Quality Assurance Project Plan
Lower Colorado River Authority

PO Box 220
Austin, Texas 78767

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 2024 to FY 2025

Questions concerning this QAPP should be directed to:
Aaron Richter
Quality Assurance Officer & Data Manager, Clean Rivers Program
Lower Colorado River Authority – Water Quality Protection
PO Box 220
Austin, Texas 78767
(512) 578-7404
Aaron.Richter@lcra.org

A1 Approval Page

Texas Commission on Environmental Quality

Water Quality Planning Division

9/29/2023

Jason Godeaux, Manager — Date
Water Quality Monitoring and Assessment

9/29/2023

Sarah Whitley, Team Leader — Date
Water Quality Standards and Clean Rivers Program

Lawrence Grant Bassett 9/29/2023

Grant Bassett, — Date
Project Quality Assurance Specialist
Clean Rivers Program

9/29/2023

Kiran Freeman, Project Manager — Date
Clean Rivers Program

Cathy S. Anderson 9/29/2023

Cathy Anderson, Team Leader — Date
Data Management and Analysis

Monitoring Division

09/29/2023

D. Jody Koehler — Date
TCEQ Quality Assurance Manager

09/29/2023

Jason Natho — Date
Acting Lead CRP Quality Assurance Specialist

Lower Colorado River Authority

09/28/23

Zoe Nichols Date
LCRA Project Manager

09/28/23

Aaron Richter Date
LCRA Quality Assurance Officer & Data Manager

Upper Colorado River Authority

09/28/23

Scott McWilliams Date
Quality Assurance Officer

09/28/23

Lexi Woods Date
UCRA Project Manager & UCRA Data Manager

City of Austin

Andrew Clamann 9/28/2023

Andrew Clamann Date
COA Project Manager & Quality Assurance Officer

Environmental Laboratory Services

Dale Jurecka 9/27/23

Dale Jurecka Date
ELS Laboratory Manager

09/27/2023

Angel Mata Date
ELS Laboratory Quality Assurance Officer

Jason Woods 9/27/2023

Jason Woods Date
ELS Project Manager

DHL Analytical

09/27/2023

John Dupont Date
DHL Laboratory General Manager

09/27/2023

Sherri Herschmann Date
DHL Laboratory Quality Assurance Manager

A2 Table of Contents

List of Acronyms

AWRL	Ambient Water Reporting Limit
BMP	Best Management Practices
CAP	Corrective Action Plan
CE	Collecting Entity
COA	City of Austin
COC	Chain of Custody
CRP	Clean Rivers Program
DMRG	Surface Water Quality Monitoring Data Management Reference Guide
DM&A	Data Management and Analysis
ELS	Environmental Laboratory Services
EPA	United States Environmental Protection Agency
FY	Fiscal Year
GPS	Global Positioning System
LCRA	Lower Colorado River Authority
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
LIMS	Laboratory Information Management System
LOD	Limit of Detection
LOQ	Limit of Quantitation
MT	Monitoring Type
NELAP	National Environmental Lab Accreditation 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
RT	Routine Monitoring
SE	Submitting Entity
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
UCRA	Upper Colorado River Authority

A3 Distribution List

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

Kiran Freeman, Project Manager
Clean Rivers Program
MC-234
(512) 239-1810
Kiran.Freeman@tceq.texas.gov

Jason Natho
Acting Lead CRP Quality Assurance Specialist
MC-165
(512) 239-1672
Jason.Natho@tceq.texas.gov

Cathy Anderson
Team Leader, Data Management and Analysis
MC-234
(512) 239-1805
Cathy.Anderson@tceq.texas.gov

Lower Colorado River Authority
PO Box 220
Austin, Texas 78767

Zoe Nichols, Project Manager
(512) 578-2858
Zoe.Nichols@lcra.org

Aaron Richter, Quality Assurance Officer & Data Manager
(512) 578-7404
Aaron.Richter@lcra.org

Upper Colorado River Authority
512 Orient
San Angelo, Texas 76903

Scott McWilliams, Quality Assurance Officer
(325) 565-0565
scottm@ucratx.org

Lexi Woods, Project Manager & Data Manager
(325) 565-0565
lexiw@ucratx.org

City of Austin
505 Barton Springs Rd
Austin, Texas 78704

Andrew Clamann, Project Manager
(512) 974-2550
Andrew.Clamann@austintexas.gov

LCRA Environmental Laboratory Services
3505 Montopolis Dr
Austin, Texas 78744

Dale Jurecka, ELS Laboratory Manager
(512) 578-3200
Dale.Jurecka@lcra.org

Angel Mata, ELS Quality Assurance Officer
(512) 578-3200
Angel.Mata@lcra.org

Jason Woods, ELS Project Manager

(512) 730-5339
Jason.Woods@lcra.org

DHL Analytical
2300 Double Creek Dr
Round Rock, Texas 78664

John Dupont, DHL Laboratory General Manager
(512) 388-8222
dupont@dhlanalytical.com

Sherri Herschmann, DHL Laboratory Quality Assurance Manager
(512) 388-8222
sh@dhlanalytical.com

The LCRA 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, subparticipants, or other units of government. The LCRA will document distribution of the plan and any amendments and appendices, maintain this documentation as part of the project's quality assurance records, and ensure the documentation is available for review.

A4 PROJECT/TASK ORGANIZATION

Description of Responsibilities

TCEQ

Sarah Whitley
Team Leader, Water Quality Standards and Clean Rivers Program
Responsible for Texas Commission on Environmental Quality (TCEQ) activities supporting the development and implementation of the Texas Clean Rivers Program (CRP). Responsible for verifying that the TCEQ Quality Management Plan (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 Quality Assurance (QA) guidance for the CRP. Reviews and approves all QA audits, corrective actions, reports, work plans, contracts, QAPPs, and TCEQ QMP. Enforces corrective action, as required, where QA protocols are not met. Ensures CRP personnel are fully trained.

Jason Natho
Acting CRP Lead Quality Assurance Specialist
Participates in the development, approval, implementation, and maintenance of written QA standards (e.g., Program Guidance, SOPs, QAPPs, QMP). Assists program and project manager in developing and implementing quality system. Reviews and approves CRP QAPPs, QAPP amendments, and QAPP special appendices. Prepares and distributes annual audit plans. Conducts monitoring systems audits of Planning Agencies. Concurs with 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 audit records for the CRP.

Kiran Freeman
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 QA standards (e.g., Program Guidance, SOPs, QAPPs, QMP). Coordinates the review and approval of CRP QAPPs in coordination with the CRP Project Quality Assurance Specialist. Ensures maintenance of QAPPs. 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.

Cathy Anderson
Team Leader, Data Management and Analysis (DM&A) Team
Participates in the development, approval, implementation, and maintenance of written QA standards (e.g., Program Guidance, SOPs, QAPPs, QMP). Ensures DM&A staff perform data management-related tasks.

Scott Delgado
CRP Data Manager, DM&A Team
Responsible for coordination and tracking of CRP data sets from initial submittal through CRP Project Manager review and approval. Ensures that data are reported following instructions in the Data Management Reference Guide, July 2019 or most current version (DMRG). Runs automated data validation checks in the Surface Water Quality Management Information System (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 SOPs for CRP data management. Coordinates and processes data correction requests. Participates in the development, implementation, and maintenance of written QA standards (e.g., Program Guidance, SOPs, QAPPs, QMP).

Grant Bassett
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 QA standards (e.g., Program Guidance, SOPs, QAPPs, QMP). Serves on planning team for CRP special projects. Reviews and approves CRP QAPPs in coordination with other CRP staff. Coordinates documentation and monitors implementation of corrective actions for the CRP.

Lower Colorado River Authority

Zoe Nichols
LCRA 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 subparticipants 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.

Aaron Richter
LCRA Quality Assurance Officer & Data Manager
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 QA records. Responsible for coordinating with the TCEQ CRP PM or Project QAS to resolve QA-related issues. Notifies the LCRA 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 is properly trained and that training records are maintained.

In addition, 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 LCRA internet sites.

Upper Colorado River Authority

Scott McWilliams
UCRA Project Manager, QA Officer, and Field Staff
Responsible for implementing the CRP requirements in the contract and in the QAPP. Ensures that UCRA staff are qualified to perform CRP activities and that they receive necessary and required training. Ensures that UCRA participates in monitoring system and fiscal audits as required. Responsible for overall quality control and quality assurance of samples, analytical results and data for samples collected by UCRA. Performs monitoring as specified in the latest edition of SWQM Procedures.

Lexi Woods
UCRA Data Manager and Field Staff
Responsible for the compilation and transmittal of QAPP-listed UCRA data and data review checklist to Lower Colorado River Authority. Responsible for verifying and validating data. Ensure that only acceptable data, as specified in the QAPP, are reported to the Lower Colorado River Authority. Responsible for corrective action communication with the Lower Colorado River Authority QAO. Performs monitoring as specified in the latest edition of SWQM Procedures.

City of Austin

Andrew Clamann
COA Project Manager, QA Officer, and Field Coordinator
Responsible for overall performance, administration and management of COA's project participation. Responsible for field team activities and that field teams receive necessary training. Responsible for overall quality control and quality assurance of samples and analytical results of the samples collected by COA. Responsible for verifying and validating data. Ensures that only acceptable data, as specified in the QAPP, are reported to the Lower Colorado River Authority. Responsible for documenting corrective actions, coordinating audit and QA activities, and responding to audit reviews by Lower Colorado River Authority. Coordinates activities with City of Austin field staff, LCRA PM, LCRA DM/QAO and DHL laboratory staff. Ensures that training records are maintained. Coordinates field activities.

Environmental Laboratory Services

Dale Jurecka
ELS Laboratory Manager
Responsible for the overall performance, administration, and reporting of analyses performed by Lower Colorado River Authority's ELS. Responsible for supervision of laboratory and field personnel involved in generating analytical data for the project. Ensures that laboratory and field personnel have adequate training and a thorough knowledge of the QAPP and related SOPs. Responsible for oversight of all laboratory operations ensuring that all QA/QC requirements are met, documentation is complete and adequately maintained, and results are reported accurately.

Angel Mata
ELS Laboratory Quality Assurance Officer
Responsible for the overall quality control and quality assurance of analyses performed by Lower Colorado River Authority's ELS. Monitors the implementation of the QM/QAPP within the laboratory to ensure complete compliance with QA data quality objectives, as defined by the contract and in the QAPP. Conducts in-house audits to ensure compliance with written SOPs and to identify potential problems. Responsible for supervising and verifying all aspects of the QA/QC in the laboratory.

Jason Woods
ELS Project Manager, Field Team Services Lead, and Account Manager
Responsible for analyses performed by Lower Colorado River Authority ELS for LCRA and UCRA's portions of this project. Responsible for project set up in LIMS. Responsible for laboratory and field staff corrective action communication with the Lower Colorado River Authority QAO. Makes ELS data available to the Lower Colorado River Authority DM. Notifies Lower Colorado River Authority and UCRA of laboratory analysis issues that may invalidate data. Responsible for coordination of the field team monitoring efforts. Ensures that samples are collected according to methods specified in the QAPP and the latest edition of the SWQM Procedures. Ensures that training records for ELS staff are created and maintained.

Colt Petri
ELS Field Staff
Responsible for the collection of LCRA water quality data in accordance with the latest edition of the SWQM Procedures. Compilation and transmittal of QAPP-listed LCRA field data to LIMS.

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

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

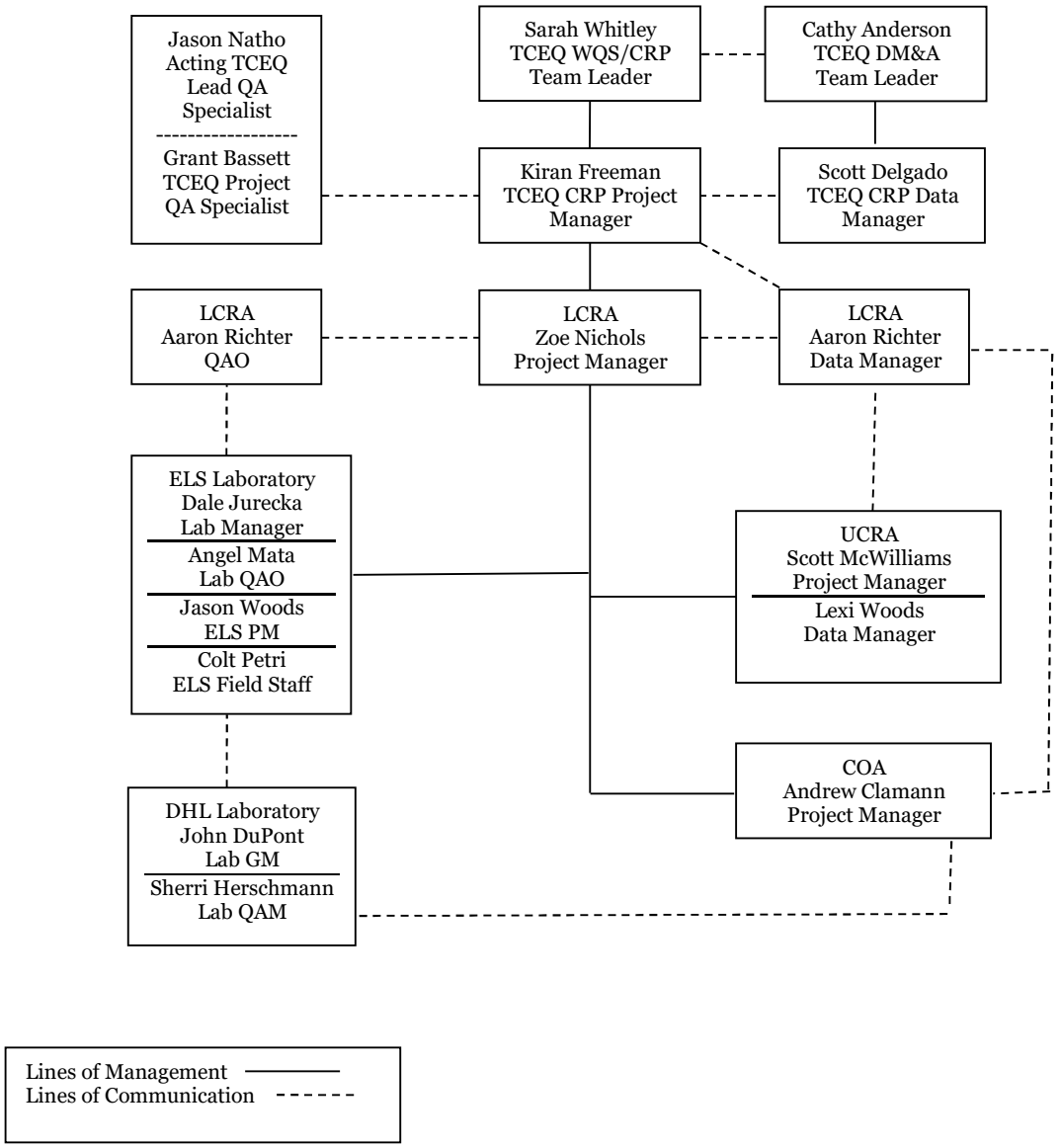
DHL Analytical

John Dupont
DHL Laboratory General Manager
Responsible for overall performance, administration, and reporting of analyses performed by DHL Analytical Laboratory. Responsible for supervision of laboratory personnel involved in generating analytical data for the project. Ensures that laboratory personnel have adequate training and a thorough knowledge of this QAPP and related SOPs. Responsible for oversight of all laboratory operations ensuring that all QA/QC requirements are met, documentation is complete and adequately maintained, and results are reported accurately. Additionally, the general manager will review and verify all field and laboratory data for integrity and continuity, reasonableness and conformance to project requirements, and then validated against the data quality objectives listed in Appendix A of this QAPP.

Sherri Herschmann
DHL Laboratory Quality Assurance Manager
Maintains operating procedures that are in compliance with this QAPP.

Project Organization Chart

Figure A4.1. Organization Chart – Lines of Communication



A5 Problem Definition/Background

In 1991, the Texas Legislature passed the Texas Clean River Act (Senate Bill 818) in response to growing concerns that water resource issues were not being pursued in an integrated, systematic manner. The act requires that ongoing water quality assessments be conducted for each river basin in Texas, an approach that integrates water quality issues within the watershed. The CRP legislation mandates that each river authority (or local governing entity) shall submit quality-assured data collected in the river basin to the commission. Quality-assured data in the context of the legislation means data that comply with TCEQ rules for surface water quality monitoring (SWQM) 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 LCRA 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, January 2023 or most recent version (QMP).

The purpose of this QAPP is to clearly delineate LCRA 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 of known and documented quality, deemed acceptable for their intended use. 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 (TMDL) and water quality standards development, permit decisions, and other program activities deemed appropriate by the TCEQ. Project results will be used to support the achievement of CRP objectives, as contained in the *Clean Rivers Program Guidance and Reference Guide FY 2024-2025*.

Table A5.1, shows which analytes are typically collected by each monitoring entity. The groups are arranged similarly to Table A7 found in Appendix A. An "X" in the column indicates that the analyte is monitored by the entity shown. Evaluation of historic data has shown many concerns for nutrients (especially nitrates) and chlorophyll *a* throughout the basin due to land use, discharges, and inadequate mitigation practices. In addition, chloride and sulfate levels rise and fall in accordance with rainfall and water levels. It is important to continue to monitor these routine parameters as stakeholders implement solutions to these water quality issues to determine if water quality conditions improve within the basin. Current 24 hr DO and metals in water sampling is being done to address on-going impairments in the basin.

Table A5.1: Analyte Groups and Monitoring Entities

Analyte Group and Analyte	**LCRA**	**UCRA**	**COA**
Field and Flow			
Temperature	X	X	X
Dissolved Oxygen	X	X	X
D.O. (% saturation)	X	X	
Specific Conductance	X	X	X
pH	X	X	X
Secchi disk transparency	X	X	X
Reservoir stage	X	X	
Reservoir % full	X	X	
Present weather	X	X	
Wind intensity	X	X	
Days since significant precipitation	X	X	X
Stream flow	X	X	X
Flow severity	X	X	X
Turbidity	X	X	
Flow estimate	X	X	X
Flow method	X	X	X
Conventional			
Total Suspended Solids	X		X
Ammonia	X		X
Total Kjeldahl Nitrogen	X	X	X

Nitrite plus Nitrate	X	X	X
Total Phosphorus	X	X	X
Orthophosphate	X		X
Chloride	X	X	X
Sulfate	X	X	X
Total Dissolved Solids (calculated)	X	X	
Chlorophyll *a*	X	X	X
Alkalinity	X		
Pheophytin	X	X	
Bacteria			
E. coli	X	X	X
E. coli holding time	X	X	X
Enterococcus	X		
24 hr Dissolved Oxygen	X	X	X
Metals in Sediment			X
Organics in Sediment			X
Drought codes	X	X	
Metals in Water	X		

A6 Project/Task Description

The Lower Colorado River Authority will collect water samples from the Colorado River below O.H. Ivie Reservoir to its mouth, as well as all the major tributaries and reservoirs. Parameters collected will include field, flow, bacteria, 24 hr dissolved oxygen, metals in water, and conventional parameters. A total of 61 sites will be routinely monitored. Sampling frequency at 50 locations will be six times per year, in order to maintain a consistent data set, to determine inter-seasonal variability and examine possible pollution impacts. Metals in water will be collected at one of these 50 locations. Quarterly monitoring will occur at seven locations. These locations are mostly rural and have few sources of large impacts on water quality. One location will be monitored twice a year while two locations on Lake Austin will be monitored 8 times a year. 24-hr dissolved oxygen will be collected at one site five times per fiscal year.

The Upper Colorado River Authority will collect water samples at sites in the Concho River and upper Colorado River watersheds, including tributaries and reservoirs. UCRA's monitoring program will include collection of field, flow, bacteria, 24 hr dissolved oxygen, and conventional parameters. Diel data will be collected at four sites, with three in Segment 1421 which has significant dissolved oxygen issues caused by urban runoff and lack of base flows. Quarterly sampling will occur at 41 sites throughout the upper basin. Six sites will be monitored twice per fiscal year. Bacteria will not be collected in segment 1412 due to the inability to meet the holding time for Enterococcus bacteria. UCRA sampling frequencies vary from quarterly to semiannually, based upon data needs and shared monitoring with the regional TCEQ offices.

City of Austin, an in-kind contributor of CRP data, will collect water samples at 14 routine sites in and around Austin. Field, flow, bacteria, 24 hr dissolved oxygen, metals/organics in sediment, and conventional parameters will be collected, analyzed, and reported for Lake Austin, Lady Bird Lake, and several tributaries to the Colorado River. Field measurements are collected at all sites. Organics and metals in sediment will be collected from Lake Austin and Lady Bird Lake. Chlorophyll *a* will be collected from sites in Lady Bird Lake and Lake Austin.

Table A6.1: Summary of monitoring groups and frequencies.

	Number of Sites							
Frequency	Field	Conv	Bacteria	Flow	24-hr DO	Metal Sed	Organic Sed	Metals Water
COA								
1	2	2	2	-	-	2	2	-
2	1	-	-	1	1	-	-	-
4	10	10	10	10	-	-	-	-
9	1	1	1	-	-	-	-	-
LCRA								
2	1	1	1	1	-	-	-	-
4	7	7	7	6	-	-	-	-
5	1	-	-	1	1	-	-	-
6	50	48	49	30	-	-	-	1-
8	2	2	2	-	-	-	-	-
UCRA								
2	6	6	6	2	4	-	-	-
4	41	41	28	31	-	-	-	-
6				2				

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

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

Amendments to the QAPP

Amendments 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 LCRA Project Manager to the CRP Project Manager electronically. The Basin Planning Agency will submit a completed QAPP Amendment document, including a justification of the amendment, a table of changes, and all pages, sections, and attachments affected by the amendment. Amendments are effective immediately upon approval by the LCRA Project Manager, the LCRA QAO, the CRP Project Manager, the CRP Lead QA Specialist, the TCEQ QA Manager or designee, the CRP Project QA Specialist, and additional parties affected by the amendment. Amendments are not retroactive. No work shall be implemented without an approved QAPP or amendment prior to the start of work. Any activities under this contract that commence prior to the approval of the governing QA document constitute a deficiency and are subject to corrective action as described in section C1 of this QAPP. Any deviation or deficiency from this QAPP which occurs after the execution of this QAPP will be addressed through a Corrective Action Plan (CAP). An Amendment may be a component of a CAP to prevent future recurrence of a deviation.

Amendments will be incorporated into the QAPP by way of attachment and distributed to personnel on the distribution list by the LCRA Project Manager. If adherence letters are required, the LCRA will secure an adherence letter from each sub-tier project participant (e.g., subcontractors, sub-participant, or other units of government) affected by the amendment 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 QA records and ensure that the documentation is available for review.

Special Project Appendices

Projects requiring QAPP appendices will be planned in consultation with the LCRA and the TCEQ Project Manager and TCEQ technical staff. Appendices will be written in an abbreviated format and will reference the Basin QAPP where appropriate. Appendices will be approved by the LCRA Project Manager, the LCRA QAO, the

Laboratory (as applicable), and the CRP Project Manager, the CRP Project QA Specialist, the CRP Lead QA Specialist, and additional parties affected by the Appendix, as appropriate. Copies of approved QAPP appendices will be distributed by the LCRA to project participants before data collection activities commence. The Basin Planning Agency will secure written documentation from each sub-tier project participant (e.g., subcontractors, subparticipants, other units of government) stating the organization's awareness of and commitment to requirements contained in each special project appendix to the QAPP. The LCRA will maintain this documentation as part of the project's QA 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 TCEQ's Guidance for Assessing and Reporting Surface Water Quality in Texas, July 2022 or most recent version (https://www.tceq.texas.gov/downloads/water-quality/assessment/integrated-report-2022/2022-guidance.pdf). These water quality data, and data collected by other organizations (e.g., United States Geological Survey (USGS), TCEQ, etc.), will be subsequently reconciled for use and assessed by the TCEQ.

Systematic watershed monitoring is defined as 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, investigate areas of potential concern, and investigate possible sources of water quality impairments or concerns. 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 LCRA 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.

There are currently impairments in Clear Creek for aluminum, copper, zinc, nickel, sulfate, TDS, and pH due to an industrial discharge. BMPs were put in place when the impairments began; however, data has not been collected in a number of years. LCRA is now collecting metals in water in Clear Creek to allow for a more recent assessment of the creek after BMPs have been implemented for some time.

The measurement performance specifications to support the project purpose for a minimum data set are specified in Appendix A.

Ambient Water Reporting Limits (AWRLs)

For surface water to be evaluated for compliance with Texas Surface Water Quality Standards ("TSWQS") and screening levels, data must be reported at or below specified reporting limits. To ensure data are collected at or below these reporting limits, required ambient water reporting limits ("AWRL") have been established. A full listing of AWRLs can be found at https://www.tceq.texas.gov/assets/public/waterquality/crp/QA/awrlmaster.pdf .

The limit of quantitation (LOQ) is the minimum reporting limit, concentration, or quantity of a target variable (e.g., target analyte) that can be reported with a specified degree of confidence by the laboratory analyzing the sample. Analytical results shall be reported down to the laboratory's LOQ (i.e., the laboratory's LOQ for a given parameter is its reporting limit) as specified in Appendix A.

The following requirements must be met in order to report results to the CRP:

- The laboratory's LOQ for each analyte must be set at or below the AWRL.
- Once the LOQ is established in the QAPP, that is the reporting limit for that parameter until such time as the laboratory amends the QAPP and lists an updated LOQ.
- The laboratory must demonstrate its ability to quantitate at its LOQ for each analyte by running an LOQ check sample for each analytical batch of CRP samples analyzed.

- When reporting data, no results may be reported below the LOQ stated in this QAPP. One exception is for toxaphene in Table A7.18 where DHL is above the TCEQ-AWRL due to GCMS instrument technology.
- Measurement performance specifications for LOQ check samples are found in Appendix A.

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.

Laboratory precision is assessed by comparing replicate analyses of Laboratory Control Samples (LCS) in the sample matrix (e.g. deionized water, sand, commercially available tissue), Matrix Spike/Matrix Spike Duplicate (MS/MSD), or sample/duplicate (DUP) pairs, as applicable. Precision results are compared against measurement performance specifications and used during evaluation of analytical performance. Program-defined measurement performance specifications for precision are defined in Appendix A.

Bias

Bias is the systematic or persistent distortion of a measurement process, which causes errors in one direction (i.e., the expected sample measurement is different from the sample's true value). Bias is a statistical measurement of correctness and includes multiple components of systematic error. Bias is determined through the analysis of LCS and LOQ check samples prepared with verified and known amounts of all target analytes in the sample matrix (e.g. deionized water, sand, commercially available tissue) and by calculating percent recovery. Results are compared against measurement performance specifications and used during evaluation of analytical performance. Program-defined measurement performance specifications for bias are specified in Appendix A.

Representativeness

Site selection, the appropriate sampling regime, comparable monitoring and collection methods, and use of only approved analytical methods will assure that the measurement data represents the conditions at the site. Routine data collected under CRP are considered to be spatially and temporally representative of ambient water quality conditions. Water quality data are collected on a routine frequency and are separated by approximately even time intervals. At a minimum, samples are collected over at least two seasons (to include inter-seasonal variation) and over two years (to include inter-year variation) and include some data collected during an index period (March 15- 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 maximum representation of the water body will be tempered by funding availability.

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 as described in this QAPP and in TCEQ guidance. 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 in Section B10.

Completeness

The completeness of the data describes how much of the data are 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

Before new field personnel independently conduct field work, the ELS Field Team Services Leader, COA Project Manager, or UCRA Project Manager trains him/her in proper instrument calibration, field sampling techniques, and field analysis procedures. The QA officer (or designee) will document the successful field demonstration. The QA Officer (or designee) will retain documentation of training and the successful field demonstration in the employee's personnel file or other designated location and ensure that the documentation will be available during monitoring systems audits.

The requirements for obtaining certified positional data using a Global Positioning System (GPS) are located in Section B10, Data Management.

Contractors and subcontractors must ensure that laboratories analyzing samples under this QAPP meet the requirements contained in The NELAC Institute Standard (2016) Volume 1, Module 2, Section 4.5 (concerning Subcontracting of Environmental Tests).

A9 Documents and Records

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

Table A9.1 Project Documents and Records

Document/Record	Location	Retention (yrs)	Format
QAPPs, amendments and appendices	LCRA	5 years	Electronic
Field SOPs	LCRA	5 years	Electronic/Paper
Laboratory Quality Manuals	LCRA/ELS/DHL	5 years	Electronic
Laboratory SOPs	LCRA/ELS/DHL	5 years	Electronic
QAPP distribution documentation	LCRA	5 years	Electronic
Field staff training records	LCRA/UCRA/COA	5 years	Electronic/Paper
Field equipment calibration/maintenance logs	ELS/UCRA/COA	5 years	Electronic/Paper
Field instrument printouts	ELS/UCRA/COA	5 years	Electronic
Field notebooks or data sheets	ELS	5 years	Electronic/Paper
Chain of custody records	LCRA/UCRA/COA/ELS	5 years	Electronic
Laboratory calibration records	ELS/DHL	5 years	Electronic
Laboratory instrument printouts	ELS/DHL	5 years	Electronic
Laboratory data reports/results	LCRA/ELS/DHL	5 years	Electronic
Laboratory equipment maintenance logs	ELS/DHL	5 years	Electronic
Corrective Action Documentation	LCRA/UCRA/COA/ELS/DHL	5 years	Electronic

Laboratory Test Reports

Test/data reports from the laboratory must document the test results clearly and accurately. Routine data reports should be consistent with the TNI Standard (2016), Volume 1, Module 2, Section 5.10 and include the information necessary for the interpretation and validation of data. The requirements for reporting data and the procedures are provided.

Laboratory Test Reports generated by ELS and DHL contain the following elements:

- Sample results
- Units of measurement
- Sample matrix
- Dry weight or wet weight (as applicable)
- Station information
- Date and time of collection
- Sample depth (as applicable)
- *E. coli* analysis time so that holding time can be calculated and reported to TCEQ
- LOQ and limit of detection (LOD) (formerly referred to as the reporting limit and the method detection limit, respectively) and qualification of results outside the working range (if applicable). LCRA receives data down to the LOD but censors data to the LOQ for reporting to CRP. The Reporting Limit may also be used and will be defined as LOQ or LOD by DHL Anlytical.
- Certification of NELAP compliance.

Electronic Data

Data will be submitted electronically to the TCEQ in the Event/Result file format described in the most current version of the DMRG, which can be found at https://www.tceq.texas.gov/waterquality/data-management/dmrg_index.html. A completed Data Review Checklist and Data Summary (see Appendix F) will be included with each data submittal.

ELS will provide data electronically through the use of Microsoft Excel spreadsheets and portable format documents. UCRA will provide data electronically to LCRA through the use of Excel spreadsheets. The COA will provide data in a text files format similar to the result/event file format. Lower Colorado River Authority will submit all acceptable LCRA and sub-participant data, Data Review Checklists and Data Summary Reports to

TCEQ.

B1 Sampling Process Design

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

B2 Sampling Methods

Field Sampling Procedures

Field sampling will be conducted in accordance with the latest versions of the TCEQ *Surface Water Quality Monitoring Procedures Volume 1: Physical and Chemical Monitoring Methods for Water, Sediment, and Tissue,* 2012 (RG-415) and *Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data*, 2014 (RG-416), collectively referred to as "SWQM Procedures." Updates to SWQM Procedures are posted to the Surface Water Quality Monitoring Procedures website (https://www.tceq.texas.gov/waterquality/monitoring/swqm_guides.html), and shall be incorporated into the LCRA, UCRA, and COA's procedures, QAPP, SOPs, etc., within 60 days of any final published update. Additional aspects outlined in Section B below reflect specific requirements for sampling under CRP and/or provide additional clarification.

Table B2.1 Sample Storage, Preservation and Handling Requirements

Parameter	Matrix	Container	Preservation	Sample Volume	Holding Time
TSS	Water	Polyethylene/Polypropylene or Glass	Ice, <6°C not frozen	1000 mL	7 days
Sulfate				250 mL	28 days
Chloride				100 mL	28 days
Alkalinity, total				200 mL	14 days
Orthophosphate				250 mL	48 hours
Ammonia-N			H_2SO_4, pH < 2; Ice, <6°C not frozen	250 mL	28 days
Kjeldahl-N				500 mL	28 days
Nitrate + Nitrite-N				250 mL	28 days
Phosphorus, total				100 mL	28 days
Chlorophyll-a		Amber Polyethylene/Polypropylene	Dark, <6°C not frozen before filtration	250 mL	48 hours, 24 days after filtration if frozen
Pheophytin-a				500 mL	
E. coli		Sterile, Polyethylene	Sodium thiosulfate; Ice, <6°C not frozen	120 mL	8 hours*
Enterococci					
Metals in sediment	Sediment	Glass w/Teflon-lined lid	Dark, Ice, <6°C not frozen	1000 mL	180 days
Organics/ Pesticides					14 days after extraction
Conventionals					28 days
Mercury					28 days
Dissolved metals in water	Water	Polyethylene/Polypropylene pre-cleaned w/HNO_3	1:1 HNO_3/H_2O; Ice, <6°C not frozen	250 mL	6 months

**E. coli* samples should always be processed as soon as possible and incubated no later than 8 hours from time of collection. When transport conditions necessitate sample incubation after 8 hours from time of collection, the holding time may be extended and samples must be processed as soon as possible and within 30 hours.

Sample Containers

Certificates from sample container manufacturers are maintained by ELS and DHL. ELS supplies LCRA and UCRA with new, pre-cleaned containers for water quality monitoring. DHL provides sample containers to COA for water and sediment sample collection. Sample containers are not reused but are properly disposed of after use. Sample containers used for conventional parameters are purchased pre-cleaned and are disposable.

- Bacteriological sample containers are the 120 and 290 mL bottles from IDEXX and contain 1% sodium thiosulfate to neutralize residual chlorine up to 15 mg/l.
- Brown polyethylene bottles are used for chlorophyll *a* sampling.
- Sample containers for metals are new, certified glass or plastic bottles. In addition, materials for collecting metals in water are stored and transported in dust-free containers, such as plastic bags.
- Sample containers for organics are purchased pre-cleaned and certified for organic constituents. ELS and DHL maintain certificates of analysis for organic and metals for sample containers.
- Sample containers may contain preservatives added by laboratory staff prior to sample collection.

Processes to Prevent Contamination

SWQM Procedures outline the necessary steps to prevent contamination of samples, including: direct collection into sample containers, when possible; use of certified containers for organics; and clean sampling techniques for metals. Field QC samples (identified in Section B5) are collected to verify that contamination has not occurred.

Documentation of Field Sampling Activities

Field sampling activities for COA are documented on electronic field data forms and LCRA and UCRA use field sheet templates for flow measurements and a waterproof field book for recording field notes and secchi depths (see Appendix D for a copy of these forms/templates). Flow worksheets and records of bacteriological analyses (if applicable) are part of the field data record. The following will be recorded for all visits:

- Station ID
- Sampling Date
- Location
- Sampling Depth
- Sampling Time
- Sample Collector's name
- Values for all field parameters collected

Additional notes containing detailed observational data not captured by field parameters may include:

- Water appearance
- Weather
- Biological activity
- Unusual odors
- Pertinent observations related to water quality or stream uses
- Watershed or instream activities
- Specific sample information
- Missing parameters

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:

- Write legibly, in indelible ink
- Make changes by crossing out original entries with a single line strike-out, entering the changes, and

initialing and dating the corrections.
- Close-out incomplete pages with an initialed and dated diagonal line.
- Exceptions to this include electronic field data collection conducted by the City of Austin (COA). Data are entered into electronic forms as shown in Appendix D. The COA field collection application contains boundary conditions upon entry to help field staff maintain high confidence that they are entering data correctly. The data are stored in the Cloud and are mirrored on an in-house server. From there the data is programmatically inserted into the COA ORACLE database and delivered to LCRA in the event/result file format described in the DMRG. Changes from the in-house application server to the ORACLE database are tracked via a series of auto-archived log files.

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, SWQM Procedures, or appropriate sampling procedures may invalidate data, and require documented corrective action. Corrective action may include for samples to be discarded and re-collected. It is the responsibility of the LCRA Project Manager, in consultation with the LCRA 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 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 E). The following list of items matches the COC form in Appendix E.

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

Sample Labeling

Samples from the field are labeled on the container, or on a label, with an indelible marker. Label information includes:

- Site identification
- Date and time of collection
- Preservative added, if applicable

- Indication of field-filtration for metals, as applicable
- Sample type (i.e., analyses) to be performed

Sample Handling

Water quality samples are collected and preserved according to the SWQM Procedures and are subsequently transported to the laboratory. Upon arrival at the laboratory, all samples and paperwork are relinquished to the sample custodian who will inspect the cooler or sample transport container for breakage and signs of leakage that may affect sample integrity.

The sample custodian also checks and documents the temperature of the samples using an infrared thermometer, and that all acid preserved samples are pH <2. Paperwork is examined for completeness and the sample custodian accepts the sample and documentation by signing the chain of custody and posting the date and time of acceptance.

NOTE: Any discrepancies will be noted on the COC and the Project Manager notified immediately for further instructions if there are any issues with the samples.

The sample custodian enters the sample information into the laboratory's information management system and prints out one set of labels. Each sample container brought in is labelled with a unique identification number. The water quality samples are then either given directly to an analyst, preparing to analyze the sample(s) immediately, or placed in a refrigerator in a secured portion of the laboratory (access is controlled using programmed access cards). Laboratory staff run backlog reports to identify samples that need to be analyzed and identify when sample hold time elapses.

Sample Tracking Procedure Deficiencies and Corrective Action

All deficiencies associated with COC procedures, as described in this QAPP, are immediately reported to the LCRA 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 LCRA Project Manager in consultation with the LCRA 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. CAPs 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. The authority for analysis methodologies under CRP is derived from the 30 Tex. Admin. Code Ch. 307, in that data generally are generated for comparison to those standards and/or criteria. The Texas Surface Water Quality Standards state "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 TCEQ, and in accordance with chapter 25 of this title."

Laboratories collecting data under this QAPP must be NELAP-accredited in accordance with 30 TAC Chapter 25. Copies of laboratory QMs and SOPs shall be made available for review by the TCEQ.

Standards Traceability

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

a way that will trace the reagent back to preparation.

Analytical Method Deficiencies and Corrective Actions

Deficiencies in field and laboratory measurement systems involve, but are not limited to such things as instrument malfunctions, failures in calibration, blank contamination, quality control samples outside QAPP-defined limits, etc. In many cases, the field technician or 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 applicable Laboratory Supervisor, who will make the determination and notify the LCRA QAO if the problem compromises sample results. 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 LCRA Project Manager. The LCRA 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 qualifier codes (e.g., "holding time exceedance," "sample received unpreserved," "estimated value") 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. However, when data is lost, its absence will be described in the data summary report submitted with the corresponding data set, and a corrective action plan (as described in section C1) may be necessary.

B5 Quality Control

Sampling Quality Control Requirements and Acceptability Criteria

Field sampling will be conducted in accordance with the ELS SOP Surface Water Field Measurements and Sample Collection.

Laboratory Measurement Quality Control Requirements and Acceptability Criteria

Batch

A batch is defined as environmental samples that are prepared and/or analyzed together with the same process and personnel, using the same lot(s) of reagents. A preparation batch is composed of one to 20 environmental samples of the same NELAP-defined matrix, meeting the above-mentioned criteria and with a maximum time between the start of processing of the first and last sample in the batch to be 24 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 in this section (e.g., sample duplicates, surrogates, internal standards, continuing calibration samples, interference check samples, positive control, negative control, and media blank), are run as specified in the methods and in SWQM Procedures. 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.

Comparison Counting

For routine bacteriological samples, repeat counts on one or more positive samples are required, at least

monthly. If possible, the analyst will compare counts with another analyst who also performs the analysis. Replicate counts by the same analyst should agree within 5 percent, and those between analysts should agree within 10 percent. The analyst(s) will record the results.

Limit of Quantitation (LOQ)

The laboratory will analyze a calibration standard (if applicable) at the LOQ published in Appendix A of this QAPP on each day calibrations are performed. In addition, an LOQ check sample will be analyzed with each analytical batch. Calibrations including the standard at the LOQ listed in Appendix A 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 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 Sample

An LOQ check sample consists of a sample matrix (e.g., deionized water, sand, commercially available tissue) free from the analytes of interest spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes. It is used to establish intra-laboratory bias to assess the performance of the measurement system at the lower limits of analysis. The LOQ check sample is spiked into the sample matrix at a level less than or equal to the LOQ published in Appendix A of this QAPP, 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 diluted or high concentration samples run on batches with calibration curves that do not include the LOQ published in Appendix A of this QAPP, a check sample will be run at the low end of the calibration curve.

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

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

$$\%R = {}^{S_R}/_{S_A} \times 100$$

Measurement performance specifications are used to determine the acceptability of LOQ Check Sample analyses as specified in Appendix A of this QAPP.

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 midpoint 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 and is performed 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; S_R is the measured result; and S_A is the true result:

$$\%R = {}^{S_R}/_{S_A} \times 100$$

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

Laboratory Duplicates

A laboratory duplicate is an aliquot taken from the same container as an original sample under laboratory conditions and processed and analyzed independently. A laboratory duplicate is achieved by preparing 2 separate aliquots of a sample, LCS, or matrix spike. Both samples are carried through the entire preparation and analytical process. Laboratory duplicates 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 results as defined by 100 times the difference (range) of each duplicate set, divided by the average value (mean) of the set. For duplicate results, X_1 and X_2, the RPD is calculated from the following equation:

$$RPD = \frac{|X_1 - X_2|}{\left(\frac{X_1 + X_2}{2}\right)} \times 100$$

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

For bacteriological parameters, precision is evaluated using the results from laboratory duplicates. Bacteriological duplicates are analyzed at a 10% frequency (or once per preparation batch, whichever is more frequent). Sufficient volume should be collected to analyze laboratory duplicates from the same sample container.

The base-10 logarithms of the results from the original sample and its duplicate are calculated. The absolute value of the difference between the two base-10 logarithms is calculated and compared to the precision criterion in Appendix A.

$$|\text{Log A} - \text{Log B}| = \text{Log Range}$$

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

The precision criterion in Appendix A for bacteriological duplicates applies only to samples with concentrations > 10 MPN.

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. If the result is not less than the LOQ, the equipment should not be used.

Matrix spike

Matrix spikes are prepared by adding a known quantity 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. Matrix-specific QC samples indicate the effect of the sample matrix on the precision and accuracy of the results generated using the selected method. The information from these controls is sample/matrix specific and would not normally be used to determine the validity of the entire batch. 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, S_{SR} is the concentration measured in the matrix spike, S_R is the concentration in the parent sample, and S_A is the concentration of analyte that was added:

$$\%R = \frac{S_{SR} - S_R}{S_A} \times 100$$

Matrix spike recoveries are compared to the same acceptance criteria established for the associated LCS recoveries, rather than the matrix spike recoveries published in the mandated test method. The EPA 1993 methods (i.e. ammonia-nitrogen, ion chromatography, TKN) that establish matrix spike recovery acceptance criteria are based on recoveries from drinking water that has very low interferences and variability and do not represent the matrices sampled in the CRP. If the matrix spike results are outside laboratory-established criteria, there will be a review of all other associated quality control data in that batch. If all of quality control data in the associated batch passes, it will be the decision of the laboratory QAO or LCRA Project Manager to report the data for the analyte that failed in the parent sample to TCEQ or to determine that the result from the parent sample associated with that failed matrix spike is considered to have excessive analytical variability and does not meet project QC requirements. Depending on the similarities in composition of the samples in the batch, LCRA may consider excluding all of the results in the batch related to the analyte that failed recovery.

Method blank

A method blank is a sample of matrix similar to the batch of associated samples (when available) that is free from the analytes of interest and is processed simultaneously with and under the same conditions as the samples through all steps of the analytical procedures, and in which no target analytes or interferences are present at concentrations that impact the analytical results for sample analyses. The method blank is used to document contamination from the analytical process. The analysis of method blanks should yield values less than the LOQ. For very high-level analyses, the blank value should be less than 5% of the lowest value of the batch, or corrective action will be implemented. Samples associated with a contaminated blank shall be evaluated as to the best corrective action for the samples (e.g. reprocessing, 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 (e.g., VOA) 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 LCRA Project Manager, in consultation with the LCRA 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 LCRA Project Manager and QAO will be relied upon in evaluating results.

Field blanks for trace elements and trace organics are scrutinized very closely. Field blanks are associated with batches of field samples. In the event of a field blank failure, any target analytes in the ambient sample associated with the field blank should be qualified as not meeting project QC requirements. Notations of blank contamination are noted in the data summaries that accompany data deliverables. 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 failure is reported to the Laboratory QAO. The Laboratory QAO will discuss the failure with the LCRA Project Manager. If applicable, the LCRA Project Manager will include this information in a 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.

Additionally, in accordance with CRP requirements and the TNI Standard (Volume 1, Module 2, Section 4.5, Subcontracting of Environmental Tests) when a laboratory that is a signatory of this QAPP finds it necessary and/or advantageous to subcontract analyses, the laboratory that is the signatory on this QAPP must ensure that the subcontracting laboratory is NELAP-accredited (when required) and understands and follows the QA/QC requirements included in this QAPP. This includes that the sub-contracting laboratory utilize the same reporting limits as the signatory laboratory and performs all required quality control analysis outlined in this QAPP. The signatory laboratory is also responsible for quality assurance of the data prior to delivering it to the LCRA, including review of all applicable QC samples related to CRP data. As stated in section 4.5.5 of the TNI Standard, the laboratory performing the subcontracted work shall be indicated in the final report and the signatory laboratory shall make a copy of the subcontractor's report available to the client (LCRA) when requested.

B6 Instrument/Equipment Testing, Inspection, and Maintenance

All sampling equipment testing and maintenance requirements are detailed in the SWQM Procedures. Sampling equipment is inspected and tested upon receipt and is assured appropriate for use by Colt Petri (ELS), Lexi Woods (UCRA), and Andrew Clamann (COA). 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 SWQM Procedures. Post-calibration check error limits and the disposition resulting from errors are adhered to. Data collected from field instruments that do not meet the post-calibration check error limits specified in the SWQM Procedures will not be submitted for inclusion into SWQMIS.

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. Laboratory QMs contain information for inspection/acceptance of laboratory-related supplies and consumables. Certification and traceability documentation are recorded in the LIMS system.

B9 Acquired Data

Non-directly measured data, secondary data, or acquired data involves the use of data collected under another project and collected with a different intended use than this project. The acquired data still meets the quality requirements of this project and is defined below. The following data source(s) will be used for this project:

USGS gage station data will be used throughout this project to aid in determining gage height and flow. Rigorous QA checks are completed on gage data by the USGS and the data are 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 the monitoring station to the USGS gage station.

Reservoir stage data are collected every day from the USGS, International Boundary and Water Commission (IBWC), and the United States Army Corps of Engineers (USACE) websites. These data are preliminary and subject to revision. The Texas Water Development Board (TWDB) derives reservoir storage (in acre-feet) from these stage data (elevation in feet above mean sea level), by using the latest rating curve datasets available. These data are published at the TWDB website at http://waterdatafortexas.org/reservoirs/statewide. Information about measurement methodology can be found on the TWDB website. These data will be submitted to the TCEQ under parameter code 00052 Reservoir Stage and parameter code 00053 Reservoir Percent Full.

For UCRA monitoring, the National Weather Service – Advanced Hydrologic Prediction Service (https://water.weather.gov/precip/) in San Angelo is used to obtain antecedent rainfall data.

The City of Austin obtains antecedent rainfall data from the City's flood early warning system. The system has rain gauges in all of the watersheds which COA monitors. COA can also report up to 75 days since significant precipitation. The City's flood warning system can be found at http://www.austintexas.gov/department/flood-early-warning-system.

The Lower Colorado River Authority obtains antecedent rainfall for its extensive network of precipitation gages throughout the basin. Data is accessible at http://hydromet.lcra.org.

B10 Data Management

Data Management Process

Field water quality data are generated by field staff in ELS, UCRA, and COA and submitted to the LCRA Data Manager as excel spreadsheets.

Laboratory data are generated at the bench by the ELS or DHL. The data are quality assured by the laboratory quality assurance manager, or in their absence, by senior staff designee.

The QA of the ELS-produced data is the ultimate responsibility of the ELS QAO and ELS Project Manager. The laboratory data are transmitted or made available in an electronic format to the LCRA or UCRA Data Managers. Hard copies of the data are provided to agencies upon request. UCRA performs in-house checks of the data, combines the field and lab data into a single excel file, and transmits the data to the LCRA Data Manager.

Data generated by DHL is sent to COA for review and is checked for completeness, verification and validation. The COA QAO combines field and lab data and transmits it to the LCRA Data Manager annually approximately at the beginning of the calendar year.

The LCRA Data Manager inserts received data into a Microsoft SQL Server database and performs automated checks of the data using in-house screening tools and adds unique tag identification numbers to the data. The data is then run through the SWQMIS validation tool to ensure correct formatting. The data management process through this step can be seen in Figure B10.1 below.

The data are bundled and transmitted to the TCEQ Project Manager along with a Data Summary Report and Validator Report. Data obtained under different QAPPs or amendments are submitted separately to ensure

compliance with the QAPP. The TCEQ project manager reviews the data and associated reports and provides comments or asks for clarification. Upon approval of the data, the TCEQ project manager notifies the TCEQ data manager who transfers the data to SWQMIS.

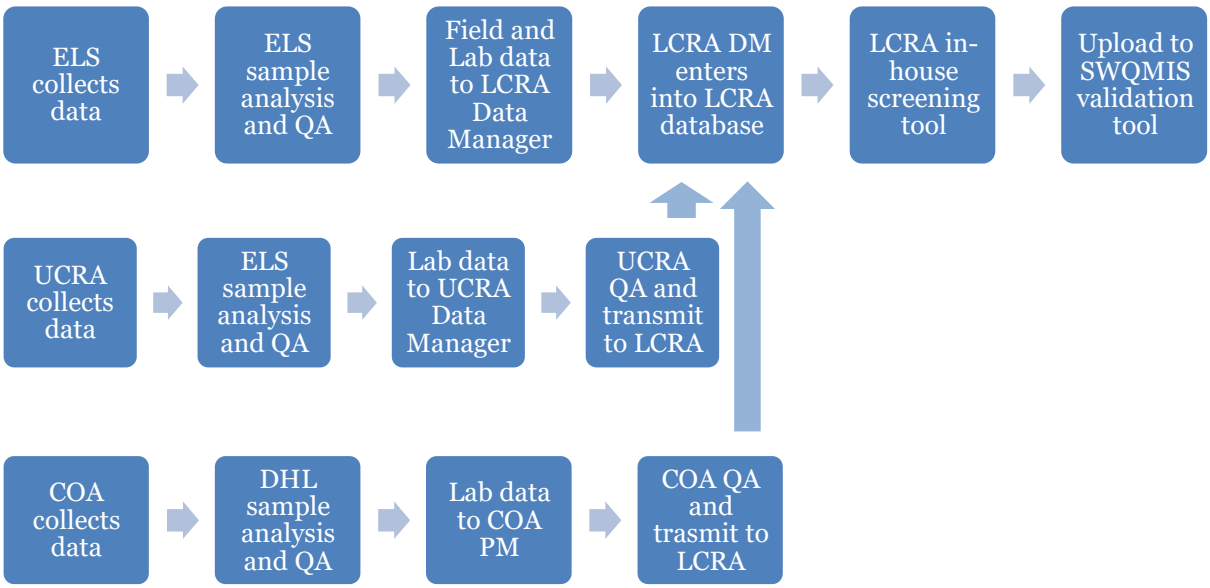


Figure B10.1: Data management process prior to submittal to the TCEQ CRP Project Manager.

Data Dictionary

Terminology and field descriptions are included in the 2019 DMRG, or most recent version.

Name of Entity	Tag Prefix	Submitting Entity	Collecting Entity
LCRA	L	LC	LC
UCRA	L	LC	UC
COA	L	LC	AU

Data Errors and Loss

Automated and manual reviews of the data are performed prior to submittal. Examples of checks that are used to review for data errors or data loss include:

- Issues identified in the laboratory's QA Summary (Lab QC).
- Review of field data.
- Data reasonableness.
- Chain of custody.
- Sample preservation.
- Sites and parameter codes are contained in the QAPP.
- Which codes are not reported.
- Which data were not reported and reason for not reporting.
- All sites have a valid five-digit identity.
- Were all sites accessible.
- Transcription or input error by evaluating minimum/maximum values.
- Relationships among analytes (example: TKN > NH3-N).
- Counts of reported analytes (example: pH = specific conductance = D.O. = temperature).
- Significant figures.
- Check laboratory data for dilution factors.
- Less than detection values are reported as < LOQ.

- Values are within LOQs.
- Check for outliers by comparing to applicable TCEQ minimum/maximum values.
- Verified outliers are flagged as verified.
- Use of correct reporting units.
- Flows have a flow method associated with the data.
- If flow severity = 1 or flow severity = 6 then no value is reported for flow.
- All streams have a flow associated.
- If a sample was collected, Days Since Significant Precipitation is included with the data.
- Depth of surface sample.
- In profile data, bottom sample should be ≥ 0.3 meters from total measured depth.
- Sediment data has associated sediment texture codes.
- Majority of diel data collected during index or critical period.
- Diel data has relevant summary codes.
- Diel data collected when flow was greater than 7Q2.
- Duplicate records are not reported.
- No results for future sampling dates are reported.
- Correct number of fields in the Event (14) and Result (9) files.
- Sample time should have leading zeros.
- Date format MM/DD/YYYY
- *E. coli* data should have holding time reported with the data.
- *E. coli* data holding time should be less than 30 hours.
- The log of *E. coli* laboratory duplicate data are within 0.5, when applicable.
- Data collected and submitted under the appropriate QAPP or amendment.

Record Keeping and Data Storage

Agencies under this QAPP have records management policies in place which help ensure security and access to records. Records are secure and password protected.

ELS lab reports are stored on a SharePoint site for 5 years and in the LIMS system.

Once UCRA data is submitted to TCEQ, UCRA data is stored in files on UCRA computers with several forms of backup. Adobe PDF versions of UCRA data are kept on a backup computer and all UCRA files are backed up off-site on a nightly basis.

LCRA data (including data received from COA and UCRA) is stored on an enterprise managed Microsoft SQL Server database server cluster. The database cluster has daily differential backups with weekly full backups that includes copying offsite backup storage.

City of Austin water quality data is stored in an Oracle relational database known as the Water Resources Monitoring Database. Database backups are managed through server replication at separate secure datacenters. Data in the WRM is available to the public via a web query form at: https://data.austintexas.gov/Environment/Water-Quality-Sampling-Data/5tye-7ray. Analytical data are uploaded from electronic data generated by the contract lab to the database and checked for completeness by the sampling project manager. Contract lab reports (including lab QC) are stored electronically on a file server that is backed up in real-time and retained with associated data in the WRM in perpetuity. COA lab QC documentation (calibration logs, etc) is maintained in hard copy logs at City offices for at least 12 years. Electronic data collection is performed using tablet pcs and a third-party cloud software with data loaded electronically into the WRM. Historic field data collection sheets are stored both electronically on the file server and paper copies are permanently filed on location at City offices or archived at off-site storage.

Data Handling, Hardware, and Software Requirements

Active Directory service accounts are used for web servers to connect and access the data for public retrieval. Standard SQL Server minimum builds include 24 GB of RAM, 2.8 GHz processor speed with 2 processors, multiple drives including 150 GB just for the operating system drive and expandable storage to scale with

databases. Microsoft "Best Practice" development standards are followed to ensure future stability and compatibility.

Information Resource Management Requirements

The LCRA Digital Services Department (IT) requires the Enterprise Architecture team to review and adjust all hardware, software, and development standards annually. Information Technology Infrastructure Library (ITIL) processes are followed for change management procedures, approval, and tracking.
Data will be managed in accordance with the TCEQ DMRG (most recent revision), and applicable Lower Colorado River Authority information resource management policies.

Data will be managed in accordance with the TCEQ DMRG (most recent revision), and applicable Basin Planning Agency information resource management policies.

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 SWQMIS database. Positional data obtained by CRP grantees using a GPS will follow the TCEQ's OPP 8.11 policy regarding the collection and management of positional data. 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 SLOC.

C1 Assessments and Response Actions

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

Table C1.1 Assessments and Response Requirements

Assessment Activity	Approximate Schedule	Responsible Party	Scope	Response Requirements
Status Monitoring Oversight, etc.	Continuous	LCRA	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 provide corrective actions response to the TCEQ
Monitoring Systems Audit of Program Subparticipants	Once per biennium	LCRA	Field sampling, handling and measurement; facility review; and data management as they relate to CRP	30 days to respond in writing to the Lower Colorado River Authority. PA will report problems to TCEQ in Progress Report.
Laboratory Assessment	Dates to be determined by TCEQ	TCEQ Laboratory Assessor	Analytical and quality control procedures employed at the laboratory and the contract laboratory	30 days to provide corrective actions response to the TCEQ

Corrective Action Process for Deficiencies

Deficiencies are any deviation from the QAPP, SWQM Procedures, or other applicable guidance. Deficiencies may invalidate resulting data and require corrective action. Repeated deficiencies should initiate a CAP. Corrective action for deficiencies may include for samples to be discarded and re-collected. Deficiencies are documented in logbooks, field data sheets, etc. by field or laboratory staff, are communicated to the LCRA Project Manager (or other appropriate staff) and should be subject to periodic review so their responses can be

uniform, and their frequency tracked. It is the responsibility of the LCRA Manager, in consultation with the LCRA 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 quarterly progress reports and by completion of a CAP.

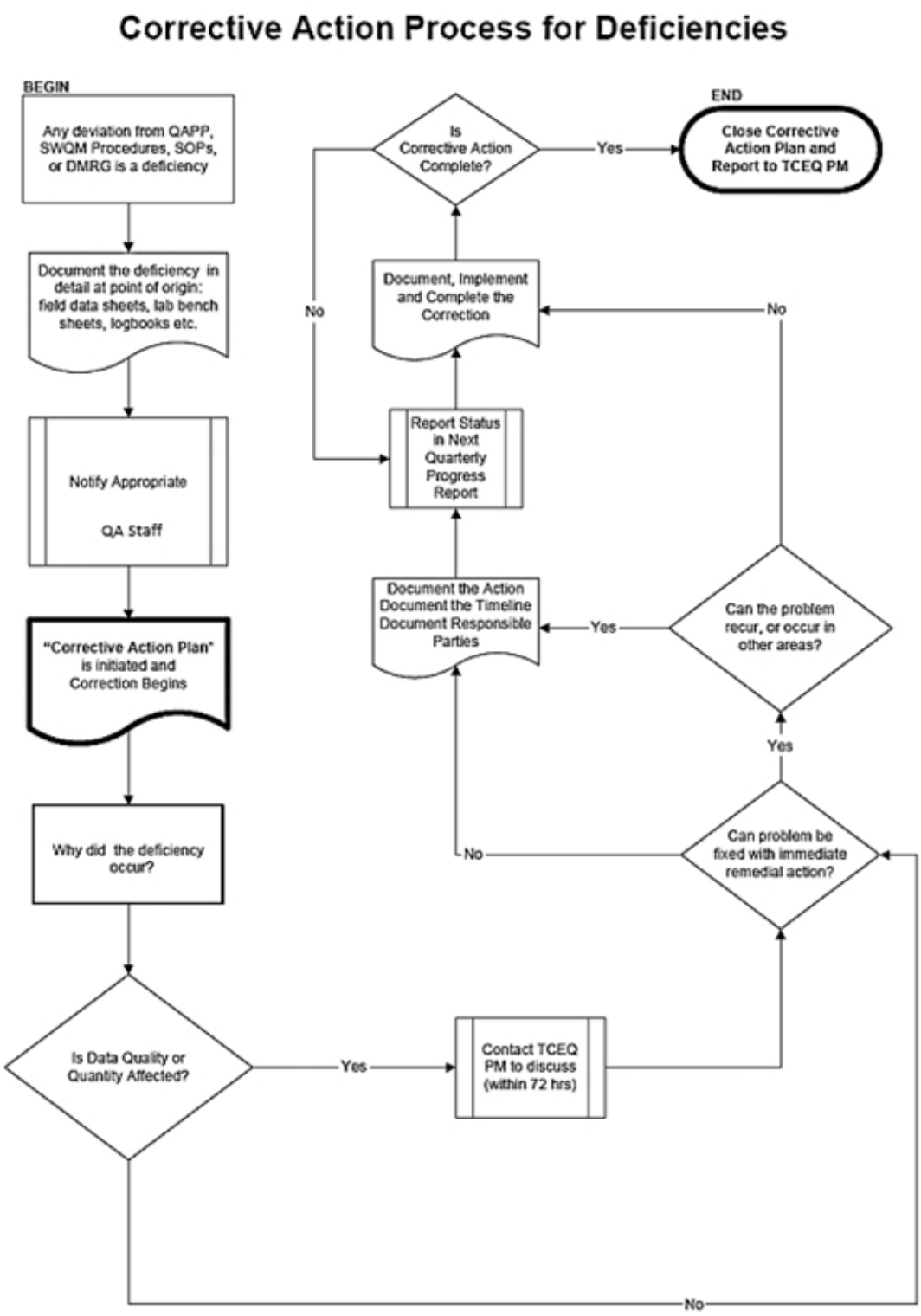
Corrective Action

CAPs should:

- Identify the problem, nonconformity, or undesirable situation
- Identify immediate remedial actions if possible
- Identify the underlying cause(s) of the problem
- Describe the programmatic impact
- Identify whether the problem is likely to recur, or occur in other areas
- Assist in determining the need for corrective action and actions to prevent reoccurrence
- Employ 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 and action(s) to prevent reoccurrence

A flow chart has been developed to facilitate the process (see figure C1.1: Corrective Action Process for Deficiencies).

Figure C1.1 Corrective Action Process for Deficiencies



The status of CAPs will be included with quarterly progress reports. In addition, significant conditions 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 LCRA Project Manager is responsible for ensuring that corrective actions have been implemented and tracks deficiencies and corrective actions. Records of audit findings and corrective actions are maintained by the LCRA Project Manager. Audit reports and associated corrective action documentation will be submitted to the TCEQ with the quarterly progress reports.

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

C2 Reports to Management

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
Non-Conformance Report	As Needed	As Needed	Field Staff Laboratory Staff	LCRA QA Staff or Laboratory Management as appropriate
CRP Progress Reports	Quarterly	December 15, 2023 March 15, 2024 June 15, 2024 September 15, 2024 December 15, 2024 March 15, 2025 June 15, 2025 August 15, 2025	LCRA Project Manager	TCEQ CRP Project Management
Monitoring Systems Audit Report and Response	As Needed	As Needed	LCRA QAO	TCEQ CRP Project Management
Data Summary	As Needed	As Needed	LCRA Data Manager	TCEQ CRP Project Management

Reports to LCRA Project Management

Results of oversight activities, deficiencies, corrective action reports, and significant QA issues are reported to the LCRA PM on an ongoing basis. They may or may not be written reports.

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

The progress report is prepared by the LCRA Project Manager and summarizes the LCRA and UCRA's activities for each task; reports monitoring status, problems, delays, deficiencies, status of open CAPs, and documentation

for completed CAPs; and outlines the status of each task's deliverables.

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

Data Summary
The data summary reports contain 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 LCRA participates in a Contractor Evaluation by the TCEQ annually for compliance with administrative and programmatic standards. Results of the evaluation are submitted to the TCEQ Financial Administration Division, Procurement and Contracts Section.

D1 Data Review, Verification, and Validation

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

D2 Verification and Validation Methods

All field and laboratory data will be reviewed, verified and validated to ensure they conform to project specifications.

Data review, verification, and validation will be performed using self-assessments as well as 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 examination of corollary or unreasonable data; this analysis may be computer-assisted. 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 LCRA 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 F) covers three main types of review: data format and structure, data quality review, and documentation review. The Data Review Checklist is completed and sent with the water quality data submitted to the TCEQ to ensure that the review process is being performed.

Another element of the data validation process is consideration of any findings identified during the monitoring systems audit conducted by the TCEQ CRP Lead Quality Assurance Specialist. Any issues requiring corrective action must be addressed, and the potential impact of these issues on previously collected data will be assessed. After the data are reviewed and documented, the LCRA 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 LCRA Data Manager with the data in the Data Summary (See Appendix F). All failed QC checks, missing samples, missing analytes, missing parameters, and suspect results should be discussed in the Data Summary.

Monitoring agencies under this QAPP have SOPs in place to ensure collection of valid field data. UCRA uses the latest version of SWQM Procedures manual to guide monitoring efforts. City of Austin water quality field sample collection and processing procedures are described in the Water Resource Evaluation (WRE) Section Standard Operating Procedures Manual and are consistent with approved methods as presented in the TCEQ SWQM Procedures manuals.

LIMS are used by ELS and DHL. LIMS consist of a collection of forms, reports, queries and tables that are used to track and manage the analytical process for laboratory reporting.

For ELS, data entry (i.e., instrument readings entered into the LIMS) is performed by the analyst and verified through a multi-level review process. Additionally, LIMS flags data that are outside of program specifications. ELS utilizes a multi-level data review and validation workflow within LIMS prior to data being reported to

clients. The final check of the data is performed by the ELS project manager or designee. At DHL, data transformations occur in the following fashion: after the data acquisition by the instrument software is completed and the sample preparation log is prepared, reviewed, and initialed by the analyst, the data is imported electronically into the LIMS for the purpose of report generation and review. All analytical results follow the rules for significant figures. The analyst will verify all imported LIMS data against the raw data records to ensure that the sample results are accurate. When manual integrations are performed, raw data records shall include a complete audit trail for those manipulations (i.e., the reconstruction of the results). The person performing the manual integration must sign and date each chromatogram and document the rationale for performing manual integration (electronic signature is acceptable). If the sample result from any target analyte exceeds the quantitation range, the sample shall be diluted and reported from the reanalysis.

For ELS, data conversions are configured to occur automatically within LIMS. Several factors determine whether conversions are needed, including the particular analytical test, the sample matrix, and any client reporting requirements. Regarding data conversions for DHL, the concentration of each analyte is calculated by using either the average response factors or regression analysis. The analyst must ensure that all confirmed hits are within the calibration range. If not, a dilution will be needed to re-analyze the sample extract. The raw data is converted into the final sample concentration based on the sample weight and final volume of extract. The formulas and acceptance criteria for each analytical test are imbedded in the LIMS for automatic data calculation. The LIMS flags data automatically that does not meet acceptance criteria.

At ELS, when nonconforming analyses are identified, the samples will be prepared again and reanalyzed, where possible. If reanalysis is impossible and data is lost, the ELS Project Manager notifies the client either verbally or via electronic mail that data has been lost. An investigation is initiated and a corrective action report is produced to correct the error and prevent it from reoccurring.

DHL evaluates the significance of the nonconforming work, and takes corrective action immediately. A Variance Report is generated, the client is notified if their data has been impacted, and corrective action is placed in the Case Narrative of the Analytical Report. Resumption of work after nonconformance is authorized by the Laboratory General Manager, Laboratory QA Manager, and/or the client. Whenever the quality control goals set for precision or accuracy of data are not achieved, a program of corrective action shall be initiated. QC criteria shall be specified in each individual Standard Operating Procedure (SOP). Corrective action can also be initiated by other items such as control limits, customer concerns, or by method specific criteria.

DHL uses data review checklists at each level of review based on project-specific requirements. DHL practices a three-tiered level of analytical data review and reporting.

- The chemist performing the analysis reviews the entire data package (100%), ensuring that all of the data is acceptable and within the guidelines established by the specific method and project-specific requirements.
- After the chemist has reviewed the data, the laboratory supervisor, senior chemist or QA department staff will review the entire package (100%) using the same criteria as the chemist.
- The Laboratory General Manager (or designee) will review the data package for completeness before the data is released.

When a quality control problem is noted in DHL data, the following steps are taken to identify and correct the problem:

- The raw data records are re-examined by the analyst.
- The analyst re-analyzes the sample(s), as appropriate.
- If the problem is not resolved by re-analysis, the Laboratory General Manager or QA Manager is consulted to provide additional information about rectifying the problem.
- If instrument-related problems cannot be resolved in-house, then equipment repaircontractors manufacturer's representatives or outside consultants are contacted as necessary.
- All information is documented on a specific analytical Variance Report, which is reviewed and signed by the QA manager or the Laboratory General Manager and then stored in the associated project folders.
- Clients may authorize the analysis of samples that may not meet QC criteria (e.g. samples out of hold time, samples received above temperature limit). All data resulting from such situations shall be appropriately flagged with data qualifiers in the report.

- All information shall be documented in the final report and summarized in the case narrative. This shall include data flags, if applicable.
- Information on the incident and corrective actions shall be noted in the instrument maintenance logbook (if applicable).

The LCRA Data Manager maintains a CRP Data Submittal Guidance SOP that describes how UCRA and COA data are processed. The document describes specifics in data checks and data handling. Final checks on the data submitted by agencies represented in this QAPP can also be found in CRP Data Submittal Guidance SOP. The document also contains information on how to upload data into SWQMIS.

Table D2.1: Data Review Tasks

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

[1] Field Task Review is performed by field team personnel and overseen by ELS PM, UCRA DM/QAO, and COA PM

[2] Laboratory and QA Task Review is performed by ELS or DHL personnel and overseen by ELS QA Officer and PM, or DHL QA Manager

[3] Lead Organization Data Management Task is performed by LCRA Data Manager and QAO position.

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 which do not meet requirements will not be submitted to SWQMIS nor will be considered appropriate for any of the uses noted in Section A5.

Appendix A: Measurement Performance Specifications (Table A7.1-18)

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 LCSs
- precision limits for LCSDs
- completeness goals
- qualitative statements regarding representativeness and comparability

The items identified above should be considered for each type of monitoring activity. The CRP encourages that data be collected to address multiple objectives to optimize resources; however, 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 will be given to the main use of the project data and the data quality needed to support that use, then secondary goals will be considered.

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 Tables A7 are stored in SWQMIS. Any parameters listed in Tables A7 that do not have a valid TCEQ parameter code assigned will not be stored in SWQMIS.

Typ

Table A7.1 - Measurement Performance Specifications for LCRA field data
Table A7.2 - Measurement Performance Specifications for LCRA flow data
Table A7.3 - Measurement Performance Specifications for LCRA conventional data
Table A7.4 - Measurement Performance Specifications for LCRA bacteria data
Table A7.5 - Measurement Performance Specifications for LCRA diel data
Table A7.6 – Measurement Performance Specifications for LCRA metals in water data
Table A7.7 - Measurement Performance Specifications for UCRA field data
Table A7.8 - Measurement Performance Specifications for UCRA flow data
Table A7.9 - Measurement Performance Specifications for UCRA conventional data
Table A7.10 - Measurement Performance Specifications for UCRA bacteria data
Table A7.11 - Measurement Performance Specifications for UCRA diel data
Table A7.12 - Measurement Performance Specifications for COA field data
Table A7.13 - Measurement Performance Specifications for COA flow data
Table A7.14 - Measurement Performance Specifications for COA conventional data
Table A7.15 - Measurement Performance Specifications for COA bacteria data
Table A7.16 - Measurement Performance Specifications for COA diel data
Table A7.17 - Measurement Performance Specifications for COA metals in sediment data
Table A7.18 - Measurement Performance Specifications for COA organics in sediment data

Appendix B: Task 3 Work Plan & Sampling Process Design and Monitoring Schedule (Plan)

Task 3: Water Quality Monitoring

Objectives: Water quality monitoring will focus on the characterization of a variety of locations and conditions. This will include a combination of the following:

- Planning and coordinating basin-wide monitoring.
- Routine, regularly scheduled monitoring to collect long-term information and support statewide assessment of water quality.
- Systematic, regularly scheduled short-term monitoring to screen water bodies for issues.

Task Description: The Performing Party will monitor water quality in the Colorado River and tributaries downstream of O.H. Ivie Reservoir and coordinate with the Upper Colorado River Authority (UCRA) to ensure sites are monitored upstream of O.H. Ivie Reservoir. Coordinated monitoring meetings will be held annually and the statewide coordinated monitoring schedule will be maintained.

The Performing Party will complete the following subtasks:

Monitoring Description –

LCRA Monitoring
The Performing Party will routinely monitor at least 44 sites in the Colorado River basin below O.H. Ivie Reservoir; 35 sites will be sampled six times per year, 6 sites will be sampled quarterly and one site will be sampled twice per year. Field data only will be collected from one site. The remainder of the sites will be analyzed for field, conventional, flow and bacteria parameters. Additional details about the monitoring activities conducted by the Performing Party are outlined in the Performing Party basin-wide QAPP.

UCRA Monitoring
In cooperation with the Upper Colorado River Authority (UCRA), the Performing Party will have at least 32 sites in the Colorado River basin above O.H. Ivie Reservoir routinely monitored. Stream sites will be monitored quarterly for flow, conventional and field parameters and bacteria. Reservoir sites will be monitored twice annually to include field and conventional parameters, bacteriological samples and elevation. Twenty-four-hour diel monitoring will be done twice annually at four sites, with one event during the index period and one event during the critical period. Additional details concerning the monitoring activities conducted by UCRA are outlined in the Performing Party basin wide QAPP.

Additional details concerning the monitoring activities conducted by unfunded data providers will be outlined in the Performing Party basin-wide QAPP.

In FY2025, the Performing Party will monitor at a similar level of effort as in FY2024. The actual number of sites, location, frequency, and parameters collected for FY2025 will be based on priorities identified at the basin Water Quality Advisory Committee and Coordinated Monitoring meetings and

included in the amended Appendix B schedule of the QAPP.)

All monitoring will be completed in accordance with the Performing Party QAPP, the *TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods* (RG-415) and the *TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data* (RG-416).

Coordinated Monitoring Meeting - The Performing Party will hold an annual coordinated monitoring meeting as described in the FY2024-2025 CRP Guidance. Qualified monitoring organizations will be invited to attend the working meeting in which monitoring needs and purposes will be discussed segment by segment and station by station. Information from participants and stakeholders will be used to select stations and parameters that will enhance overall water quality monitoring coverage, eliminate duplication of effort, and address basin priorities. A summary of the changes to the monitoring schedule will be provided to the participants within two weeks of the meeting. Changes to the monitoring schedule will be entered into the statewide CMS (http://cms.lcra.org) and communicated to meeting attendees. Changes to monitoring schedules that occur during the year will be entered into the CMS and communicated to meeting attendees. All requirements related to meetings will be followed and required meetings will be conducted in-person or via TCEQ approved virtual format.

The Performing Party will maintain the statewide Internet-based Coordinated Monitoring Schedule web site (CMS). The Performing Party will provide technical support to authorized users of the database by responding to calls, making changes to schedules, and adapting the web page as determined by the TCEQ CRP Project Manager and the Performing Party Staff.

Monitoring Activities - Each progress report will include a description of activities including all types of monitoring performed, number of sampling events, and the types of monitoring conducted in the quarter. The Performing Party will complete and submit a monitoring activities report as an attachment to the progress report.

Deliverables and Due Dates:

September 1, 2023 through August 31, 2024

A. Conduct water quality monitoring, submit monitoring activities report, and submit with progress report– December 15, 2023; March 15 and June 15, 2024
B. Coordinated Monitoring Meeting – between March 15 and April 30, 2024
C. Coordinated Monitoring Meeting Summary of Changes – within 2 weeks of the meeting
D. Email notification that Coordinated Monitoring Schedule updates are complete – May 31, 2024

September 1, 2024 through August 31, 2025

A. Conduct water quality monitoring, submit monitoring activities report, and submit with progress report– September 15 and December 15, 2024; March 15 and June 15 and August 15, 2025
B. Coordinated Monitoring Meeting – between March 15 and April 30, 2025
C. Coordinated Monitoring Meeting Summary of Changes – within 2 weeks of themeeting
D. Email notification that Coordinated Monitoring Schedule updates are complete – May 31, 2025

Sample Design Rationale FY 2024

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

There are on-going nutrient and chlorophyll *a* concerns throughout the basin especially downstream of urban areas. Chlorides and sulfates are always of particular concern because they are tied to water quantity within the basin. Lastly, there are on-going bacteria, dissolved oxygen, and metal impairments at several locations in the basin. All sites require continued monitoring of all historical parameters to assess degradation or improvement as stakeholders work within the basin to mitigate the concerns and impairments.

The following changes or additions have been made to the monitoring schedule:

- Remove Station ID 12169 from UCRA monitoring,
- Add Station IDs 12207 and 15536 to UCRA monitoring,
- City of Austin is collecting 1 field, conventional (including chlorophyll), and bacteria sample at 12294 and 12297 instead of 3 samples,
- Station ID 12222 has been removed by the City of Austin for FY24.

The first two changes are being made so that UCRA may collect data on Elm Creek before it travels into Ballinger and monitor the creek in a more consistent location once the creek passes into Ballinger. The COA is reducing the number of samples in Lake Austin (stations 12294 and 12297) due to the overlapping schedule with LCRA in July and September. The COA will collect samples in May while the LCRA will collect during even months plus July and September. Finally, station 12222 will not be sampled in FY24 due to construction at the sample location which will disturb habit and limit site access.

Site Selection Criteria

This data collection effort involves monitoring routine water quality using procedures that are consistent with the TCEQ SWQM program. Some general guidelines are followed when selecting sampling sites, as outlined below, and discussed thoroughly in SWQM Procedures, Volumes I and II. 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 specified are those the TCEQ would like considered to produce data which is complementary to that collected by the state and which may be used in assessments, etc.

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 multiple potential sites on a stream segment are appropriate for monitoring, choose one that would best represent the water body, and not a site that displays unusual conditions or contaminant source(s). 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. 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 Monitoring site that adequately

characterizes the water body, and monitoring should be coordinated with the TCEQ or other qualified monitoring entities reporting routine data to TCEQ.

6. 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 for FY 2024

Table B1.1 Sample Design and Schedule, FY 2024

Site Description	Station ID	Waterbody ID	Region	SE	CE	MT	24 hr DO	Metal Water	Metal Sed	Organic Sed	Conv	Bacteria	Flow	Field	Comments	Map Name
COLORADO RIVER TIDAL AT SELKIRK ISLAND 2 MI DOWNSTREAM FROM FM 521 SW OF WADSWORTH	12281	1401	12	LC	LC	RT					6	6		6		Coastal
COLORADO RIVER AT SH 35 BRIDGE AT BAY CITY	12284	1402	12	LC	LC	RT					6	6	6	6		Lower Colorado River
COLORADO RIVER APPROXIMATELY 367 METERS DOWNSTREAM OF SH 183 IN WHARTON	12286	1402	12	LC	LC	RT					6	6	6	6		Lower Colorado River
COLORADO RIVER AT OLD HWY 71 IN COLUMBUS	12290	1402	12	LC	LC	RT					6	6	6	6		Lower Colorado River
COLORADO RIVER APPROXIMATELY 15 M OFF EAST BANK IMMEDIATELY DOWNSTREAM OF US ALT 90 NEAR ALTAIR	18351	1402	12	LC	LC	RT					6	6	6	6	Garwood site dropped FY 06	Lower Colorado River
COLORADO RIVER AT PECAN VALLEY ROAD BOAT RAMP 290 METERS NORTH AND 50 METERS EAST OF THE INTERSECTION OF PECAN VALLEY ROAD AND NELSON ROAD / WHARTON CR 167	21808	1402	12	LC	LC	RT						6	6	6	Added in 2017 to bracket site 12286 for bacteria impairment	Lower Colorado River
COLORADO RIVER 20 METERS UPSTREAM OF FM 960 NEAR GLEN FLORA	21809	1402	12	LC	LC	RT						6	6	6	Added in 2017 to bracket site 12286 for bacteria impairment	Lower Colorado River
BUCKNERS CREEK AT FAYETTE CR137/COUNTRY CLUB ROAD SW OF LA GRANGE	17053	1402C	11	LC	LC	BS	5						5	5		Lower Colorado River
FAYETTE RESERVOIR AT THE MID POINT OF THE LAKE OVER CEDAR CREEK CHANNEL APPROX 150 YDS NORTH OF THE BAFFLE DIKE	17017	1402G	11	LC	LC	RT					6	6		6		Lower Colorado River
LAKE AUSTIN NEAR TOM MILLER DAM TO THE WEST OF LAKE AUSTIN BLVD	12294	1403	11	LC	AU	RT			1	1	1	1		1	field added to match Bact and Conv in consult W/ COA	Austin
LAKE AUSTIN NEAR TOM MILLER DAM TO THE WEST OF LAKE AUSTIN BLVD	12294	1403	11	LC	LC	RT					8	8		8		Austin
LAKE AUSTIN NEAR METROPOLITAN PARK TO THE SOUTH OF CITY PARK RD AND TO THE EAST OF WESTON RD	12297	1403	11	LC	AU	RT					1	1		1	added samples for the growing season (May, July, September)	Austin
LAKE AUSTIN NEAR METROPOLITAN PARK TO THE SOUTH OF CITY PARK RD AND TO THE EAST OF WESTON RD	12297	1403	11	LC	LC	RT					8	8		8		Austin

Site Description	Station ID	Waterbody ID	Region	SE	CE	MT	24 hr DO	Metal Water	Metal Sed	Organic Sed	Conv	Bacteria	Flow	Field	Comments	Map Name
BULL CREEK AT SPICEWOOD SPRINGS RD 5TH CROSSING TO THE WEST OF YUCCA MOUNTAIN RD	12218	1403A	11	LC	AU	RT	2						2	2		Austin
SPICEWOOD TRIBUTARY OF SHOAL CREEK APPROX 13 METERS DOWNSTREAM OF CEBERRY DR IN AUSTIN	16316	1403J	11	LC	AU	RT					4	4	4	4	Added for TMDL	Austin
TAYLOR SLOUGH SOUTH 20 M DOWNSTREAM OF PECOS STREET SOUTH OF RIVER ROAD IN AUSTIN	17294	1403K	11	LC	AU	RT					4	4	4	4	Added for TMDL	Austin
LAKE TRAVIS NEAR DAM AT LCRA TRAVIS COUNTY PARK	12302	1404	11	LC	LC	RT					6	6		6		Lake Travis
LAKE TRAVIS IN BIG SANDY CREEK COVE 1.25 KM DOWNSTREAM OF THE CONFLUENCE WITH LIME CREEK/BRUSHY CREEK 140 M SE OF THE END OF TRAIL END RD AND 1.4 KM WEST OF FM 973	12307	1404	11	LC	LC	RT					6	6		6		Lake Travis
LAKE TRAVIS AT ARKANSAS BEND TO THE WEST OF RANCH ROAD 620	12309	1404	11	LC	LC	RT					6	6		6		Lake Travis
LAKE TRAVIS MID LAKE AT CONFLUENCE WITH COW CREEK ARM AT PACE BEND APPROXIMATELY 2.02 KILOMETERS TO THE SOUTH OF FM 1431	12313	1404	11	LC	LC	RT					6	6		6		Lake Travis
LAKE TRAVIS NEAR SPICEWOOD EAST OF SHAW RD AND NORTH OF MULE SHOE BEND RD	12316	1404	11	LC	LC	RT					6	6		6		Lake Travis
LAKE TRAVIS IN THE HURST CREEK ARM APPROX 200 YDS UPSTREAM OF HURST HARBOR NEAR LADIN LANE IN LAKEWAY SUBDIVISION	15428	1404	11	LC	LC	RT					6	6		6		Lake Travis
LAKE TRAVIS IN BEE CREEK COVE 191 M NORTH AND 443 M WEST OF THE INTERSECTION OF BEE CREEK ROAD AND CORY LANE	20070	1404	11	LC	LC	RT					6	6		6		Lake Travis
LAKE MARBLE FALLS NEAR MAX STARCKE DAM/TO SOUTHEAST OF COMINO REAL RD	12319	1405	11	LC	LC	RT					6	6		6		Lake Travis
LAKE LYNDON B JOHNSON NEAR ALVIN WIRTZ DAM APPROX 658 METERS NORTH OF FM 2147	12324	1406	11	LC	LC	RT					6	6		6		Lake LBJ
LAKE LYNDON B JOHNSON AT CONFLUENCE WITH SANDY CREEK APPROX 453 METERS TO THE NORTH OF	12327	1406	11	LC	LC	RT					6	6		6		Lake LBJ

Site Description	Station ID	Waterbody ID	Region	SE	CE	MT	24 hr DO	Metal Water	Metal Sed	Organic Sed	Conv	Bacteria	Flow	Field	Comments	Map Name
BLUE MOUNTAIN RD																
LAKE LYNDON B JOHNSON AT CONFLUENCE WITH LLANO RIVER ARM NEAR KINGSLAND APPROX 51 METERS TO THE SOUTHWEST OF SCENIC RD	12330	1406	11	LC	LC	RT					6	6		6		Lake LBJ
SANDY CREEK APPROXIMATELY 73 M DOWNSTREAM OF SH 71 SOUTH OF KINGSLAND	12214	1406A	11	LC	LC	RT					6	6	6	6		Lake LBJ
INKS LAKE NEAR INKS DAM APPROX 161 METERS TO THE NORTHEAST OF ROY INKS DAM	12336	1407	11	LC	LC	RT					6	6		6		Lake LBJ
CLEAR CREEK 1.28 KM UPSTREAM OF SH 29	18710	1407A	11	LC	LC	RT		6			6		6	6	Conv: include sulfate and chloride only	Lake LBJ
LAKE BUCHANAN NEAR BUCHANAN DAM APPROX 475 METERS TO THE WEST OF CORONADO RD	12344	1408	11	LC	LC	RT					6	6		6		Lake Buchanan
LAKE BUCHANAN AT ROCKY POINT APPROX 1.3.KM NORTHWEST OF ROCKY RIDGE	12347	1408	11	LC	LC	RT					6	6		6		Lake Buchanan
LAKE BUCHANAN AT CONFLUENCE OF COUNCIL AND MORGAN CREEKS APPROX 302 METERS SOUTH OF LAKESHORE RD	12349	1408	11	LC	LC	RT					6	6		6		Lake Buchanan
LAKE BUCHANAN NEAR BEAVER CREEK COVE ADJACENT TO PARADISE POINT APPROX 1.4 KM TO THE SOUTH OF RANCH ROAD 2341	12352	1408	11	LC	LC	RT					6	6		6		Lake Buchanan
LAKE BUCHANAN NEAR LAKE HEADWATER APPROX 687 METERS TO THE NORTHEAST OF LLANO TOW VALLEY RD	12353	1408	11	LC	LC	RT					6	6		6		Lake Buchanan
COLORADO RIVER AT US 190 EAST OF SAN SABA	12355	1409	9	LC	LC	RT					6	6	6	6		Lake Buchanan
CHEROKEE CREEK AT FM 501 5 MILES WEST OF BEND	12274	1409A	9	LC	LC	RT					2	2	2	2		Lake Buchanan
COLORADO RIVER BRIDGE ON US 377 AT WINCHELL	12358	1410	3	LC	LC	RT					6	6	6	6		Lake Buchanan
E V SPENCE RESERVOIR APPROX 5.3 KM WEST OF STATE HIGHWAY 208	12359	1411	8	LC	UC	RT					2	2		2	Chlorophyll 2x year, UCRA Sample Q2 and Q4	Upper Colorado River
E V SPENCE RESERVOIR FM 2059 BRIDGE NEAR SILVER	12360	1411	8	LC	UC	RT					4	4	4	4		Upper Colorado River

Site Description	Station ID	Waterbody ID	Region	SE	CE	MT	24 hr DO	Metal Water	Metal Sed	Organic Sed	Conv	Bacteria	Flow	Field	Comments	Map Name
E V SPENCE RESERVOIR AT DAM 1.75 KM WEST OF THE INTERSECTION OF FM 1904 AND ST LOOP 229	13863	1411	8	LC	UC	RT					2	2		2	Chlorophyll 2x year, UCRA Sample Q2 and Q4	Upper Colorado River
COLORADO RIVER AT MITCHELL CR343/PECAN CROSSING 7.5KM WEST OF SH208 AND 25.0KM SOUTH OF COLORADO CITY AT IH20	17002	1412	3	LC	UC	RT					4		4	4	Chlorophyll 4x year	Upper Colorado River
BEALS CREEK 35 M DOWNSTREAM OF SH 163 APPROXIMATELY 11 MI SOUTH OF WESTBROOK	12156	1412B	3	LC	UC	RT					4		4	4	Chlorophyll 4x year	Upper Colorado River
LAKE J B THOMAS AT DAM APPROX 1.0 KM WEST OF THE INTERSECTION OF FM 1298 AND SCURRY CR 8	21614	1413	3	LC	UC	RT					2	2		2	Chlorophyll 2x year, UCRA Sample Q2 and Q4	Upper Colorado River
PEDERNALES RIVER AT CR 962 AT HAMMETT'S CROSSING APPROX 532 METERS TO THE EAST OF HAMMETS ROAD	12369	1414	11	LC	LC	RT					6	6	6	6		Lake Travis
PEDERNALES RIVER AT FM 1320	12375	1414	11	LC	LC	RT					6	6	6	6		Lake Travis
PEDERNALES RIVER AT GOEHMAN LANE CROSSING EAST OF FREDRICKSBURG OFF OF US 290 E APPROX 1.5 KM TO THE NORTH OF US HWY290	12377	1414	13	LC	LC	RT					6	6	6	6	Added in 2016 after TCEQ San Antonio dropped	Lake Travis
PEDERNALES RIVER AT US 87 APPROX 3.0 MILES SOUTH OF FREDERICKSBURG	17472	1414	13	LC	LC	RT					6	6	6	6		Lake Travis
PEDERNALES RIVER 20 METERS UPSTREAM OF PEDERNALES HILLS ROAD	21398	1414	11	LC	LC	RT					6	6	6	6	added in 2014 to replace 12372 (Ped at Johnson City)	Lake Travis
LLANO RIVER COUNTY ROAD 6.5 MILES UPSTREAM FROM KINGSLAND/LLANO RIVER AT RANCH ROAD 3404	12383	1415	11	LC	LC	RT					6	6	6	6		Lake LBJ
LLANO RIVER 0.4 MILE DOWNSTREAM FROM BRIDGE ON SH 16 AT LLANO	12386	1415	11	LC	LC	RT					6	6	6	6		Lake LBJ
LLANO RIVER AT YATES CROSSING ON RR 385 15 MI EAST OF JUNCTION IN KIMBLE COUNTY	14231	1415	8	LC	LC	RT					4	4	4	4		Lake LBJ
SOUTH LLANO RIVER APPROXIMATELY 10 MI UPSTREAM OF SOUTH LLANO RIVER STATE PARK 204 YD UPSTREAM OF SECOND US 377 CROSSING	18197	1415	8	LC	LC	RT					4	4		4		Lake LBJ
NORTH LLANO RIVER 75 METERS UPSTREAM OF US 377 IN JUNCTION	21548	1415	8	LC	LC	RT					4	4	4	4	moved upstream of 17245 in 2015 because site was frequently dry	Lake LBJ

Site Description	Station ID	Waterbody ID	Region	SE	CE	MT	24 hr DO	Metal Water	Metal Sed	Organic Sed	Conv	Bacteria	Flow	Field	Comments	Map Name
LLANO RIVER IMMEDIATELY UPSTREAM OF RR 1871 APPROX 470 METERS WEST OF INTERSECTION OF RR 1871 AND CAMP HOLLAND ROAD	22385	1415	8	LC	LC	RT					4	4	4	4		Lake LBJ
JOHNSON FORK CREEK 10 METERS UPSTREAM OF KIMBLE CR 410 SOUTHEAST OF JUNCTION	21812	1415A	8	LC	LC	RT					4	4	4	4	Site 13550 was taken over from TCEQ in 2014. Moved downstream in 2017 to capture more of the watershed	Lake LBJ
JAMES RIVER/AT JAMES RIVER RD AT UPPER MASON COUNTY ROAD CROSSING 14 MILES SOUTHWEST OF MASON	12210	1415C	8	LC	LC	RT					4	4	4	4		Lake LBJ
SAN SABA RIVER AT SH 16 NORTH OF SAN SABA	12392	1416	9	LC	LC	RT					6	6	6	6		Lake Buchanan
SAN SABA RIVER IMMEDIATELY DOWNSTREAM OF US87	17004	1416	8	LC	LC	RT					4	4	4	4		Lake Buchanan
BRADY CREEK 2.81 KM DOWNSTREAM OF RR 714	14232	1416A	8	LC	UC	RT					4	4	4	4	Chlorophyll 4x year	Lake Buchanan
BRADY CREEK AT ELM STREET IN BRADY IMMEDIATELY DOWNSTREAM OF LOW WATER CROSSING	17005	1416A	8	LC	UC	BS	2						2			Lake Buchanan
BRADY CREEK RESERVOIR MID LAKE NEAR DAM/SOUTHEAST BOUND OFF RANCH ROAD 3022	12179	1416B	8	LC	UC	RT					4	4		4	Chlorophyll 4x year, UCRA Sample Q1-Q4	Lake Buchanan
LOWER PECAN BAYOU AT FM 573 SOUTHWEST OF MULLIN	12394	1417	9	LC	LC	RT					6	6	6	6		Pecan Bayou
CONCHO RIVER BRIDGE ON US83 AT PAINT ROCK	12401	1421	8	LC	UC	RT					4	4	4	4	Chlorophyll 4x year	Concho River
CONCHO RIVER AT FM381	12402	1421	8	LC	UC	RT					4		4	4		Concho River
CONCHO RIVER AT FM1692 SOUTH OF MILES	12403	1421	8	LC	UC	RT					4	4	4	4	Chlorophyll 4x year	Concho River
CONCHO RIVER AT FM380 NEAR VERIBEST	12407	1421	8	LC	UC	RT					4	4	4	4		Concho River
CONCHO RIVER 235 M DOWNSTREAM OF S BELL ST AND 540 M DOWNSTREAM FROM CONFLUENCE OF NORTH AND SOUTH FORKS IN SAN ANGELO	12409	1421	8	LC	UC	BS	2						2		24 hour DO sampling	Concho River
CONCHO RIVER 235 M DOWNSTREAM OF S BELL ST AND 540 M DOWNSTREAM FROM CONFLUENCE OF NORTH AND SOUTH FORKS IN SAN ANGELO	12409	1421	8	LC	UC	RT					4	4	4	4	Chlorophyll 4x year	Concho River

Site Description	Station ID	Waterbody ID	Region	SE	CE	MT	24 hr DO	Metal Water	Metal Sed	Organic Sed	Conv	Bacteria	Flow	Field	Comments	Map Name
NORTH CONCHO RIVER 20M UPSTREAM OF IRVING STREET DAM IN SAN ANGELO TOM GREEN COUNTYTEXAS	12412	1421	8	LC	UC	BS	2						2		24 hour DO sampling. Flow is measured at 15886	Concho River
CONCHO RIVER SOUTH FORK AT US87	12416	1421	8	LC	UC	RT					4	4	4	4		Concho River
NORTH CONCHO RIVER AT CADDO ST IN SAN ANGELO	15886	1421	8	LC	UC	BS	2						2		24 hour DO sampling	Concho River
NORTH CONCHO RIVER AT CADDO ST IN SAN ANGELO	15886	1421	8	LC	UC	RT					4	4	4	4		Concho River
DRY HOLLOW CREEK AT HEADWATERS OF CHANDLER LAKE APPROXIMATELY 484 M TO THE EAST OF PRIVATE ROAD 1775	12257	1421A	8	LC	UC	RT					4		4	4		Concho River
KICKAPOO CREEK AT FM 380	12255	1421B	8	LC	UC	RT					4		4	4		Concho River
LIPAN CREEK APPROX 900M UPSTREAM OF THE CONFLUENCE OF THE CONCHO RIVER ON PRIVATE PROPERTY	12254	1421C	8	LC	UC	RT					4		4	4		Concho River
LAKE NASWORTHY 40 M WEST OF DAM CENTERPOINT APPROX 1.3 KM TO THE NORTH OF COUNTRY CLUB RD	12418	1422	8	LC	UC	RT					4	4		4	Chlorophyll 4x year, UCRA Sample Q1-Q4	Concho River
LAKE NASWORTHY IN RIVER CHANNEL IN SOUTH CONCHO ARM 880 M WEST AND 220 M NORTH OF SOUTH COUNTRY CLUB ROAD AT LAS LOMAS COURT	12419	1422	8	LC	UC	RT					4	4		4	Chlorophyll 4x year, UCRA Sample Q1-Q4	Concho River
LAKE NASWORTHY MIDDLE COVE 120 M DOWNSTREAM OF CENTER POINT OF CONFLUENCE OF MIDDLE CONCHO AND SPRING CREEK CHANNELS	12421	1422	8	LC	UC	RT					4	4		4	Chlorophyll 4x year, UCRA Sample Q1-Q4	Concho River
TWIN BUTTES RESERVOIR AT DAM 695 M SOUTH AND 195 M WEST OF INTAKE STRUCTURE TO LAKE NASWORTHY	12422	1423	8	LC	UC	RT					4	4		4	Chlorophyll 4x year, UCRA Sample Q1-Q4	Concho River
TWIN BUTTES RESERVOIR SOUTH POOL RIVER CHANNEL NEAR DAM APPROX 21 METERS TO THE WEST OF MOTL DAM	12425	1423	8	LC	UC	RT					4	4		4	Chlorophyll 4x year, UCRA Sample Q1-Q4	Concho River
SPRING CREEK S BANK 20 M DOWNSTREAM OF FM2335 NEAR TANKERSLEY	12161	1423A	8	LC	UC	RT					4	4	4	4	Chlorophyll 4x year	Concho River
SPRING CREEK AT LAKE AVENUE CROSSING IN MERTZON	17346	1423A	8	LC	UC	RT					4	4	4	4		Concho River
DOVE CREEK AT BRIDGE SE BOUND ON FM2335 NEAR KNICKERBOCKER	12166	1423B	8	LC	UC	RT					4	4	4	4	Chlorophyll 4x year	Concho River
SOUTH CONCHO RIVER IMMEDIATELY DOWNSTREAM OF US 277 AT	12427	1424	8	LC	UC	RT					4	4	4	4	Chlorophyll 4x year	Concho River

Site Description	Station ID	Waterbody ID	Region	SE	CE	MT	24 hr DO	Metal Water	Metal Sed	Organic Sed	Conv	Bacteria	Flow	Field	Comments	Map Name
CHRISTOVAL																
MIDDLE CONCHO RIVER AT FM 853 NORTH OF MERTZON	16903	1424	8	LC	UC	RT					4	4	4	4		Concho River
SOUTH CONCHO RIVER 175 M DOWNSTREAM OF ANSON SPRING APPROXIMATELY 6.3 KM SOUTH OF CHRISTOVAL	18712	1424	8	LC	UC	RT					4		4	4		Concho River
WEST ROCKY CREEK AT FM 853 43.4 KM/27 MI NORTHEAST OF MERTZON	12165	1424A	8	LC	UC	RT					4		4	4		Concho River
O C FISHER RESERVOIR MID LAKE 425 M WEST OF DAM RELEASE CONTROL TOWER	12429	1425	8	LC	UC	RT					4	4		4	Chlorophyll 4x year, UCRA Sample Q1-Q4	Concho River
NORTH CONCHO RIVER AT COUNTY ROAD BRIDGE 0.6 MILE SOUTHWEST OF CARLSBAD	12171	1425A	8	LC	UC	RT					4	4	4	4	Chlorophyll 4x year	Concho River
N CONCHO RIVER AT SHERWOOD LANE CROSSING 2.1MI SE OF STERLING CITY .75MI SOUTH OF SH87	16779	1425A	8	LC	UC	RT					4	4	4	4		Concho River
NORTH CONCHO RIVER 664 METERS UPSTREAM OF WILLOW CREEK CONFLUNCE 6.2MI NW OF STERLING CITY ON SH87.	16780	1425A	8	LC	UC	RT					4		4	4		Concho River
NORTH CONCHO RIVER AT RR 2034 SOUTHWEST OF WATER VALLEY	17350	1425A	8	LC	UC	RT					4	4	4	4		Concho River
COLORADO RIVER AT FM 2111 0.4 MI UPSTREAM FROM ROCKY CREEK 5.0 MI SW OF BALLINGER	13651	1426	3	LC	UC	RT					4	4	4	4	Chlorophyll 4x year	Upper Colorado River
COLORADO RIVER AT FM3115 SOUTH OF MAVERICK	16901	1426	3	LC	UC	RT					4	4	4	4		Upper Colorado River
COLORADO RIVER AT BLAIR RANCH APPROX 0.75 KM DOWNSTREAM OF MUSTANG CREEK CONFLUENCE SOUTHEAST OF BALLINGER	17244	1426	3	LC	UC	RT					4		4	4		Upper Colorado River
COLORADO RIVER USGS STATION IMMEDIATELY DOWNSTREAM OF SH 208 IN ROBERT LEE TEXAS	18338	1426	8	LC	UC	RT					4		4	4		Upper Colorado River
OAK CREEK RESERVOIR MID LAKE NEAR DAM OFF BONNER POINT AND WEST OFF RANCH RD 3399	12180	1426A	8	LC	UC	RT					4	4		4	Chlorophyll 4x year, UCRA Sample Q1-Q4	Upper Colorado River
ELM CREEK APPROXIMATELY 15 M DOWNSTREAM OF COUNTY ROAD 330 4 MILES NORTH OF BALLINGER	12207	1426B	3	LC	UC	RT					4	4	4	4	Chlorophyll 4x year	Upper Colorado River

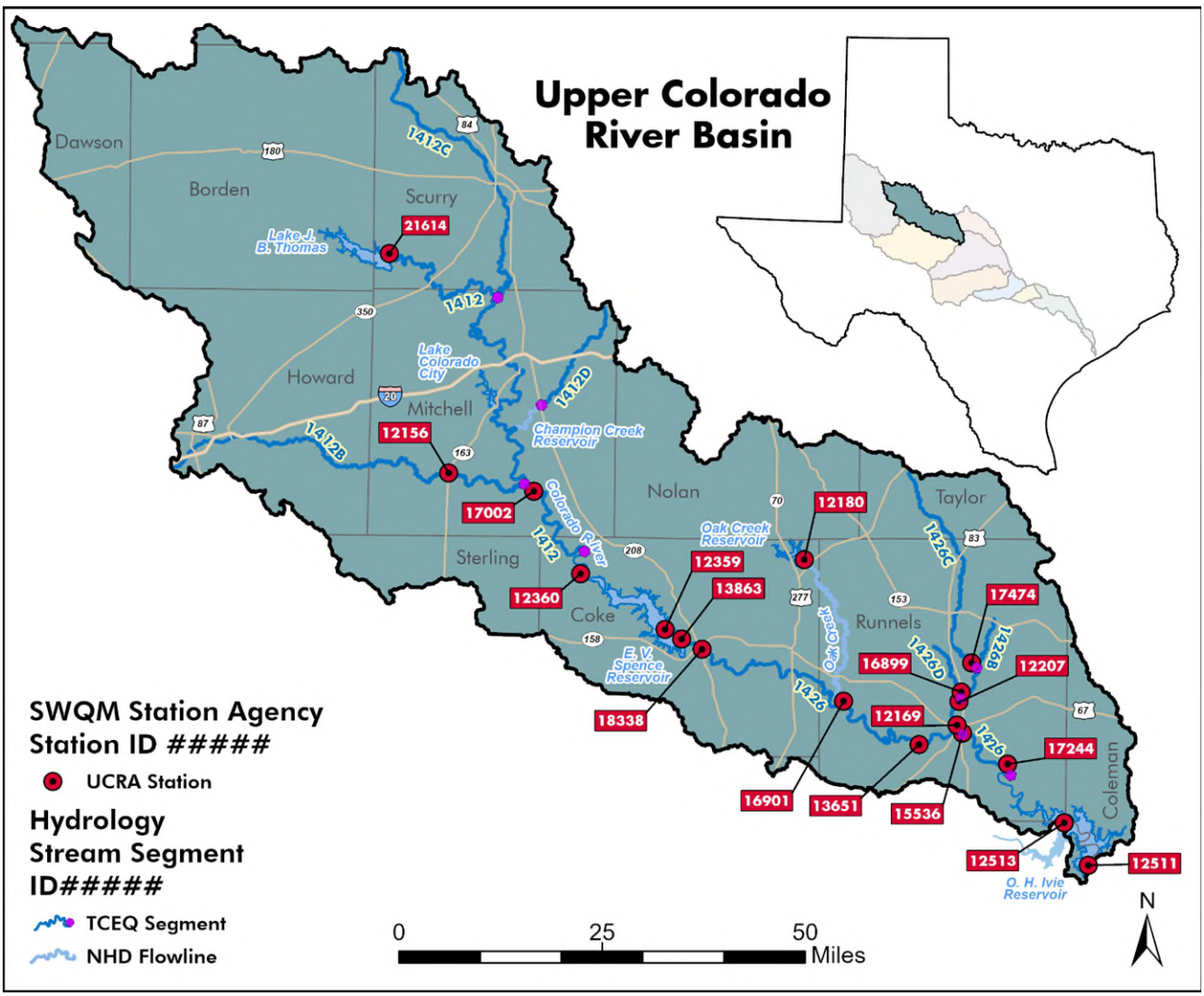
Site Description	Station ID	Waterbody ID	Region	SE	CE	MT	24 hr DO	Metal Water	Metal Sed	Organic Sed	Conv	Bacteria	Flow	Field	Comments	Map Name
ELM CREEK AT THE BALLINGER WWTP DISCHARGE PERMIT 10325-003 1.32 KM DOWNSTREAM OF US 67	15536	1426B	3	LC	UC	RT					4	4	4	4	Chlorophyll 4x year	Upper Colorado River
BLUFF CREEK AT RUNNELS CR 351/HATCHELL-EAGLE-BRANCH ROAD	17474	1426C	3	LC	UC	RT					4		4	4		Upper Colorado River
COYOTE CREEK AT RUNNELS CR 342 NORTH OF BALLINGER	16899	1426D	3	LC	UC	RT					4		4	4		Upper Colorado River
ONION CREEK AT US 183 SOUTHEAST OF AUSTIN	12436	1427	11	LC	LC	RT					6	6	6	6		Austin
COLORADO RIVER AT COUNTY PARK IN WEBBERVILLE APPROX 334 METERS TO THE WEST OF WATER ROAD	12466	1428	11	LC	LC	RT					6	6	6	6		Austin
COLORADO RIVER AT FM 973 AT DEL VALLE	12469	1428	11	LC	LC	RT					6	6	6	6		Austin
COLORADO RIVER BRIDGE ON US 183 SOUTHEAST OF AUSTIN/COLORADO RIVER ON LOCKHART BRIDGE NEXT TO US 183 BRIDGE	12474	1428	11	LC	LC	RT					6	6	6	6		Austin
COLORADO RIVER NEAR AUSTINS COLONY NEIGHBORHOOD 4KM DOWNSTREAM OF SH 130 APPROX 160 METERS SOUTH AND 150 METERS WEST OF CROWNOVER STREET	22387	1428	11	LC	LC	RT					6	6	6	6		Austin
WALNUT CREEK AT SOUTHERN PACIFIC RR APPROXIMATELY 26 M DOWNSTREAM OF AUSTIN AND NORTHWESTERN 1.2 MILES SOUTH OF FM 969 IN EAST AUSTIN	12231	1428B	11	LC	AU	RT					4	4	4	4		Austin
WALNUT CREEK IMMEDIATELY DOWNSTREAM OF LOOP 1/MOPAC EXPWY IN AUSTIN	17251	1428B	11	LC	AU	RT					4	4	4	4	Quarterly sampling for TMDL in conjunction with EII	Austin
GILLELAND CREEK AT FM 973 SOUTH OF MANOR	12235	1428C	11	LC	AU	RT					4	4	4	4	for Gilleland TMDL Implementation Plan monitoring	Austin
GILLELAND CREEK AT US 290 NORTH OF MANOR	12236	1428C	11	LC	AU	RT					4	4	4	4	for Gilleland TMDL Implementation Plan monitoring	Austin
GILLELAND CREEK IMMEDIATELY DOWNSTREAM OF WEBBERVILLE ROAD/FM 969 EAST OF AUSTIN	17257	1428C	11	LC	LC	RT					6	6	6	6		Austin
GILLELAND CREEK APPROXIMATELY 20 M UPSTREAM OF GRAND AVENUE PARKWAY IN PFLUGERVILLE	18762	1428C	11	LC	LC	RT					6	6	6	6		Austin

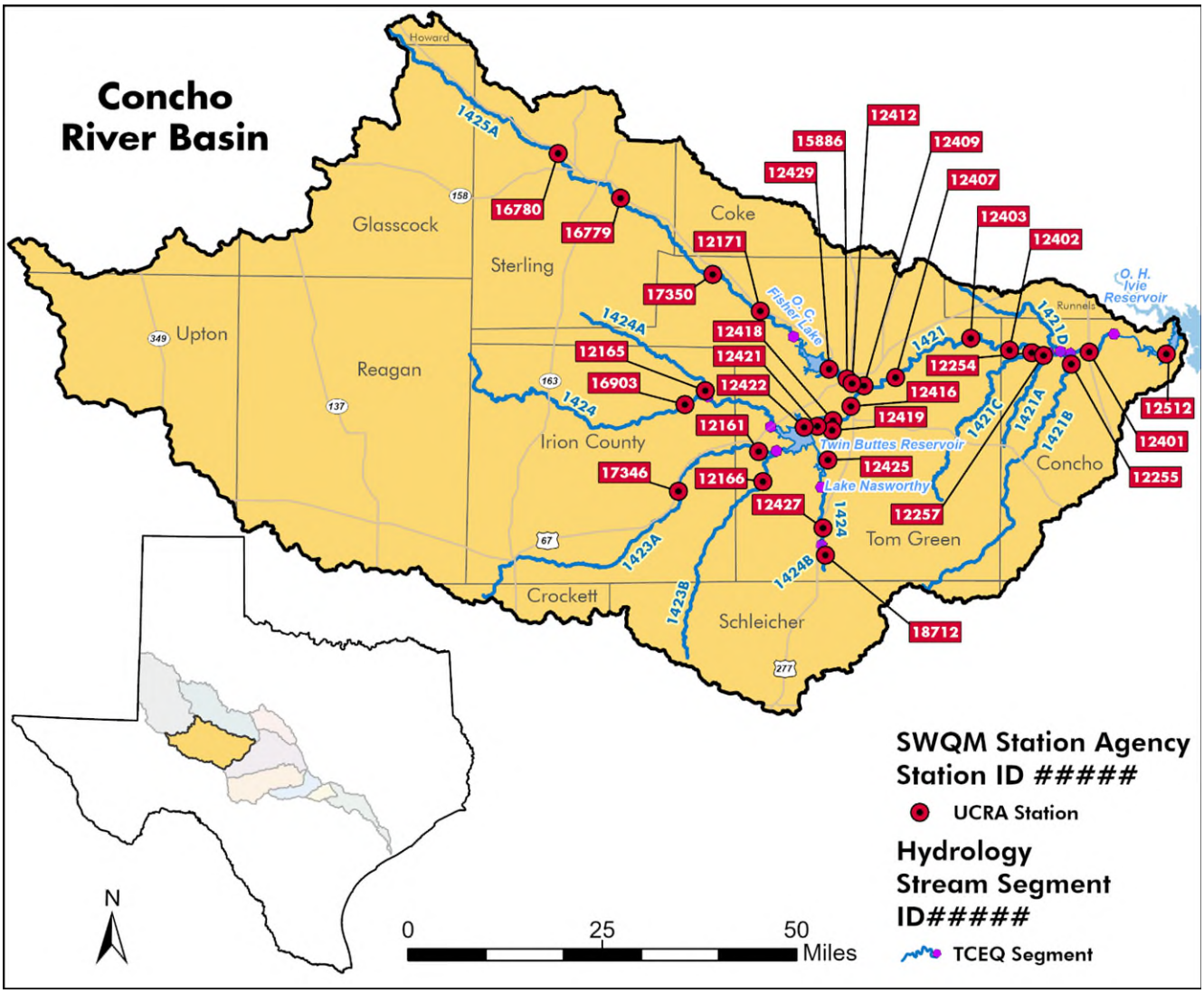
Site Description	Station ID	Waterbody ID	Region	SE	CE	MT	24 hr DO	Metal Water	Metal Sed	Organic Sed	Conv	Bacteria	Flow	Field	Comments	Map Name
LADY BIRD LAKE AT LONGHORN DAM APPROXIMATELY 280 METERS SOUTH AND 250 METERS EAST OF INTERSECTION OF CANTERBURY STREET AND PEDERNALES STREET	12476	1429	11	LC	AU	RT			1	1	9	9		9		Austin
SHOAL CREEK 15 M UPSTREAM OF NORTHLAND DRIVE/FM 2222 IMMEDIATEL WEST OF INTERSECTION NORTHLAND DRIVE AND SHOAL CREEK BLVD IN AUSTIN	17310	1429A	11	LC	AU	RT					4	4	4	4		Austin
WALLER CREEK AT 24TH STREET ON UT CAMPUS IN AUSTIN	15962	1429C	11	LC	AU	RT					4	4	4	4	Added for TMDL	Austin
WALLER CREEK AT AVENUE H AT THE ELISABET NEY MUSEUM	16331	1429C	11	LC	AU	RT					4	4	4	4	Added for TMDL	Austin
BARTON CREEK AT LOST CREEK BLVD	13555	1430	11	LC	AU	RT					4	4	4	4		Austin
O H IVIE RESERVOIR NEAR DAM	12511	1433	3	LC	UC	RT					2	2		2	Chlorophyll 2x year, UCRA Sample Q2 and Q4	Upper Colorado River
O H IVIE RESERVOIR IN CONCHO RIVER ARM AT FM 1929	12512	1433	8	LC	UC	RT					2	2		2	Chlorophyll 2x year, UCRA Sample Q2 and Q4	Concho River
O H IVIE RESERVOIR IN COLORADO RIVER ARM AT ABILENE PUMP STATION	12513	1433	8	LC	UC	RT					2	2		2	Chlorophyll 2x year, UCRA Sample Q2 and Q4	Upper Colorado River
COLORADO RIVER AT SH 71 AT LA GRANGE	12292	1434	11	LC	LC	RT					6	6	6	6		Lower Colorado River
COLORADO RIVER DOWNSTREAM SH 95 1 MI AT OLIVE RD IN SMITHVILLE	12293	1434	11	LC	LC	RT					6	6	6	6		Lower Colorado River
COLORADO RIVER AT LOOP 150 SOUTH OF BASTROP	12462	1434	11	LC	LC	RT					6	6	6	6		Lower Colorado River
LAKE BASTROP OFF TRIANGLE POINT OVER SPICER CREEK CHANNEL APPROX 185M EAST OF LANDMARK/TRIANGLE POINT	17020	1434C	11	LC	LC	RT					6	6		6		Lower Colorado River
ALUM CREEK APPROX 200FT UPSTREAM OF PARK ROAD 1C EAST OF BASTROP STATE PARK	16188	1434G	11	LC	LC	RT					6	6	6	6		Lower Colorado River

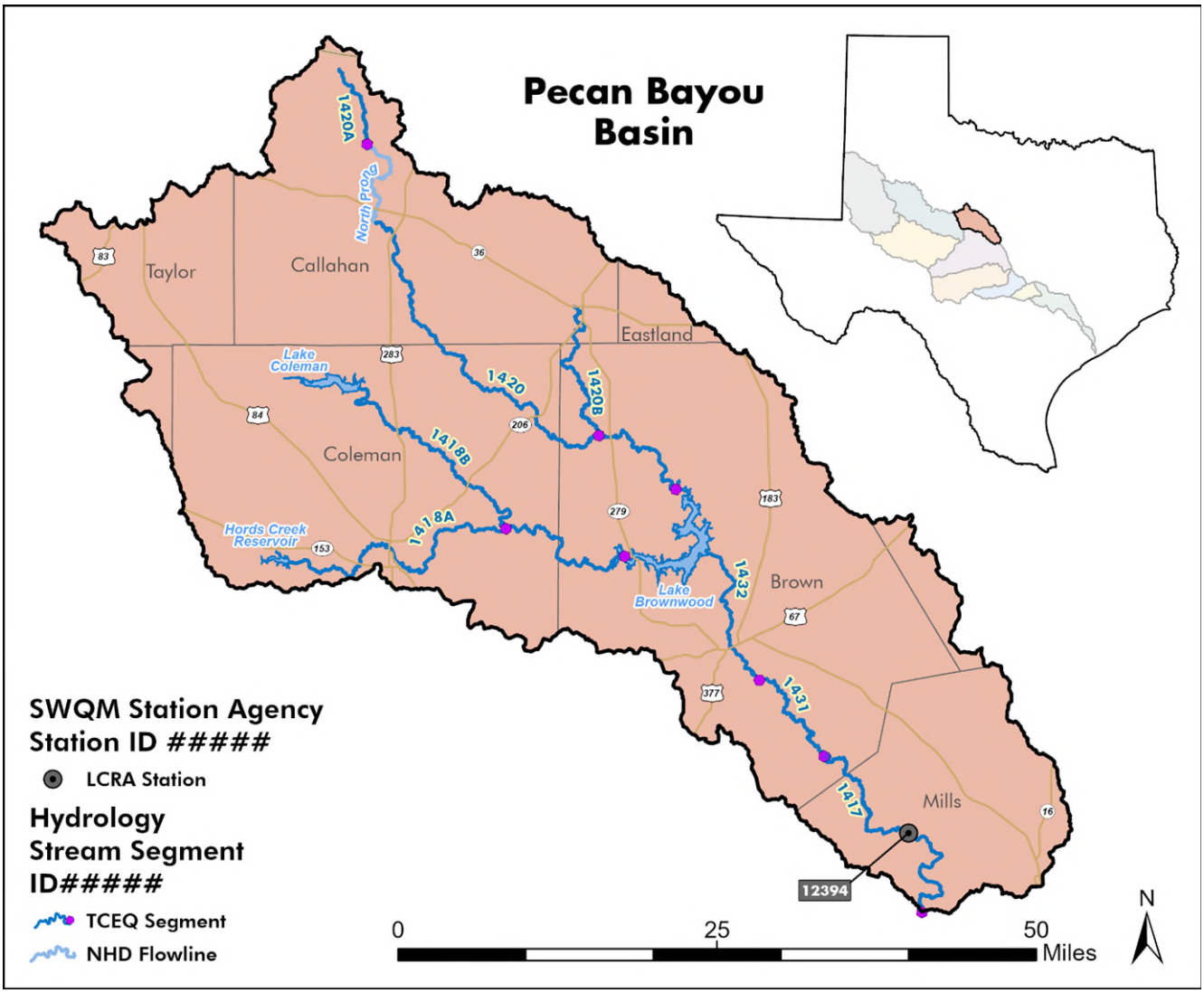
Appendix C: Station Location Maps

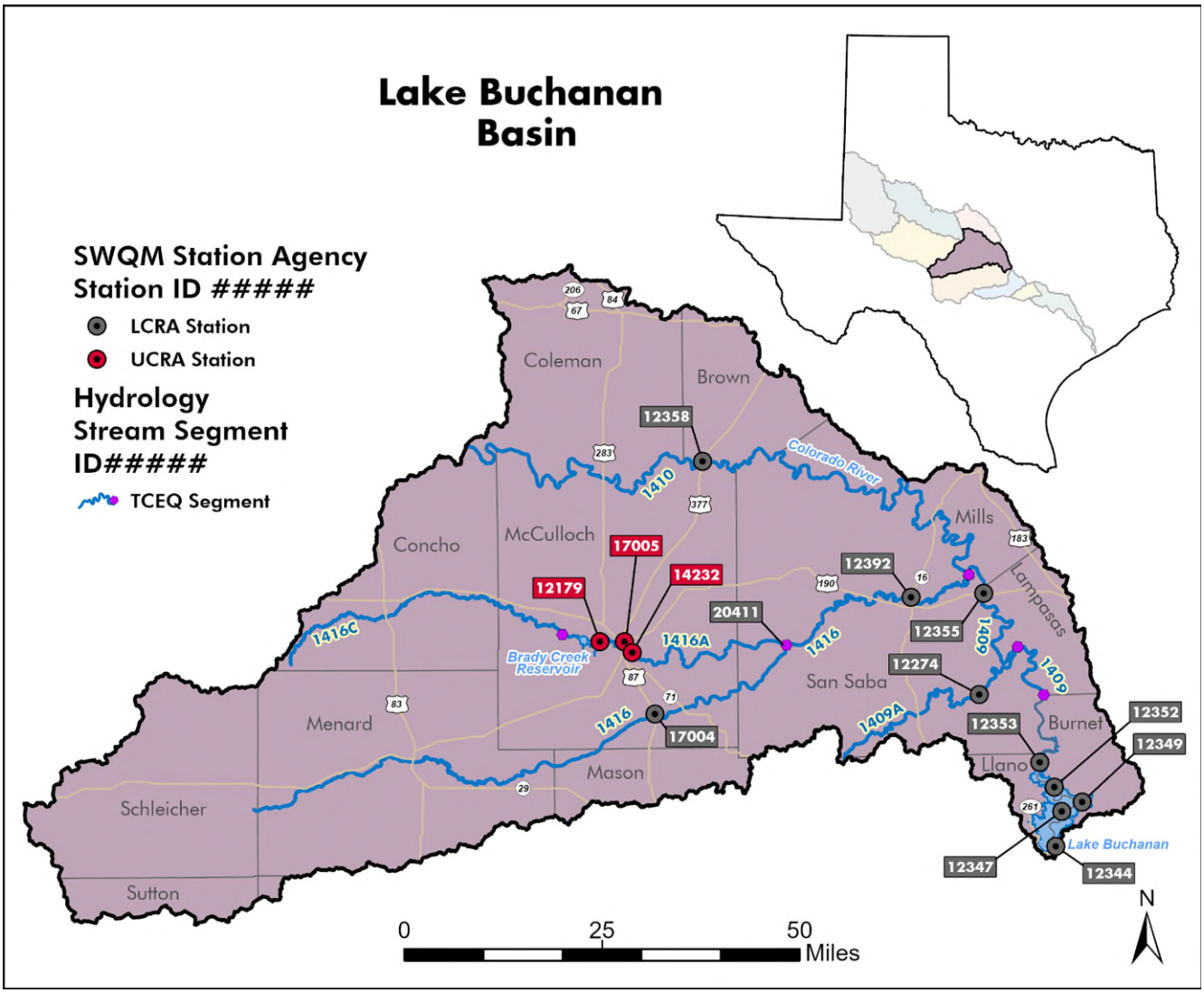
Station Location Maps

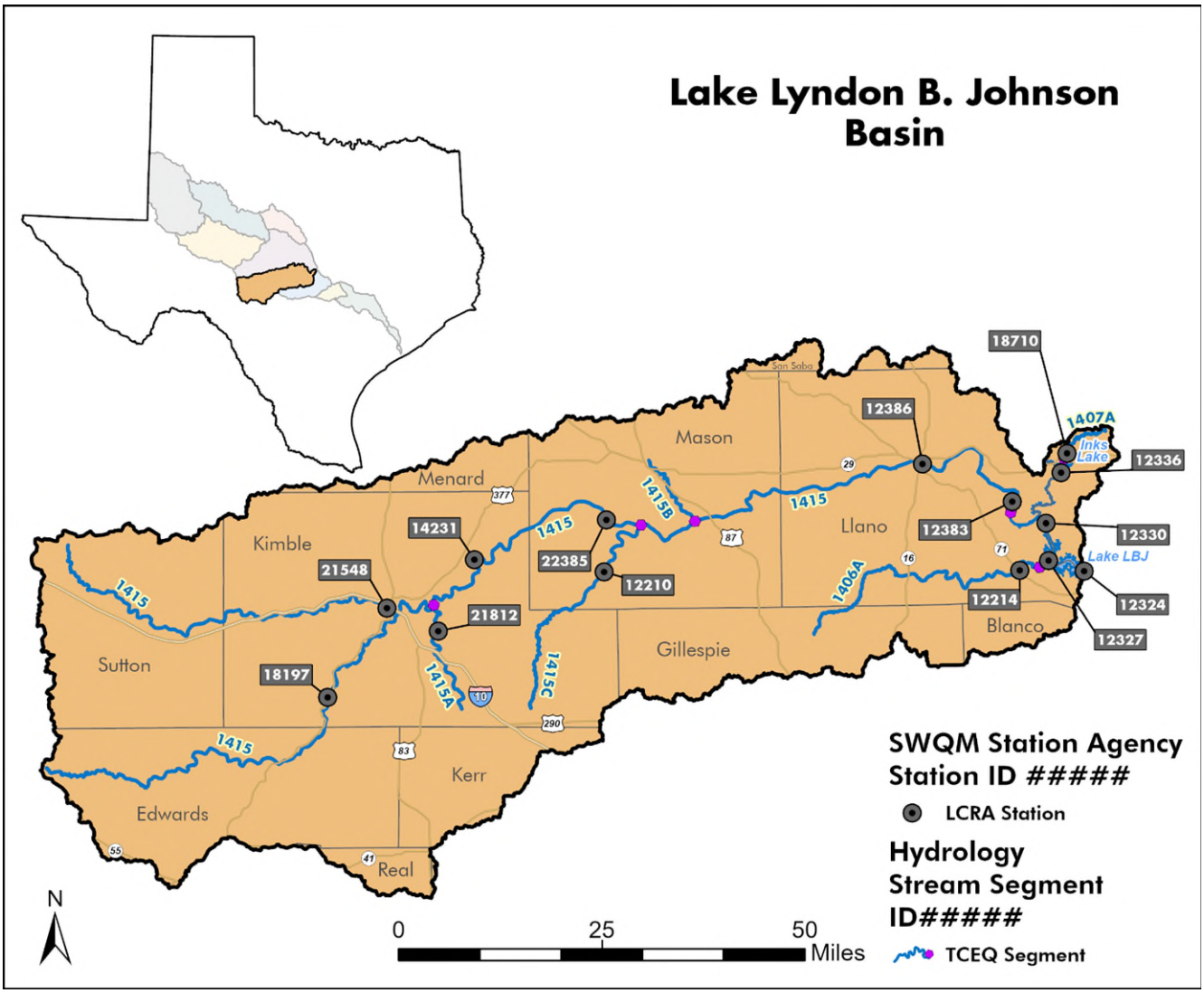
Maps of stations monitored by the LCRA are provided below. The maps were generated by the LCRA. This product is for informational purposes and may not have been prepared for or be suitable for legal, engineering, or surveying purposes. It does not represent an on-the-ground survey and represents only the approximate relative location of property boundaries. For more information concerning this map, contact the Zoe Nichols at (512) 578-2858.

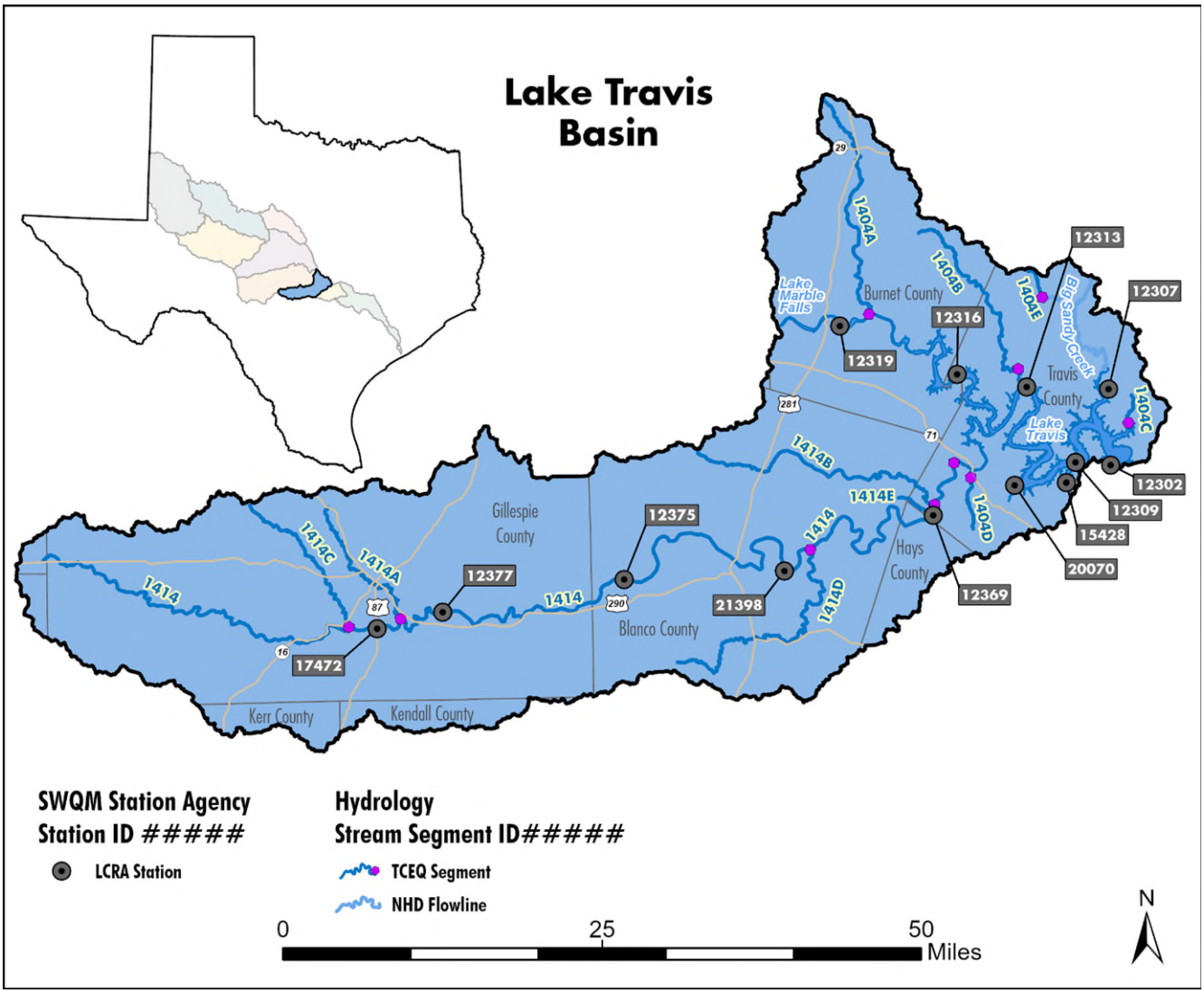


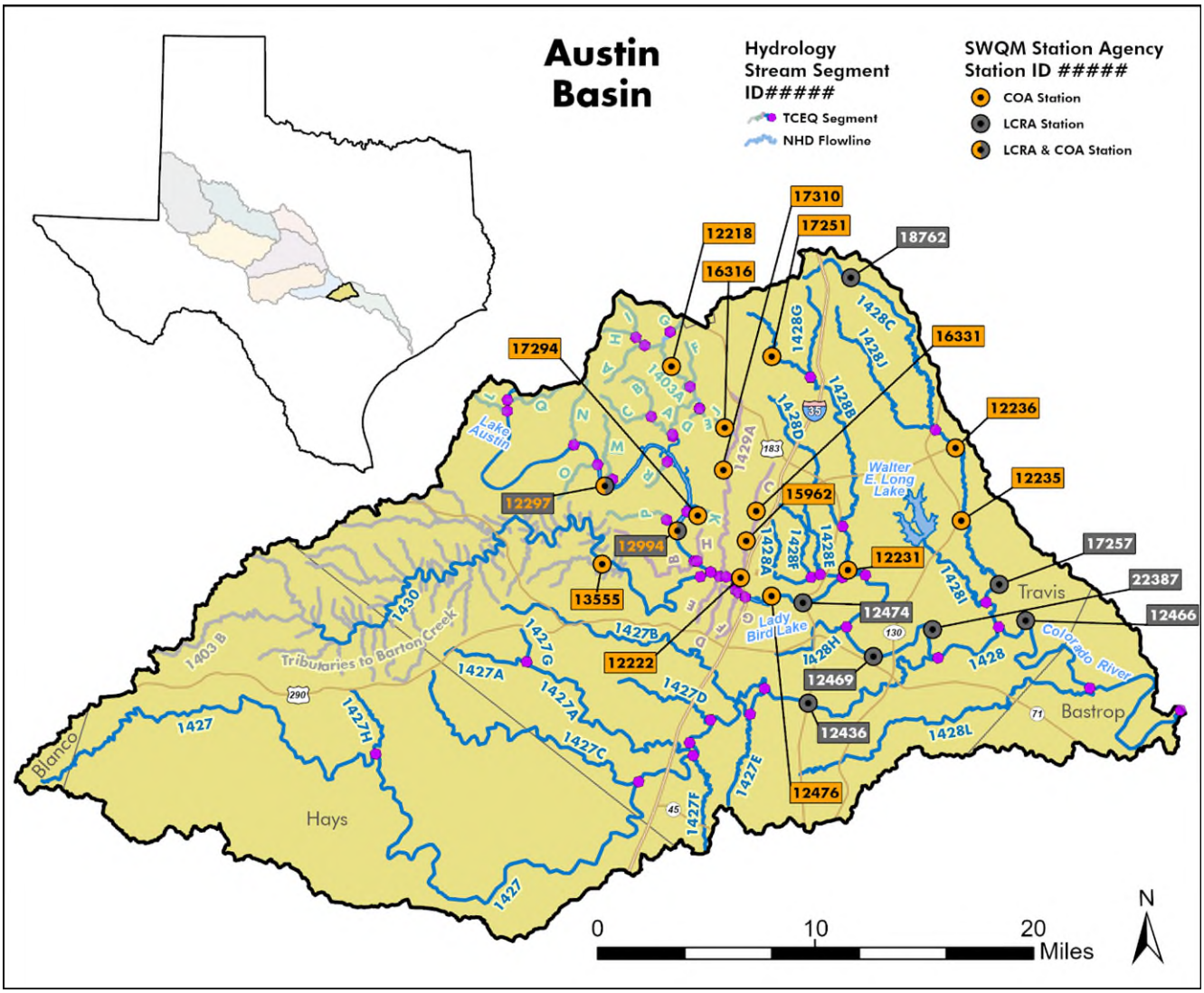

Concho River Basin
Howard
Glasscock
Sterling
Coke
Upton
Reagan
Irion County
Tom Green
Concho
Crockett
Schleicher
Runnels
1425A
1424A
1424
1423A
1423B
1424B
1421
1421D
1421C
1421A
1421B
16780
16779
12171
17350
12412
15886
12409
12429
12407
12403
12402
12418
12421
12422
12165
16903
12161
17346
12166
12427
12254
12416
12419
12425
12257
12512
12401
12255
18712
O. C. Fisher Lake
O. H. Ivie Reservoir
Twin Buttes Reservoir
Lake Nasworthy
158
349
163
137
67
277
N
0
25
50
Miles
SWQM Station Agency Station ID #####
UCRA Station
Hydrology Stream Segment ID#####
TCEQ Segment

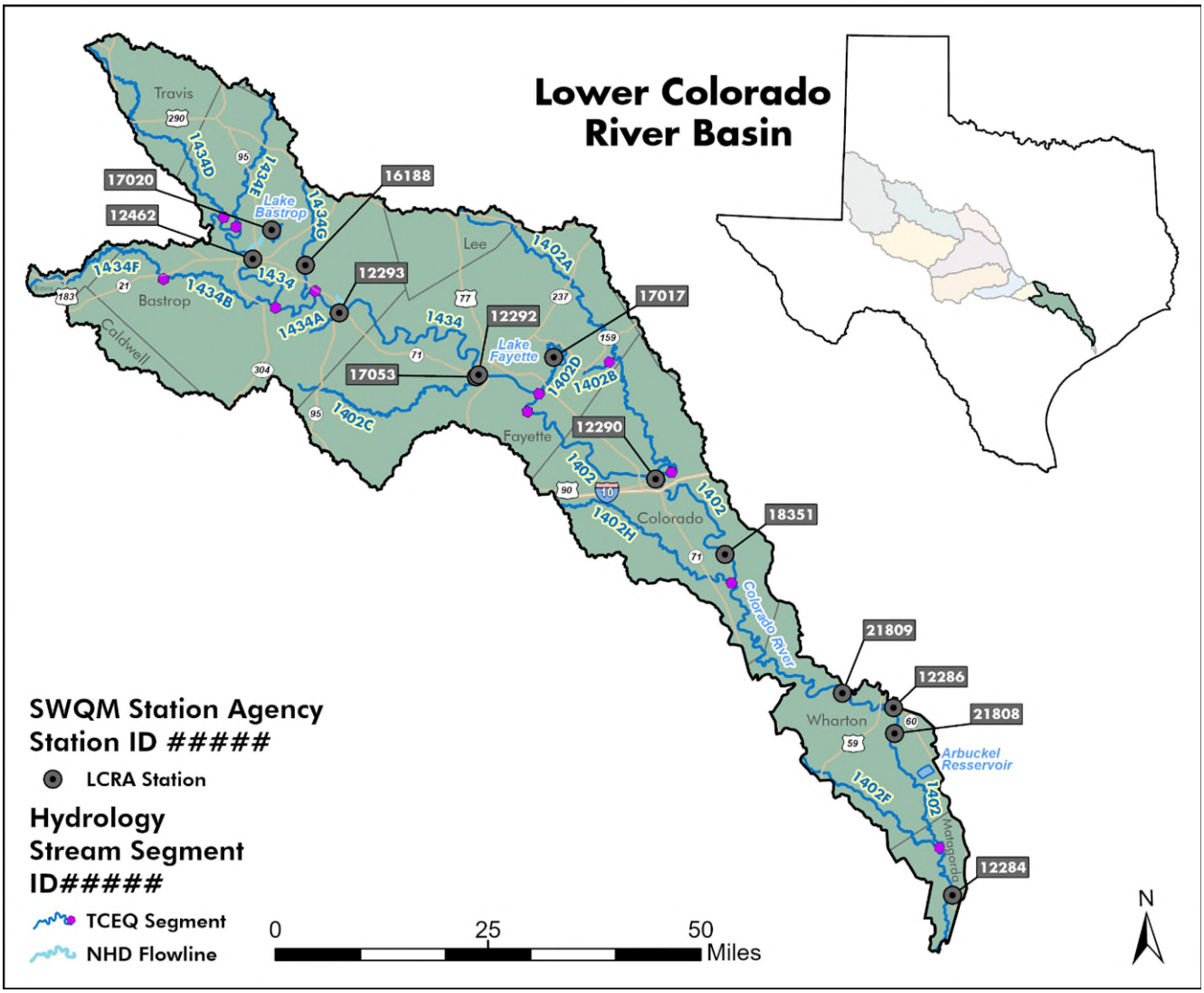

Pecan Bayou Basin
Taylor
Callahan
Eastland
Coleman
Brown
Mills
Lake Coleman
Hords Creek Reservoir
Lake Brownwood
North Prong
1420A
1420
1420B
1418B
1418A
1432
1431
1417
12394
SWQM Station Agency
Station ID #####
LCRA Station
Hydrology
Stream Segment
ID#####
TCEQ Segment
NHD Flowline
0
25
50
Miles
N

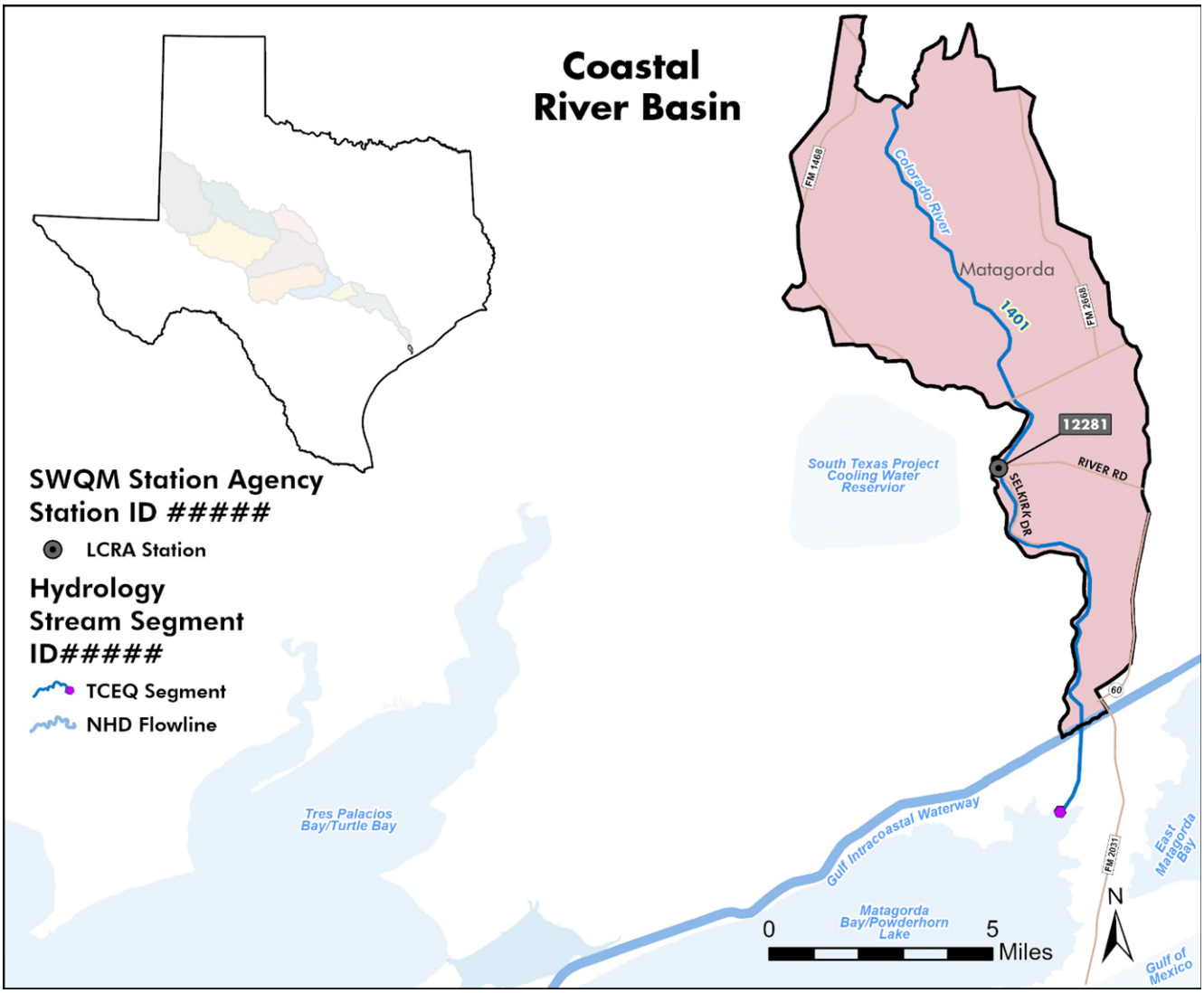

Lake Buchanan Basin
SWQM Station Agency
Station ID #####
LCRA Station
UCRA Station
Hydrology
Stream Segment
ID#####
TCEQ Segment
Coleman
Brown
Concho
McCulloch
Mills
Menard
Mason
San Saba
Lampasas
Burnet
Llano
Schleicher
Sutton
12358
17005
14232
12179
12392
20411
12355
12274
12353
12352
12349
12347
12344
17004
1410
1416C
1416A
1416
1409
1409A
Colorado River
Brady Creek Reservoir
Lake Buchanan
0
25
50
Miles
N


Lake Lyndon B. Johnson Basin
18710
12386
1407A
Inks Lake
12336
Mason
Menard
377
1415B
1415
29
Llano
12383
12330
Lake LBJ
71
16
87
14231
1415
22385
12210
1406A
12214
12324
Kimble
21548
1415
21812
Blanco
12327
Gillespie
Sutton
18197
1415A
1415C
10
290
1415
83
Kerr
Edwards
55
41
Real
N
0
25
50
Miles
SWQM Station Agency Station ID #####
LCRA Station
Hydrology Stream Segment ID#####
TCEQ Segment


Lake Travis Basin
1404A
1404B
1404E
1404C
1404D
1414
1414A
1414B
1414C
1414D
1414E
12313
12307
12316
12319
12302
12309
15428
20070
12369
12375
12377
21398
17472
Lake Marble Falls
Burnet County
Big Sandy Creek
Travis County
Lake Travis
Gillespie County
Hays County
Blanco County
Kerr County
Kendall County
29
281
71
87
290
16
SWQM Station Agency
Station ID #####
LCRA Station
Hydrology
Stream Segment ID#####
TCEQ Segment
NHD Flowline
0
25
50
Miles
N

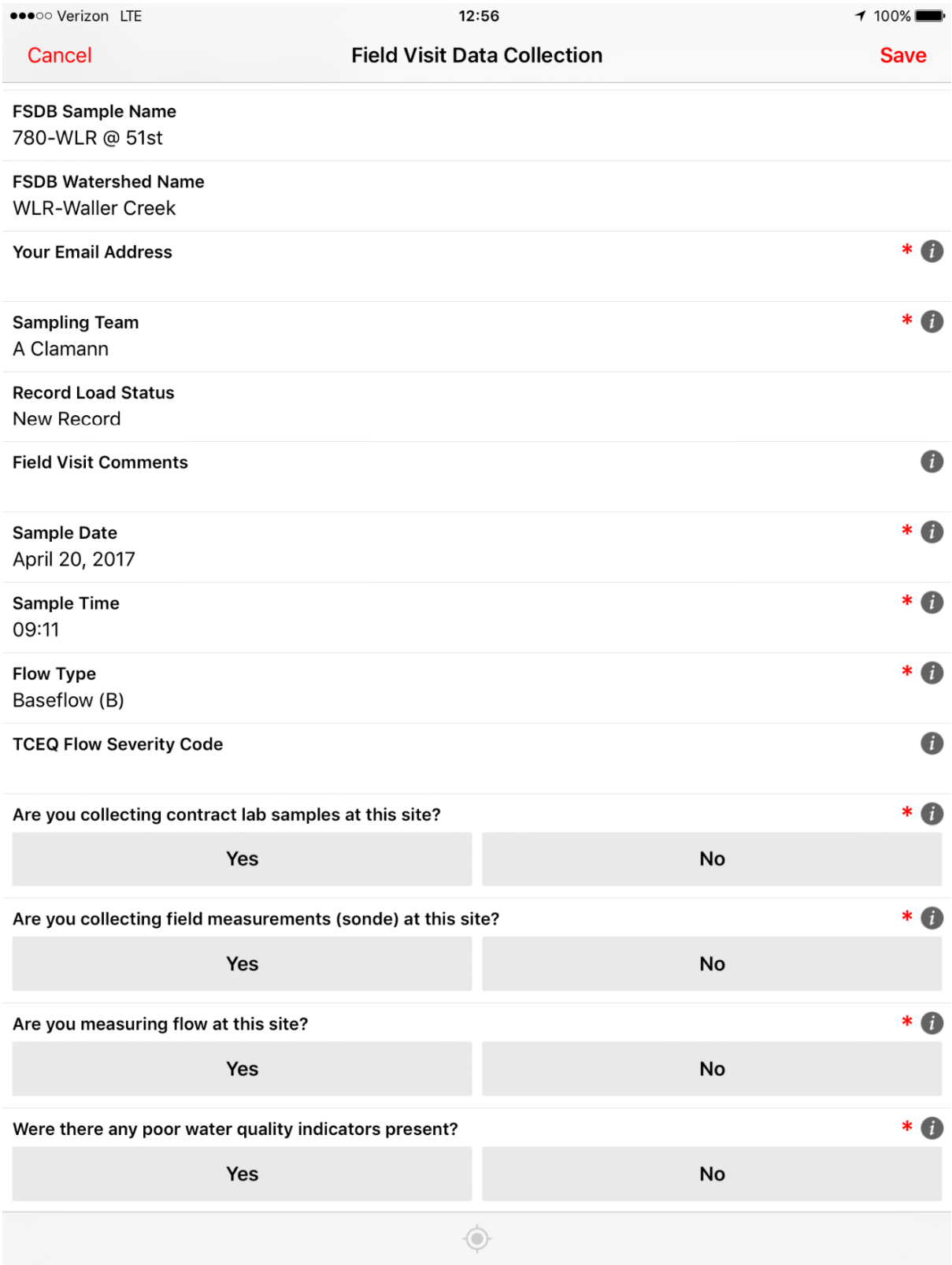

Austin Basin
Hydrology
Stream Segment ID#####
TCEQ Segment
NHD Flowline
SWQM Station Agency Station ID #####
COA Station
LCRA Station
LCRA & COA Station
17310
17251
18762
12218
16316
17294
16331
12236
12235
12297
15962
12994
17257
12231
22387
13555
12474
12466
12222
12469
12436
12476
Lake Austin
Walter E. Long Lake
Lady Bird Lake
Colorado River
Tributaries to Barton Creek
Travis
Hays
Blanco
Bastrop
1428C
1428J
1428B
1428D
1429A
1428A
1428E
1428F
1428I
1428H
1428L
1428
1427B
1427G
1427A
1427J
1427D
1427C
1427E
1427F
1427H
1427
1430
1403 B
1403A
290
35
183
130
71
45
0
10
20
Miles
N


Lower Colorado River Basin
Travis
Lee
Bastrop
Caldwell
Fayette
Colorado
Wharton
Lake Bastrop
Lake Fayette
Arbuckel Resservoir
Colorado River
Matagorda
17020
12462
16188
12293
12292
17017
17053
12290
18351
21809
12286
21808
12284
1434D
1434E
1434G
1434F
1434B
1434A
1434
1402A
1402D
1402B
1402C
1402
1402H
1402F
SWQM Station Agency
Station ID #####
LCRA Station
Hydrology
Stream Segment
ID#####
TCEQ Segment
NHD Flowline
0
25
50
Miles
N


Coastal
River Basin
SWQM Station Agency
Station ID #####
LCRA Station
Hydrology
Stream Segment
ID#####
TCEQ Segment
NHD Flowline
Colorado River
Matagorda
1401
FM 1468
FM 2668
12281
RIVER RD
SELKIRK DR
South Texas Project
Cooling Water
Reservior
60
Gulf Intracoastal Waterway
Tres Palacios
Bay/Turtle Bay
Matagorda
Bay/Powderhorn
Lake
FM 2031
East
Matagorda
Bay
0
5
Miles
N
Gulf of
Mexico

Appendix D: Field Data Sheets

COA Electronic Field Sheet



COA Backup Field Sheet

WPD
FIELD DATA SHEET

E ☐ P ☐ F ☐
Date: _____ _____ _____
By: _____ _____ _____
Ref. No:

Database No.: _____
Site Name: _____ Project #: _____
Date: _____ Watershed: _____
Time: _____ Blank, Split, Duplicate
Personnel: _____
Current Weather: _____ QC Name: _____
Antecedent Weather: _____ Batch ID: _____
Days Since Sign. Rain (>0.1"): _____ FEWS Gauge / Other: _____

Flow Type: Baseflow (B) - Stormflow (S) - Special Event (E) - No Flow or Dry (N)
Flow Severity: **None** (pools only) (1) - **Low** (2) - **Normal** (3) - **Flood** (4) - **High** (5) - **Dry** (6)

Sample Type: Grab, Grab Composite **Medium:** Surface Water, Groundwater, Sediment, Soil, Other

Field Parameters:

		Post Calibration Values			
		Initial	*True*	*Initial*	*True*
Dissolved Oxygen	_____ mg/L / % Sat				
Water Temp.	_____ °C °F				
pH	_____ Std.Units		7		10
Conductivity	_____ µS/cm		0		
Flow	_____ cfs	pH ±0.5 s.u.	SPCond 5%	Dissolved Oxygen ±0.5 mg/L	
Depth	_____ ft or m				

Sonde #

Sonde QC Batch ID #

24 hr D.O. Sonde #

Method: Hydrolab-MiniSonde, Hydrolab-DataSonde, Hydrolab-Quanta, Cole Parmer, Other
Flow : Estimate, Marsh McBirney, Measured w/ bottle, USGS gauge _____

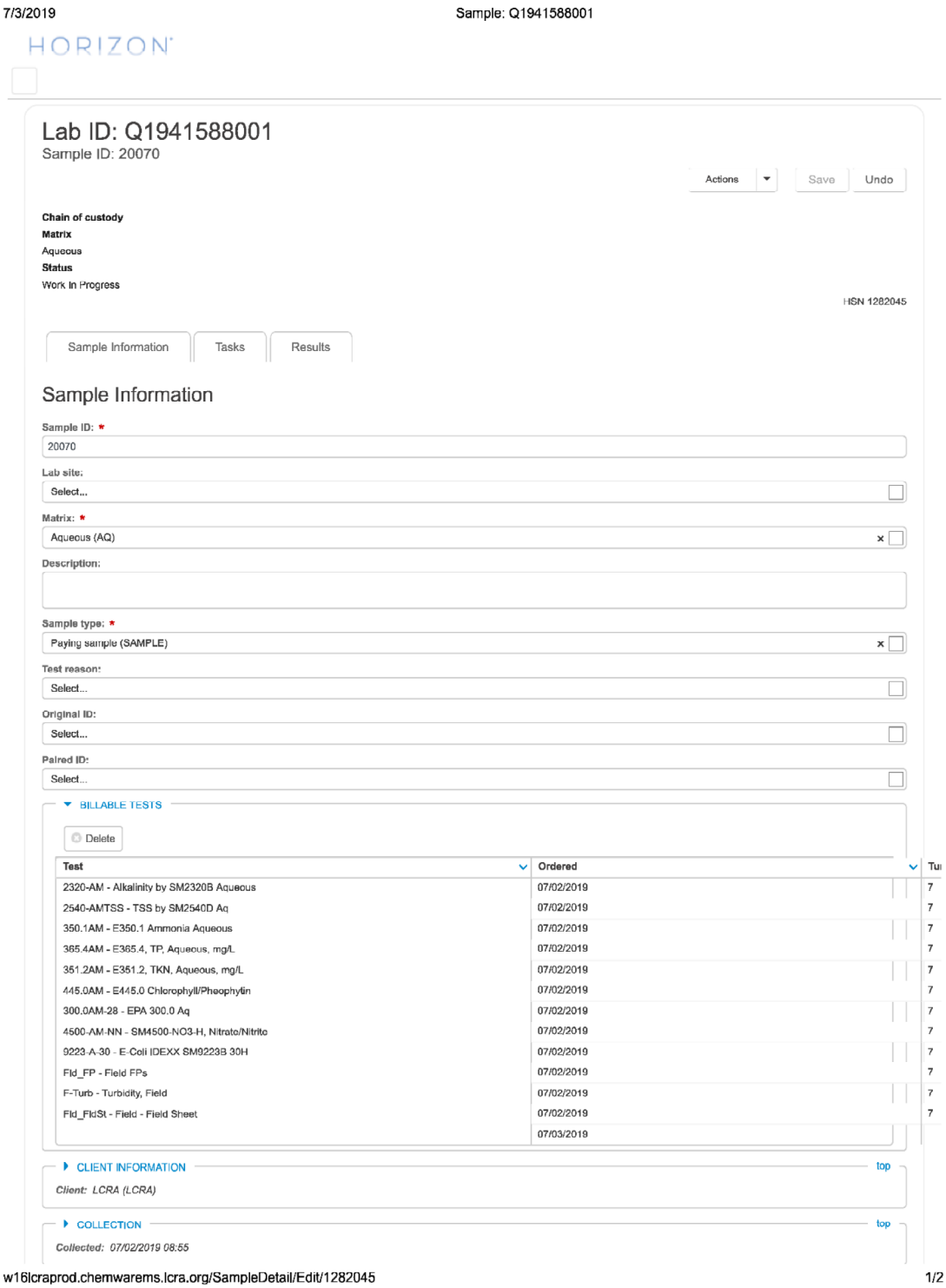
Photos
RB _____ LB _____
DS _____ US _____

Densiometer
Left _____
Center _____ (downstream)
Right _____

Notes: (Sampling Location, Site Description - Algae Type, Algae % Cover, Substrate Description, Flow, Water Color and Clarity, General Vegetation, Benthics, Fish, Trash, Sample Collection and Field Measurement Location, Number of Grab Samples and etc.)

_____
_____
_____
_____
_____
_____

Calibration Notes:



7/3/2019 Sample: Q1941588001

HORIZON

Lab ID: Q1941588001
Sample ID: 20070

Actions Save Undo

Chain of custody
Matrix
Aqueous
Status
Work In Progress

HSN 1282045

Sample Information | Tasks | Results

Sample Information

Sample ID: * 20070
Lab site: Select...
Matrix: * Aqueous (AQ)
Description:
Sample type: * Paying sample (SAMPLE)
Test reason: Select...
Original ID: Select...
Paired ID: Select...

BILLABLE TESTS

Delete

Test	Ordered	Tu
2320-AM - Alkalinity by SM2320B Aqueous	07/02/2019	7
2540-AMTSS - TSS by SM2540D Aq	07/02/2019	7
350.1AM - E350.1 Ammonia Aqueous	07/02/2019	7
365.4AM - E365.4, TP, Aqueous, mg/L	07/02/2019	7
351.2AM - E351.2, TKN, Aqueous, mg/L	07/02/2019	7
445.0AM - E445.0 Chlorophyll/Pheophytin	07/02/2019	7
300.0AM-28 - EPA 300.0 Aq	07/02/2019	7
4500-AM-NN - SM4500-NO3-H, Nitrate/Nitrite	07/02/2019	7
9223-A-30 - E-Coli IDEXX SM9223B 30H	07/02/2019	7
Fld_FP - Field FPs	07/02/2019	7
F-Turb - Turbidity, Field	07/02/2019	7
Fld_FldSt - Field - Field Sheet	07/02/2019	7
	07/03/2019	

CLIENT INFORMATION top

Client: LCRA (LCRA)

COLLECTION top

Collected: 07/02/2019 08:55

w16lcraprod.chemwarems.lcra.org/SampleDetail/Edit/1282045 1/2

LCRA Backup Field Sheet

RESERVOIR AND STREAM FIELD DATA SHEET

Date: **Instrument ID:** **Run ID:** RSS LTravis **Turbidity Unit:** **Work Order #**: **Not Within Specifications** (Fill in blank with sonde parameter):_____

Data Collected By:

Time	Station Location	Sample Depth (m)	Secchi (m)	Flow[1] (cfs)	Flow Severity[2]	Present Weather[3]	Wind Intensity[4]	Macrophyte Bed (%)	Notes (site/watershed conditions that could impact water quality, biological conditions, etc…)

1 Use feet ASL at headwaters and dam sites

2 Flow Severity: 1= No Flow 2= Low Flow 3- Normal Flow 4= Flood Flow 5= High Flow 6 = Dry

3 Present Weather: 1= Clear 2= Partly Cloudy 3= Cloudy 4= Rain

4 Wind Intensity: 1= Calm (<5mph) 2= Slight (5-10mph) 3= Moderate (10-15mph) 4= Strong (>15mph)

UCRA Field Data Sheet for Flow Measurements (all other data is recorded in a waterproof field notebook)

Flow Measurement Field Notes

River Run Pers.

Site ID/Loc Date

Time Begin: Time End:

Measurement Depth: 60% 20% 80%

Int. #	X-Sect. width ft	x-Sect. depth ft	Velocity (ft./sec)	Int. #	X-Sect. width ft	x-Sect. depth ft	Velocity (ft./sec)
1				30			
2				31			
3				32			
4				33			
5				34			
6				35			
7				36			
8				37			
9				38			
10				39			
11				40			
12				41			
13				42			
14				43			
15				44			
16				45			
17				46			
18				47			
19				48			
20				49			
21				50			
22				51			
23				52			
24				53			
25				54			
26				55			
27				56			
28				57			
29				58			

Appendix E: Chain of Custody Forms

COA Chain of Custody for DHL

COA Env Monitoring and Compliance

WPD Chain of Custody Document
Submitted to: **DHL**

DO#: 6300 22101801337

Laboratory Use Only

QAPP	Sampling Plan	Storm Begin Date	Sample Collection Personnel
581-TMDL Bacteria Monitoring 2015-19	TMDL FY2023		

Lab Only	Sample ID	Samp Date	Samp Time 24-hr	Samp Type	Bottlesets					
					A	B	C	D	E	F
	318-TYS @ Reed Pk		:	Grab	X	X	X	-	-	-
	404-WLN ds IH35		:	Grab	X	X	X	-	-	-
	497-WLN @ Mopac/Loop 1		:	Grab	X	X	X	-	-	-
	502-WLN @ Old Manor		:	Grab	X	X	X	-	-	-
	503-WLN us Freescale		:	Grab	X	X	X	-	-	-
	781-WLR @ Shipe Pk		:	Grab	X	X	X	-	-	-
	930-Spicewood Trib ds Spwd Spg		:	Grab	X	X	X	-	-	-
	1101-GIL @ West Parsons		:	Grab	X	X	X	-	-	-
	1192-GIL @ FM973		:	Grab	X	X	X	-	-	-
	-	-	-	-	-	-	-	-	-	-

Bottleset	Analysis Requested	Bottleset Details
A	NO3+NO2-N, Ammonia-N, TP, TKN	(2) 250mL Plastic - H2SO4, Ice
B	OP	(1) 250mL Plastic - Ice
C	ECOLI	(1) 125mL Bac-T - Na2S2O3, Ice
D	TSS	(1) 1L Plastic - Ice
E	-	-
F	-	-

Requestor Comments

[ ] Emergency [X] Standard
Requested Turnaround Time
[ ] 24 hr [ ] 48 hr [ ] 5-day [X] 2-Week
EDD and report to: abel.porras@austintexas.gov; robert.clayton@austintexas.gov; todd.jackson@austintexas.gov

Laboratory Comments

Receiving Temp (°C): _____ Themometer No: _____
Custody Seals: [ ] Not Used [ ] Intact [ ] Broken
Carrier: [ ] Courier [ ] Hand-deliver [ ] UPS [ ] Fedex [ ] LSO

Date/ Time:	Relinquished By:	Received By:

Revision: 10/05/2022 v2023.3 to request changes/updates to this document: WPD-WRM-Help@austintexas.gov Page 1 of 1

LCRA Environmental Laboratory Services
Request for Analysis Chain-of-Custody Record

LCRA - Environmental Lab
3505 Montopolis Dr.
Austin, TX 78744

Phone: (512) 730-6022 or 1-800-776-5272
Fax: (512) 356-6021
https://els.lcra.org

8664

Lab ID#:
Client PO:

Project:	RSS Lower Travis	Client:	LCRA
Collector:		Contact:	Jason Woods
Event#:	1440462 / 8664	Phone:	(512)730-5339

Report To: Dave Bass, LCRA WQP, L-105

Invoice To: Lisa Benton, LCRA, S-416

LAB USE ONLY	Sample ID *	Collected * Date*	Collected * Time * HH:MM	Matrix* AQ = Aqueous S = Solid T = Tissue DW = Drinking Water	Container(s) Type/Preservative/Number * COMPOSITE Y/N	FILTERED Y/N	250/PHOS04	250/APU	125STERL	250/PU	1LPU				Requested Analysis * 2320-Alk	351.2AM	2540-AMTSS	Fld_FAS1	351.1AM	4500-AM-NN	Fld_FP	445.0AM	300.0AM-28	365.4AM	9223-A-30	E-Turb
1	12302			AQ			1	1	1	1	1				X	X	X	X	X	X	X	X	X	X	X	X
2	12302 Bottom			AQ			1			1	1				X	X	X		X	X			X	X		
3	12307			AQ			1	1	1	1	1				X	X	X	X	X	X	X	X	X	X	X	X
4	12307 Bottom			AQ			1			1	1				X	X	X		X	X			X	X		
5	12309			AQ			1	1	1	1	1				X	X	X	X	X	X	X	X	X	X	X	X
6	12309 Bottom			AQ			1			1	1				X	X	X		X	X			X	X		
7	15428			AQ			1	1	1	1	1				X	X	X	X	X	X	X	X	X	X	X	X
8	15428 Bottom			AQ			1			1	1				X	X	X		X	X			X	X		

Transfers	Relinquished By	Date/Time	Received By	Date/Time	Cooler Temp: #	T#	Obs.	Corr.
1								
2					1			
3					2			

Client Special Instructions:

Lab Use Only:

Note: Relinquishing sample(s) and signing the COC, client agrees to accept and is bound by the ELS Standard Terms and Conditions. All fields with an asterisk (*) are required to be completed.

Page 1 of 1

Appendix F: Data Review Checklist and Summary Shells

Data Review Checklist

Data Set Name
Event File Name
Result File Name

Table 1: Data Format and Structure	Y, N, or N/A
A. Are there any duplicate Tag Id numbers?	
B. Are the Tag prefixes correct?	
C. Are all Tag ID numbers 7 characters?	
D. Are TCEQ station location (SLOC) numbers assigned?	
E. Are sampling Dates in the MM/DD/YYYY format?	
F. Is the sampling Time based on the 24-hour clock?	
G. Is the Comments field filled in where appropriate?	
H. Were Submitting Entity, Collecting Entity, and Monitoring Type codes used correctly?	
I. Is the sampling date in the Results file the same as the one in the Events file?	
J. Values represented by a valid parameter (STORET) code with the correct units?	
K. Are there duplicate parameter codes for the same Tag Id?	
L. Are there any invalid symbols in the GT/LT field?	
M. Are there any Tag Ids in the Results file that are not in the Events file?	
N. Have confirmed outliers been identified?	
O. Have grab data taken during 24-hour events been reported separately as RT samples?	
P. Are all reported parameter codes in the appropriate QAPP's DQO table?	
Q. Are all reported monitoring stations in the appropriate Coordinated Monitoring Schedule?	
Table 2: Data Quality Review	Y, N, or N/A
A. Are all values reported at or below the AWRL?	
B. Have the outliers been verified?	
C. Checks on correctness of analysis or data reasonableness performed?	
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 in the QAPP?	
F. Are all stations in the data set listed in the QAPP?	
Table 3: Documentation Review	Y, N, 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 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.	

Data Summary

Date Range:
Tag Range:
Submitting Entity:
Collecting Entity:
Project Manager:
Number of Visits:
Number of Events:
Number of Results:

Table 4: Unreportable Data

TagID	ParameterCode	Reason

Table 5: Monitoring Types

MT	Number of Events

Table 6: Data Correctness and Reasonableness

Check	Failures

Table 7: Verified Min/Max Outliers

ParameterCode	Number of Outliers

Table 8: PQL>LOQ

TagID	ParameterCode	PQL	LOQ	Reason

Table 9: Actual vs Expected Routine Parameter Counts

Parameter Code	Actual Count	Expected Count	Profile Count	Reason

Table 10: Actual vs Expected Diel Parameter Counts

Parameter Code	Actual Count	Expected Count	Reason

Comments

□ 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.

LCRA Data Manager: ———————————————— Date: ————————