective action must be documented.

The method blank shall be analyzed at a minimum of one per preparation batch. In those instances for which no separate preparation method is used (example: volatiles in water) the batch shall be defined as environmental samples that are analyzed together with the same method and personnel, using the same lots of reagents, not to exceed the analysis of 20 environmental samples.

Quality Control or Acceptability Requirements Deficiencies and Corrective Actions

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

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

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

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. Reference to the laboratory QM may be appropriate 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. Only data collected directly under this QAPP is submitted to the SWQMIS database.

Note: If you intend to use USGS gage station data please use the following language instead of the statement above.

The following non-direct measurement source(s) will be used for this project:
USGS gage station data will be used throughout the project to aid in determining gage height and flow. Rigorous QA checks are completed on gage data by the USGS and the data is approved by the USGS and permanently stored at the USGS. This data will be submitted to the TCEQ under parameter code 00061 Flow, Instantaneous or parameter code 74069 Flow Estimate depending on the proximity of monitoring station to the USGS gage station.

Insert additional sources of non-direct measurements as needed.

B10 DATA MANAGEMENT

Note: Because of the diversity in data management protocols among CRP Partners, there is no shell language presented here; rather, these are mandatory sections and required content.

Data Management Process

Describe the data management process, tracing the path of the data from their generation through their transmittal to the TCEQ and their storage. A flowchart is recommended. All data to be stored in the SWQMIS will be submitted in the format specified in the SWQM Data Management Reference Guide, ~~2009~~January 2010, or latest version.

Data Dictionary - Terminology and field descriptions are included in the SWQM Data Management Reference Guide, ~~2009~~ January 2010 or most recent version. For the purposes of verifying which ~~-~~entity codes are included in this QAPP, a table outlining the entities that will be used when submitting data under this QAPP is included below.

Name of ~~Monitoring~~ Entity	**Tag Prefix**	**Submitting Entity**	**Collecting Entity**
Ex. Texas A&M Univ. Corpus Christi, Center for Coastal Studies	*A*	*AM*	*AM*

NOTE: Requests for new tag prefixes and entity code information need to be made to the TCEQ Project Manager before updating the QAPP. The Tag Prefix is the first one or two digits of the Tag ID (the unique 7-digit number that identifies a sample in the SWQMIS database), and is used to identify the entity collecting the data. The Submitting Entity Code identifies the entity responsible for submitting the data and Collecting Entity code specifies the actual entity collecting the samples in the field. This table should be resubmitted with amendments to the QAPP when monitoring entities are added to or removed from the project.

Data Errors and Loss

Discuss the control mechanisms for detecting and correcting errors and for preventing loss of data during data reduction (mathematical operations), data reporting, and data entry to forms, reports, and databases. Provide examples of forms or checklists to be used in Appendix E. Refer to QAPP Appendices as appropriate for Field and Laboratory Data Sheets, the Data Summary, etc.

Record Keeping and Data Storage

Describe the standard record keeping procedures, document control system, and the approach used for data storage and retrieval on electronic media.

Data Handling, Hardware, and Software Requirements

Identify and describe all data handling equipment and procedures to process, compile, and analyze the data. Include any required computer hardware and software and address any specific performance requirements for the hardware/software configuration used. Describe the procedures that will be followed to demonstrate acceptability of the hardware/software configuration required.

Information Resource Management Requirements

Describe the process for assuring that applicable information resource management requirements are satisfied. Please reference the processes used to assure information management specifications will be met. These information management specifications include TCEQ as well as each grantee's internal information management controls. The TCEQ has the following data specification requirements: the Surface Water Quality Monitoring Data Management Reference Guide, GIS Policy (TCEQ OPP 8.11)

and GPS Policy (TCEQ OPP 8.12). Note that GPS certification is not required for positional data that will be used for photo interpolation in the SLOC request process.

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

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

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

C1 ASSESSMENTS AND RESPONSE ACTIONS

The following table presents the types of assessments and response actions for data collection activities applicable to the QAPP. *For more information see the "Project Oversight" section of The Clean Rivers Program Guidance and Reference Guide ~~FY 2010 -2011~~FY 2012 -2013. This table may not contain all of the assessment activities being conducted, e.g., readiness reviews, audits of data quality, proficiency testing, etc. Please provide all appropriate information.*

Table C1.1 Assessments and Response Requirements

Assessment Activity	Approximate Schedule	Responsible Party	Scope	Response Requirements
Status Monitoring Oversight, etc.	Continuous	Basin Planning Agency	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 Basin Planning Agency (at least once per contract period)	Basin Planning Agency	Field sampling, handling and measurement; facility review; and data management as they relate to CRP	30 days to respond in writing to the Basin Planning Agency. 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 Process for Deficiencies

Insert additional staff involved in the process if needed.

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

Corrective Action

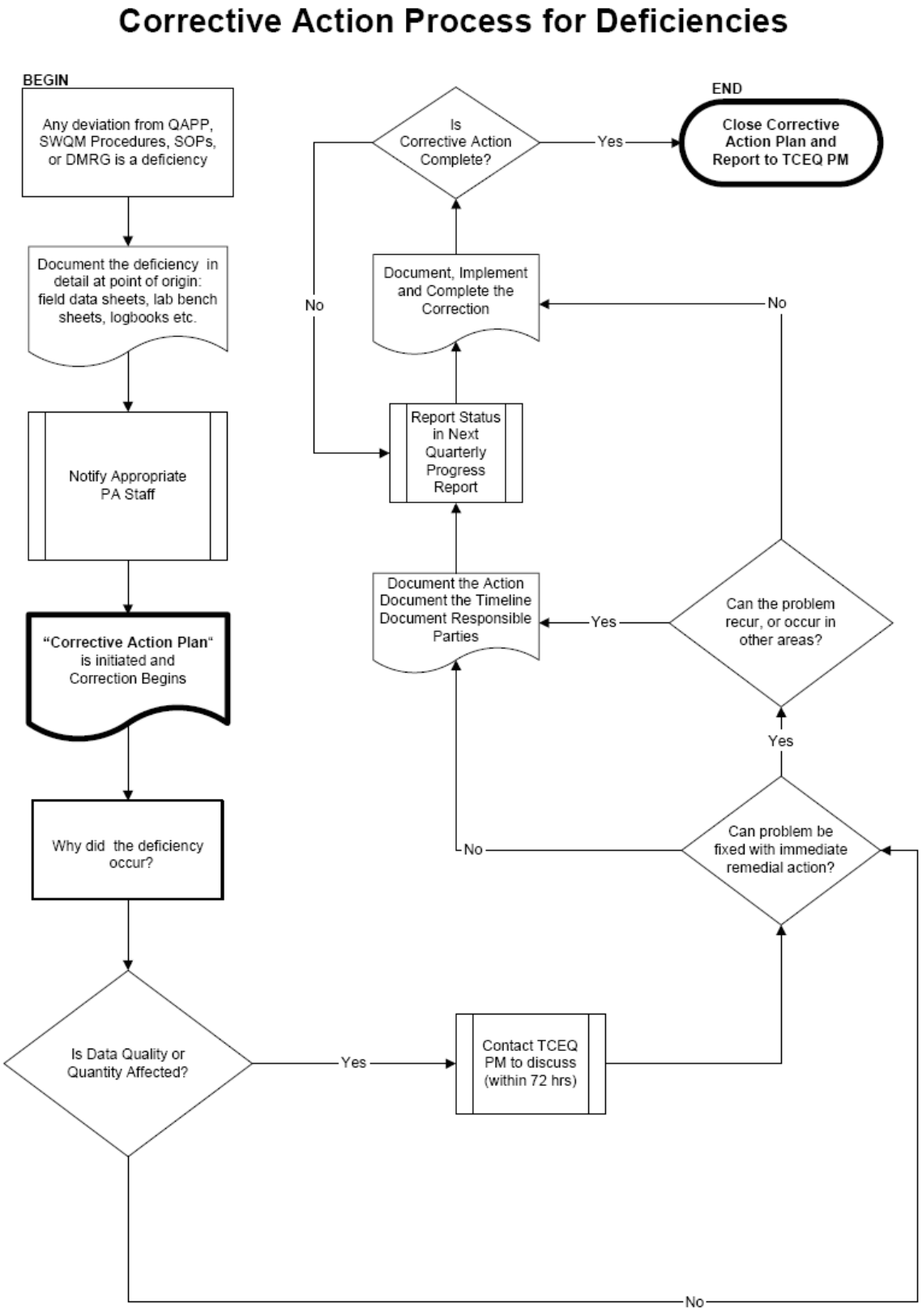
Corrective Action Plans (CAPs) should:

- Identify the problem, nonconformity, or undesirable situation
- Identify immediate remedial actions if possible

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

To facilitate the process a flow chart has been developed (see figure C1.1: Corrective Action Process for Deficiencies). *Insert additional staff involved in the process if needed.*

Figure C1.1 Corrective Action Process for Deficiencies



Status of Corrective Action Plans will be included with quarterly progress reports. In addition, significant conditions (i.e., situations which, if uncorrected, could have a serious effect on safety or on the validity or integrity of data) will be reported to the TCEQ immediately.

The Basin Planning Agency Project Manager is responsible for implementing and tracking corrective actions. Records of audit findings and corrective actions are maintained by the Basin Planning Agency 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~~TCEQ QMP and in agreements in contracts between participating organizations.

C2 REPORTS TO MANAGEMENT

Suggested Content for Reports to Management:

- *Frequency of preparation and distribution of reports to inform management of the project's status.*
- *Identification of report preparer and recipients, as well as any specific actions or recommendations recipients are expected to make (Projects of short duration may only have a final report which includes assessment results, along with project results and conclusions).*

Table C2.1 can be used to summarize this information.

Table C2.1 QA Management Reports

Type of Report	Frequency (daily, weekly, monthly, quarterly, etc.)	Projected Delivery Date(s)	Person(s) Responsible for Report Preparation	Report Recipients

Reports to Basin Planning Agency Project Management

A number of Basin Planning Agencies have processes in place to report project status, results of oversight activities, deficiencies, corrective action reports, and significant QA issues to management. They may or may not be written reports. Please list and describe as appropriate. Also include the schedule for submission (e.g., quarterly, etc.)

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 Basin Planning Agency's activities for each task; reports monitoring status, problems, delays, and status of corrective actions; and outlines the status of each task's deliverables.

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

Data ~~Review Checklist and~~ Summary – Contains basic identifying information about the data set and comments regarding inconsistencies and errors identified during data verification and validation steps or problems with data collection efforts (e.g. Deficiencies).

Reports by TCEQ Project Management

Contractor Evaluation - The Basin Planning Agency 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

Note: For the purposes of this document, the term verification refers to the data review processes used to determine data completeness, correctness, and compliance with technical specifications contained in applicable documents (e.g. QAPPs, SOPs, QMs, analytical methods). Validation refers to a specific review process that extends the evaluation of a data set beyond method and procedural compliance (i.e., data verification) to determine the quality of a data set specific to its intended use.

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

D2 VERIFICATION AND VALIDATION METHODS

Much of the information previously listed in other elements will be discussed here for the series of final checks on the data that will be conducted. The data may be reviewed to verify how it was: recorded or formatted; transformed (for example, log values, calculations of replicate measurements, dry weight to wet weight values); reduced (for example, calculation of sample concentrations from peak areas), transferred (for example, software); analyzed (for example, using the organization's Laboratory Information Management System); and qualified.

The methods to be used or processes to be followed can be identified as SOPs, if available, or described in the text. For example, indicate what data validation software will be used, if any. Those responsible for performing these functions should have been identified earlier in the plan (Element A4, Project/Task Organization); if not, then identify them here. Describe the process to show how errors will be handled and this information given to the data users. Include necessary forms and checklists in Appendix E for TCEQ's review.

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 columns of Table D2.1, respectively. Potential errors are identified by examination of documentation and by manual *(or computer-assisted)* examination of corollary or unreasonable data. If a question arises or an error is identified, the manager of the task responsible for generating the data is contacted to resolve the issue. Issues which can be corrected are corrected and documented. If an issue cannot be corrected, the task manager consults with the higher level project management to establish the appropriate course of action, or the data associated with the

issue are rejected and not reported to the TCEQ for storage in SWQMIS. Field and laboratory reviews, verifications, and validations are documented.

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

The Data Review Checklist (See Appendix E) covers three main types of review: data format and structure, data quality review, and documentation review. The Data Review Checklist is transferred with the water quality data submitted to the TCEQ to ensure that the review process is being performed. *All Data Review Checklists to be used in the project should be included in Appendix D for the TCEQ's review.*

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 Basin Planning Agency 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 Planning Agency Data Manager with the data. This information is communicated to the TCEQ by the Basin Planning Agency in the Data Summary (See Appendix E).

Table D2.1: Data Review Tasks *(please insert the ~~name/~~position of the person responsible for each task in the table)* *This table may not contain all of the data review tasks being conducted. Please provide all appropriate information.*

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

~~Verified data log submitted~~			
10% of data manually reviewed			

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*~~*Integrated Report* in accordance with TCEQ's *Guidance for Assessing Texas Surface and Finished Drinking Water Quality Data*, and for TMDL development, ~~stream standards modifications~~ water quality standards development, and permit decisions as appropriate. Data which do not meet requirements will not be submitted to SWQMIS nor will be considered appropriate for any of the uses noted above.

Appendix A:

~~Task 3 Workplan~~Measurement Performance Specifications (Table A7.1)

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

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

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

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

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

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

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

Agency should discuss the situation with the TCEQ and we will discuss if they are project-specific analytes of concern, if low recoveries are acceptable or alternative methods should be run.

Table A7.1 - Measurement Performance Specifications

Table A7 will be sent out as an excel spreadsheet a later date.

Basin Planning Agency Clean Rivers Program

~~FY 2010/2011 QAPP –~~ Appendix B

Task 3 Work Plan & Sampling Process Design and Monitoring Schedule (Plan)~~Monitoring Schedule for FY 2010~~

Appendix B Sampling Process Design and Monitoring Schedule (plan)

The following language and table can be used to meet the requirements of this section. In addition to the table, reference maps should be included. The table is provided as an example only. However, consistency with the TCEQ format and general categories when filling in the monitoring table is mandatory.

Sample Design Rationale FY ~~2010~~2012

The sample design is based on the legislative intent of the Clean Rivers Program. Under the legislation, the Basin Planning Agencies have been tasked with providing data to characterize water quality conditions in support of the ~~305(b) assessment~~Texas Water Quality Integrated Report, and to identify significant long-term water quality trends. Based on Steering Committee input, achievable water quality objectives and priorities and the identification of water quality issues are used to develop work plans which are in accord with available resources. As part of the Steering Committee process, the Basin Planning Agency coordinates closely with the TCEQ and other participants to ensure a comprehensive water monitoring strategy within the watershed. *A discussion of past or ongoing water quality issues should be provided here to justify the monitoring schedule. Specify changes in sites and sampling frequency; why parameters or sites were added or dropped; issues you were unable to address at the time; future monitoring recommendations; and any information you wish to capture about the process that will help make future decisions or help you document current decisions.*

Example

The following changes or additions have been made to the monitoring schedule. These changes have come about because of concerns or requests of steering committee members or monitoring entities.

1. The Guadalupe River at Dupont site will be discontinued at the present location and a new site that is downstream and out of the mixing zone of the Dupont discharges will be found for 2010.
2. A new site on Peach Creek will be added bimonthly in 2010 (site no. 17935, Peach Creek at FM 397.) Data at this site was collected during the Peach Creek TMDL. The site will be monitored in 2010 and beyond to identify any changes in the water quality that may be a result of the implementation of BMPs in the watershed.
3. The UGRA weekly monitoring of *E. coli* will no longer be funded by CRP. The TCEQ has sufficient data for assessment purposes and does not need the bacterial data at this frequency any longer. UGRA will evaluate their ability to continue monitoring at these sites for their own use and use by their constituents.
4. The metals in the water sample that was to be collected in 2009 at the Dupont site will be moved to Geronimo Creek. Metals in sediment in Geronimo Creek will be added to the 2010 schedule.
5. Organics in sediment, specifically those organics associated with urban environments (TPH and BTEX), will be analyzed at the San Marcos River at IH 35 location.
6. Background radiological data will be collected on Coleto Creek in advance of in- situ mining in Goliad County in 2010.

End Example

Site Selection Criteria

This data collection effort involves monitoring routine water quality, using procedures that are consistent with the TCEQ SWQM program, for the purpose of data entry into the SWQMIS database maintained by the TCEQ. To this end, some general guidelines are followed when selecting sampling sites, as basically outlined below, and discussed thoroughly in the TCEQ Surface Water Quality Monitoring Procedures, Volume 1 (RG-415). Overall consideration is given to accessibility and safety. All monitoring activities have been developed in coordination with the CRP Steering Committee and with the TCEQ. *The site selection criteria set forth here may not apply to all programs. The site selection criteria specified are those the TCEQ would like considered in order to produce data which is complementary to that collected by the state and which can be used in assessments, etc. Other criteria may be considered and should be described.*

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 ~~2010~~ 2012 are presented on the following page. *Monitoring tables are in the appendix, so that only the tables will need to be modified annually (unless other program changes are made in the 2nd year). This appendix must be re-submitted annually.*

Monitoring Sites for ~~FY *2010*~~FY 2012

The sample design for surface water quality monitoring is shown in Table B1.1 below. Terminology and field descriptions are included in the SWQM Data Management Reference Guide, January 2010 or most recent version. ***Please use the schedule download feature at http://cms.lcra.org to populate this table.*** *Please use the list of Monitoring Type Codes provided in the Surface Water Quality Monitoring Data Management Reference Guide* (~~February 2009~~January 2010, or most current version). *Include a legend with this table listing the individual types of parameters to be measured for each parameter group represented in the table (e.g., Field = dissolved oxygen, pH, conductivity, temperature). TCEQ Surface Water Quality Monitoring Procedures volume 2: Methods for Collecting and Analyzing Biological Community and Habitat Data, 2005 (RG-416), outlines voucher requirements for benthic and nekton sampling.*

Table B1.1 Sample Design and Schedule, FY ~~*2010*~~*2012*

Site Description	Station ID	Waterbody ID	Region	SE	CE	MT	24 hr DO	AqHab	Benthics	Nekton	Metal Water	Organic Water	Metal Sed	Organic Sed	Conv	Amb Tox Water	Amb Tox Sed	Bacteria	Flow	Fish Tissue	Field	Comments

Critical vs. non-critical measurements

All data taken for CRP and entered into SWQMIS are considered critical. *An exception to this may be data taken using an experimental procedure or for "research purposes" for which no "standardized" methodology exists. This should be discussed, if applicable.*

Appendix C:
Field Data Sheets

Appendix D:
Chain-of-Custody Forms

Appendix E:
Data Review Checklist and Summary

Data Review Checklist

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

Data Format and Structure		✓, ✗, or N/A
A.	Are there any duplicate Tag Id numbers in the Events file?	
B.	Do the Tag prefixes correctly represent the entity providing the data?	
C.	Have any Tag Id numbers been used in previous data submissions?	
D.	Are TCEQ station location (SLOC) numbers assigned?	
E.	Are sampling Dates in the correct format, MM/DD/YYYY with leading zeros?	
F.	Are sampling Times based on the 24 hr clock (e.g. 09:04) with leading zeros?	
G.	Is the Comments field filled in where appropriate (e.g. unusual occurrence, sampling problems, unrepresentative of ambient water quality)?	
H.	Are ~~Submitting~~ submitting Entity, Collecting Entity, and Monitoring Type codes used correctly?	
I.	Do ~~S~~sampling dates in the Results file match those in the Events file for each Tag Id?	
J.	Are values represented by a valid parameter code with the correct units?	
K.	Are there any duplicate parameter codes for the same Tag Id?	
L.	Are there any invalid symbols in the Greater Than/Less Than (GT/LT) field?	
M.	Are there any Tag Ids in the Results file that are not in the Events file or vice versa?	
Data Quality Review		✓, ✗, or N/A
A.	Are "less-than" values reported at the LOQ? If no, explain in Data Summary.	
B.	Have the outliers been verified and a "1" placed in the Verify_flg field?	
C.	Have checks on correctness of analysis or data reasonableness been performed? e.g., Is ortho-phosphorus less than total phosphorus? Are dissolved metal concentrations less than or equal to total metals? Is the minimum 24 hour DO less than the maximum 24 hour DO? Do the values appear to be consistent with what is expected for site?	
D.	Have at least 10% of the data in the data set been reviewed against the field and laboratory data sheets?	
E.	Are all parameter codes in the data set listed in the QAPP?	
F.	Are all stations in the data set listed in the QAPP?	
Documentation Review		✓, ✗, or N/A
A.	Are blank results acceptable as specified in the QAPP?	
B.	Were control charts used to determine the acceptability of field duplicates?	
C.	Was documentation of any unusual occurrences that may affect water quality included in the Event table's Comments field?	
D.	Were there any failures in sampling methods and/or deviations from sample design requirements that resulted in unreportable data? If yes, explain in Data Summary.	
E.	Were there any failures in field and/or laboratory measurement systems that were not resolvable and resulted in unreportable data? If yes, explain in Data Summary.	
F.	Was the laboratory's ~~NELAC~~ NELAP Accreditation current for analysis conducted?	

Data Summary

Data Set Information

Data Source: _____

Date Submitted: _____

Tag_id Range: _____

Date Range: _____

□ I certify that all data in this data set meets the requirements specified in Texas Water Code Chapter 5, Subchapter R (TWC §5.801 et seq) and Title 30 Texas Administrative Code Chapter 25, Subchapters A & B.
□ This data set has been reviewed using the criteria in the Data Review Checklist.

Planning Agency Data Manager: _____ Date: _____

Comments

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

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

Parameter	Tag Ids Affected	Type of Problem	Reason for Problem	Percent Loss*	Corrective Action (Y/N/SOP)
pH	XL12345	Post calibration	Equipment failure	4%	SOP
pH	XL12346	Post calibration	Forgot to write in log	4%	N
TKN	XL12351-XL12353	Laboratory analysis	LOQ Check Sample ~~Standard~~ failed	10%	Y
TOC	XL12345-XL12350	Exceeded hold time	Sample received late in day and not set up next day.	10%	Y
Zinc	XL12365	Field equipment blank	Possible contamination	4%	N

* Percent Loss = # Data Points Lost / # Data Points Expected for that parameter in the data set.

ATTACHMENT 1
Example Letter to Document Adherence to the QAPP

TO: (name)
(organization)

FROM: (name)
(organization)

RE: Basin Planning Agency ~~FY2010~~FY2012-~~11~~ 13 CRP QAPP

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

(address)

I acknowledge receipt of the "QAPP Title, Revision Date". I understand the document(s) describe quality assurance, quality control, data management and reporting, and other technical activities that must be implemented to ensure the results of work performed will satisfy stated performance criteria. My signature on this document signifies that I have read and approved the document contents pertaining to my program. Furthermore, I will ensure that all staff members participating in Clean Rivers Program activities will be required to familiarize themselves with the document contents and adhere to them as well.

_____

Signature Date

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

ATTACHMENT 2 Additional Parameters

PARAMETER	UNITS	MATRIX	METHOD	PARAMETER CODE	AWRL	Limit of Quantitation (LOQ)	LOQ CHECK STANDARD %Rec	PRECISION (RPD of LCS/LCSD)	BIAS %Rec. of LCS	LAB***
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
Wind Intensity	1-calm 2-slight 3-moderate 4-strong	NA	NA	89965	NA	NA	NA	NA	NA	Field
Water Surface	1-calm 2-ripples 3-waves 4-whitecap	NA	NA	89968	NA	NA	NA	NA	NA	Field
Tidal Stage	1-low 2-falling 3-slack 4-rising 6-high	NA	NA	89972	NA	NA	NA	NA	NA	Field
Turbidity	NTU	water	SM 2130B	82079	.5		NA	NA	NA	
Alkalinity, total	mg/L	water	SM 2320B	00410	20		NA	20	NA	
BOD, 5-day	mg/L	water	SM 5210B	00310	2		NA	NA	NA	
COD	mg/L	water	SM 5220C	00335	10		70-130	20	80-120	
Calcium, total	mg/L	water	SM 3500-Ca B	00916	.5		70-130	20	80-120	
E. coli, mTec	org/100mL	water	SM 9213B	31648	1		NA	.5**	NA	
E. coli, MF Partition Procedure	org/100mL	water	SM 9222G	31700	1		NA	.5**	NA	
Total Coliform	org/100mL	water	SM 9222 B	31501	1		NA	.5**	NA	
Enterococcus, MF	org/100mL	water	EPA 1600	31649	1		NA	.5**	NA	
Hardness, total (calculated; sum of total Ca+total Mg)	mg/L	water	SM 2340 B	82394	NA		NA	NA	NA	
Iron, total	ug/L	water	SM3111B or C	01045	300		70-130	20	80-120	
Magnesium, total	mg/L	water	SM3111 B or C	00927	.5		70-130	20	80-120	
Manganese, total	ug/L	water	SM 3111B	01055	50		70-130	20	80-120	
Nitrite-N	mg/L	water	EPA 300.0 Rev. 2.1 (1993)	00615	.05		70-130	20	80-120	
Oil and grease, Freon extraction	mg/L	water	SM 5520B	00556	5		NA	NA	NA	
TOC	mg/L	water	SM 5310 B, C, or D	00680	2.0		NA	NA	NA	

PARAMETER	UNITS	MATRIX	METHOD	PARAMETER CODE	AWRL	Limit of Quantitation (LOQ)	LOQ CHECK STANDARD %Rec	PRECISION (RPD of LCS/LCSD)	BIAS %Rec. of LCS	LAB***
Aluminum, dis.	ug/L	water	EPA 200.7 Rev 4.4 (1994)	01106	200		70-130	20	80-120	
Arsenic, dis.	ug/L	water	EPA 200.8 Rev 4.4 (1994)	01000	5		70-130	20	80-120	
Cadmium, dis.	ug/L	water	EPA 200.8 Rev 5.4 (1998)	01025	.1 for waters <50 mg/L hardness ===== .3 for waters ≥50 mg/L hardness		70-130	20	80-120	
Chromium, dis.	ug/L	water	EPA 200.8 Rev 5.4 (1998)	01030	10		70-130	20	80-120	
Copper, dis.	ug/L	water	EPA 200.8 Rev 5.4 (1998)	01040	1 for waters <50 mg/L hardness ===== 3 for waters ≥50 mg/L hardness		70-130	20	80-120	
Lead, dis.	ug/L	water	EPA 200.8 Rev 5.4 (1998)	01049	.1 for waters <85 mg/L hardness ===== 1 for waters ≥85 mg/L hardness		70-130	20	80-120	
Mercury, total	ug/L	water	EPA 1631	71960	.006		70-130	20	80-120	
Nickel, dis.	ug/L	water	EPA 200.8 Rev 5.4 (1998)	01065	10		70-130	20	80-120	
Selenium, total	ug/L	water	EPA 200.8 Rev 5.4 (1998)	01147	2		70-130	20	80-120	
Silver, dis.	ug/L	water	EPA 200.8 Rev 5.4 (1998)	01075	.5		70-130	20	80-120	
Zinc, dis.	ug/L	water	EPA 200.8 Rev 5.4 (1998)	01090	5		70-130	20	80-120	

Note: Not all sample parameters are addressed in the QAPP shell. If they are to be included, please use 60-140% as the bias limit in Table A7 for metals in solid samples (i.e., sediment and tissue); 65-135% as the bias limit in Table A7 for organics in water sample parameters; and 40 - 160% as the bias limit in Table A7 for organics in solid samples (i.e., sediment and tissue).

Benthics - Freshwater - Quantitative					
PARAMETER	**UNITS**	**MATRIX**	**METHOD**	**PARAMETER CODE**	**LAB*****
Biological Data Reporting Units	1= number of individuals from subsample; 2 = number of individuals/ft^2; 3 = number of individuals/m^2; 4 = total number in kicknet	Water	TCEQ SOP, V2	89899	NA
Surber Sampler Effort, area sampled	m^2	Water	TCEQ SOP, V2	89901	NA
Ekman Sampler Effort, area sampled	m^2	Water	TCEQ SOP, V2	89935	NA
Petersen Sampler Effort, area sampled	m^2	Water	TCEQ SOP, V2	89934	NA
Hester-Dendy Duration	days	Water	TCEQ SOP, V2	89933	NA
Benthic Sampler	1=Surber, 2=Ekman, 3=kicknet, 4=Petersen, 5=Hester-Dendy	Water	TCEQ SOP, V2	89950	NA
Area of snag surface sampled	m^2	Water	TCEQ SOP, V2	89975	NA
Undercut bank at sample point	%	Water	TCEQ SOP, V2	89921	NA
Overhanging brush at sample point	%	Water	TCEQ SOP, V2	89922	NA
Gravel substrate at sample point	%	Water	TCEQ SOP, V2	89923	NA
Sand substrate at sample point	%	Water	TCEQ SOP, V2	89924	NA
Soft bottom at sample point	%	Water	TCEQ SOP, V2	89925	NA
Macrophyte bed at sample point	%	Water	TCEQ SOP, V2	89926	NA
Snags and brush at sample point	%	Water	TCEQ SOP, V2	89927	NA
Bedrock at sample point	%	Water	TCEQ SOP, V2	89928	NA
Benthic Organisms, None Present	NA	Water	TCEQ SOP, V2	90005	NA
Mesh Size, any net or sieve, average bar (diagonal measurement) for benthic collection	cm	NA	TCEQ SOP, V2	89946	NA
Stream Order	#	NA	TCEQ SOP, V1	84161	NA
Ecoregion (Texas Ecoregion Code)	#	NA	TCEQ SOP, V1	89961	NA
Total Taxa Richness, Benthos	#	Water	TCEQ SOP, V2	90055	NA
Diptera Taxa	#	Water	TCEQ SOP, V2	90056	NA
Ephemeroptera Taxa	#	Water	TCEQ SOP, V2	90057	NA
Intolerant Taxa, Benthos	#	Water	TCEQ SOP, V2	90058	NA
Individuals as EPT Taxa	%	Water	TCEQ SOP, V2	90060	NA
Chironomidae	%	Water	TCEQ SOP, V2	90062	NA
Tolerant Taxa, Benthos	%	Water	TCEQ SOP, V2	90066	NA
Grazers	%	Water	TCEQ SOP, V2	90020	NA
Gatherers	%	Water	TCEQ SOP, V2	90025	NA
Filterers	%	Water	TCEQ SOP, V2	90030	NA
Dominance (3 Taxa)	%	Water	TCEQ SOP, V2	90067	NA

Benthics - Freshwater - RBA (Qualitative)					
PARAMETER	UNITS	MATRIX	METHOD	PARAMETER CODE	LAB***
Biological Data Reporting Units	1= number of individuals from sub-sample; 2 = number of individuals/ft^2; 3 = number of individuals/m^2; 4 = total number in kicknet	Water	TCEQ SOP, V2	89899	NA
Kicknet Effort, area kicked	m^2	Water	TCEQ SOP, V2	89903	NA
Kicknet Effort, minutes kicked	minutes	Water	TCEQ SOP, V2	89904	NA
Debris and Shoreline Sampling Effort, minutes picked	minutes	Water	TCEQ SOP, V2	89905	NA
Number of individuals in benthic RBA sub-sample (± 100)	#	Water	TCEQ SOP, V2	89906	NA
Benthic Sampler	1=Surber, 2=Ekman, 3=kicknet, 4=Petersen, 5=Hester-Dendy	Water	TCEQ SOP, V2	89950	NA
Undercut bank at sample point	%	Water	TCEQ SOP, V2	89921	NA
Overhanging brush at sample point	%	Water	TCEQ SOP, V2	89922	NA
Gravel substrate at sample point	%	Water	TCEQ SOP, V2	89923	NA
Sand substrate at sample point	%	Water	TCEQ SOP, V2	89924	NA
Soft bottom at sample point	%	Water	TCEQ SOP, V2	89925	NA
Macrophyte bed at sample point	%	Water	TCEQ SOP, V2	89926	NA
Snags and brush at sample point	%	Water	TCEQ SOP, V2	89927	NA
Bedrock at sample point	%	Water	TCEQ SOP, V2	89928	NA
Benthic Organisms, None Present	NA	Water	TCEQ SOP, V2	90005	NA
Mesh Size, any net or sieve, average bar (diagonal measurement) for benthic collection	cm	NA	TCEQ SOP, V2	89946	NA
Stream Order	#	NA	TCEQ SOP, V1	84161	NA
Ecoregion (Texas Ecoregion Code)	#	NA	TCEQ SOP, V1	89961	NA
Total Taxa Richness, Benthos	#	Water	TCEQ SOP, V2	90055	NA
EPT Index, Abundance	#	Water	TCEQ SOP, V2	90008	NA
Biotic Index (HBI)	NA	Water	TCEQ SOP, V2	90007	NA
Chironomidae	%	Water	TCEQ SOP, V2	90062	NA
Dominant Taxon, Benthos	%	Water	TCEQ SOP, V2	90042	NA
Dominant FFG	%	Water	TCEQ SOP, V2	90010	NA
Predators	%	Water	TCEQ SOP, V2	90036	NA
Ratio of Intolerant:Tolerant taxa, Benthos	NA	Water	TCEQ SOP, V2	90050	NA
Total Trichoptera as Hydropsychidae	%	Water	TCEQ SOP, V2	90069	NA
Non-insect taxa	#	Water	TCEQ SOP, V2	90052	NA
Collector-gatherers	%	Water	TCEQ SOP, V2	90025	NA
Total number as Elmidae	%	Water	TCEQ SOP, V2	90054	NA

Nekton- Freshwater					
PARAMETER	UNITS	MATRIX	METHOD	PARAMETER CODE	LAB***
Nekton, none captured	NA	Water	TCEQ SOP, V2	98005	NA
Electrofishing effort, duration of shocking	Seconds	Water	TCEQ SOP, V2	89944	NA
Seining effort	# of Hauls	Water	TCEQ SOP, V2	89947	NA
Combined length of seine hauls	meters	Water	TCEQ SOP, V2	89948	NA
Seining effort, duration	minutes	Water	TCEQ SOP, V2	89949	NA
Seine Minimum Mesh Size, net average bar, Nekton	in	Water	TCEQ SOP, V2	89930	NA
Seine Maximum Mesh Size, net average bar, Nekton	in	Water	TCEQ SOP, V2	89931	NA
Net length	meters	Water	TCEQ SOP, V2	89941	NA
Electrofishing method	1 = boat 2 = backpack 3 = tote barge	Water	TCEQ SOP, V2	89943	NA
Area seined	m^2	Water	TCEQ SOP, V2	89976	NA
Stream Order	#	NA	TCEQ SOP, V1	84161	NA
Ecoregion (Texas Ecoregion Code)	#	NA	TCEQ SOP, V1	89961	NA
Total number fish species	#	Water	TCEQ SOP, V2	98003	NA
Total native cyprinid species, fish	#	Water	TCEQ SOP, V2	98032	NA
Total benthic invertivore species, fish	#	Water	TCEQ SOP, V2	98052	NA
Total benthic species, fish	#	Water	TCEQ SOP, V2	98053	NA
Total sunfish species	#	Water	TCEQ SOP, V2	98008	NA
Total intolerant fish species	#	Water	TCEQ SOP, V2	98010	NA
Tolerant individuals (excluding Western Mosquitofish), fish	%	Water	TCEQ SOP, V2	98070	NA
Omnivore individuals, fish	%	Water	TCEQ SOP, V2	98017	NA
Invertivore individuals, fish	%	Water	TCEQ SOP, V2	98021	NA
Piscivore individuals, fish	%	Water	TCEQ SOP, V2	98022	NA
Total Individuals seining	#	Water	TCEQ SOP, V2	98039	NA
Total Individuals electrofishing	#	Water	TCEQ SOP, V2	98040	NA
Individuals/seine haul	#	Water	TCEQ SOP, V2	98062	NA
Individuals/minute electrofishing	#	Water	TCEQ SOP, V2	98069	NA
Individuals as non-native species	%	Water	TCEQ SOP, V2	98033	NA
Individuals w/ disease/anomalies	%	Water	TCEQ SOP, V2	98030	NA

Physical Habitat

PARAMETER	UNITS	METHOD	PARAMETER CODE	LAB***
Streambed slope over evaluated reach ****	ft/ft	TCEQ SOP, V2	72052	NA
Approximate drainage area above the most downstream transect ****	km^2	TCEQ SOP, V2	89859	NA
Stream Order	#	TCEQ SOP, V2	84161	NA
Length of stream	km	TCEQ SOP, V2	89860	NA
Lateral transects made	#	TCEQ SOP, V2	89832	NA
Average stream width	meters	TCEQ SOP, V2	89861	NA
Average stream depth	meters	TCEQ SOP, V2	89862	NA
Instantaneous stream flow	cfs	TCEQ SOP, V2	00061	NA
Flow measurement method	1 = gage 2 = electric 3 = mechanical 4 = weir/flume 5 = Doppler	TCEQ SOP, V2	89835	NA
Habitat Flow Status	1 = no flow 2 = low 3 = moderate 4 = high	TCEQ SOP, V2	89848	NA
Maximum pool width at time of study	meters	TCEQ SOP, V2	89864	NA
Maximum pool depth in study area	meters	TCEQ SOP, V2	89865	NA
Total stream bends	#	TCEQ SOP, V2	89839	NA
Well-defined stream bends	#	TCEQ SOP, V2	89840	NA
Moderately defined stream bends	#	TCEQ SOP, V2	89841	NA
Poorly defined stream bends	#	TCEQ SOP, V2	89842	NA
Riffles	#	TCEQ SOP, V2	89843	NA
Dominant substrate	1 = clay, 2 = silt, 3 = sand, 4 = gravel, 5 = cobble, 6 = boulder, 7 = bedrock, 8 = other	TCEQ SOP, V2	89844	NA
Avg. % of substrate gravel size or larger	%	TCEQ SOP, V2	89845	NA
Avg. % instream cover	%	TCEQ SOP, V2	84159	NA
Stream Cover Types	#	TCEQ SOP, V2	89929	NA
Avg. % stream bank erosion potential	%	TCEQ SOP, V2	89846	NA
Avg. stream bank slope	degrees	TCEQ SOP, V2	89847	NA
Avg. width natural riparian vegetation	meters	TCEQ SOP, V2	89866	NA
Avg. % trees as riparian vegetation	%	TCEQ SOP, V2	89849	NA
Avg. % shrubs as riparian vegetation	%	TCEQ SOP, V2	89850	NA
Avg. % grass as riparian vegetation	%	TCEQ SOP, V2	89851	NA
Avg. % cultivated fields as riparian vegetation	%	TCEQ SOP, V2	89852	NA
Avg. % other as riparian vegetation	%	TCEQ SOP, V2	89853	NA
Avg.% tree canopy coverage	%	TCEQ SOP, V2	89854	NA
Overall Aesthetics	1 = wilderness 2 = natural 3 = common 4 = offensive	TCEQ SOP, V2	89867	NA
Texas Ecoregion Code	#	TCEQ SOP, V2	89961	NA

Physical Habitat (continued)				
PARAMETER	UNITS	METHOD	PARAMETER CODE	LAB***
Land development impact	1 = unimpacted 2 = low 3 = moderate 4 = high	TCEQ SOP, V2	89962	NA

24-hour Dissolved Oxygen Monitoring Parameters										
Parameter	Units	Matrix	Method	Parameter Code	AWRL	Limit of Quantitation (LOQ)	LOQ CHECK STANDARD %Rec	PRECISION (RPD of LCS/LCSD)	Bias % Rec LCS	Lab***
24-Hr D.O. Avg.	mg/l	water	TCEQ SOP, V1	89857	NA	NA	NA	NA	NA	field
Max Daily DO	mg/l	water	TCEQ SOP, V1	89856	NA	NA	NA	NA	NA	field
Min Daily DO	mg/l	water	TCEQ SOP, V1	89855	NA	NA	NA	NA	NA	field
# DO measurements during 24-Hrs	# meas.	water	TCEQ SOP, V1	89858	NA	NA	NA	NA	NA	field
24-Hr Avg. water Temperature	◦ Celsius	water	TCEQ SOP, V1	00209	NA	NA	NA	NA	NA	field
Max Daily water Temperature	◦ Celsius	water	TCEQ SOP, V1	00210	NA	NA	NA	NA	NA	field
Min Daily water Temperature	◦ Celsius	water	TCEQ SOP, V1	00211	NA	NA	NA	NA	NA	field
# water temp measurements during 24-Hrs.	# meas.	water	TCEQ SOP, V1	00221	NA	NA	NA	NA	NA	field
24-Hr Avg. Spec Conductance	uS/cm	water	TCEQ SOP, V1	00212	NA	NA	NA	NA	NA	field
24-Hr Max Spec Conductance	uS/cm	water	TCEQ SOP, V1	00213	NA	NA	NA	NA	NA	field
24-Hr Min Spec Conductance	uS/cm	water	TCEQ SOP, V1	00214	NA	NA	NA	NA	NA	field
# Spec Conductance measurements during 24-Hrs.	# meas.	water	TCEQ SOP, V1	00222	NA	NA	NA	NA	NA	field
Max Daily pH	Standard units	water	TCEQ SOP, V1	00215	NA	NA	NA	NA	NA	field
Min Daily pH	Standard units	water	TCEQ SOP, V1	00216	NA	NA	NA	NA	NA	field
# pH measurements during 24-Hrs.	# meas.	water	TCEQ SOP, V1	00223	NA	NA	NA	NA	NA	field
24-Hr Salinity Avg	ppt	water	TCEQ SOP, V1	00218	NA	NA	NA	NA	NA	field

24-hour Dissolved Oxygen Monitoring Parameters (continued)

Parameter	Units	Matrix	Method	Parameter Code	AWRL	Limit of Quantitation (LOQ)	LOQ CHECK STANDARD %Rec	PRECISION (RPD of LCS/LCSD)	Bias % Rec LCS	Lab***
Max Daily Salinity	ppt	water	TCEQ SOP, V1	00217	NA	NA	NA	NA	NA	field
# salinity measurement during 24 Hrs	# meas.	water	TCEQ SOP, V1	00220	NA	NA	NA	NA	NA	field

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

** Based on range statistic as described in Standard Methods, 21st Edition, Section 9020-B, "Quality Assurance/Quality Control - Intralaboratory Quality Control Guidelines." This criterion applies to bacteriological duplicates with concentrations >10 MPN/100mL or > 10org./100 mL.

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

**** From USGS Map

References:

TCEQ SOP,V1 - TCEQ Surface Water Quality Monitoring Procedures Volume 1: Physical and Chemical Monitoring Methods for Water, Sediment, and Tissue, 2008 (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)

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 may be used if it becomes available)*

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