Quality Assurance Project Plan
San Antonio River Authority

100 E. Guenther
San Antonio, Texas 78204

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:
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SARA CRP QA Officer
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San Antonio, Texas 78212
210-302-3672
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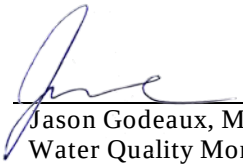
A1 Approval Page

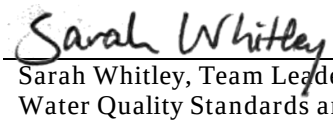
Texas Commission on Environmental Quality

Water Quality Planning Division



9/1/2023

Jason Godeaux, Manager — Date
Water Quality Monitoring and Assessment Section



9/1/2023

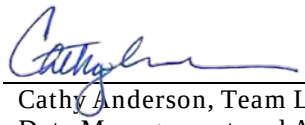
Sarah Whitley, Team Leader — Date
Water Quality Standards and Clean Rivers Program

9/1/2023

Grant Bassett, — Date
Project Quality Assurance Specialist

9/1/2023

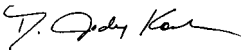
Grant Bassett, Project Manager — Date
Clean Rivers Program



09/01/2023

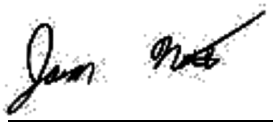
Cathy Anderson, Team Leader — Date
Data Management and Analysis

Monitoring Division



09/01/2023

D. Jody Koehler — Date
TCEQ Quality Assurance Manager



09/01/2023

Jason Natho, Acting — Date
Lead CRP Quality Assurance Specialist

San Antonio River Authority

Rebecca S. Reeves — 8-31-23
Rebecca S. Reeves — Date
CRP Project Manager

Patricia M. Carvajal — 8/30/23
Patricia M. Carvajal — Date
CRP Quality Assurance Officer

San Antonio River Authority Regional Environmental Laboratory

8/30/23
Zachary Jendrusch — Date
Laboratory Supervisor

Jeanette Hernandez — 8/30/23
Jeanette Hernandez — Date
Laboratory Quality Assurance Officer

Bandera County River Authority and Groundwater District

David Mauk
General Manager

9/1/2023
Date

Cint Carter
Field Operations Manager

9/1/23
Date

City of Boerne

Ryan Bass — Date 8/31/23
Environmental Planner / Urban Forester

GBRA Laboratory

8/31/2023

Miliana Hernandez
Laboratory Lead Analyst

Date

8/31/2023

Kylie Gudgell
Quality Assurance Officer

Date

DHL Laboratory

	08/30/2023		08/30/2023
John Dupont General Manager	Date	Sherri Herschmann Quality Assurance Officer	Date

Bio-West, Inc

Brad M Littrell 8/31/2023

Brad Littrell Date
Aquatic Ecologist / Project Manager

A2 Table of Contents

List of Acronyms

AWR	Ambient Water Reporting Limit
BCRAGD	Bandera County River Authority & Groundwater District
CAP	Corrective Action Plan
CE	Collecting Entity
COB	City of Boerne
COC	Chain of Custody
CRP	Clean Rivers Program
DHL	DHL Laboratory
DM	Data Manager
DMRG	Surface Water Quality Monitoring Data Management Reference Guide
DM&A	Data Management and Analysis
ESD	Environmental Sciences Department
EPA	United States Environmental Protection Agency
FY	Fiscal Year
GBRA	Guadalupe Blanco River Authority
GIS	Geographical Information System
GPS	Global Positioning System
IT	Information Technology Department (SARA)
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
LIMS	Laboratory Information Management System
LOD	Limit of Detection
LOQ	Limit of Quantitation
MS	Matrix spike
MSD	Matrix Spike Duplicate
MT	Monitoring Type
NELAP	National Environmental Lab Accreditation Program
PM	Project Manager
QA	Quality Assurance
QAM	Quality Manual
QAO	Quality Assurance Officer
QAPP	Quality Assurance Project Plan
QAS	Quality Assurance Specialist
QC	Quality Control
QMP	Quality Management Plan
RPD	Relative Percent Difference
RSD	Relative Standard Deviation
RT	Routine Monitoring
SARA	San Antonio River Authority
SARA-REL	San Antonio River Authority Regional Environmental Laboratory
SARA-WM	San Antonio River Authority Watershed Monitoring
SE	Submitting Entity
SLOC	Station Location
SOP	Standard Operating Procedure
SQL	Structured Query Language
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 Standard
VOA	Volatile Organic Analytes
WMS	Watershed Monitoring Supervisor

A3 Distribution List

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Brad Littrell, Aquatic Ecologist/Project Manager
blittrell@bio-west.com
(512) 392-6548

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

Grant Bassett
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 San Antonio River Authority audits. Verifies QAPPs are being followed by contractors and that projects are producing data of known quality. Coordinates project planning with the San Antonio River Authority Project Manager. Reviews and approves data and reports produced by contractors. Notifies QA Specialists of circumstances which may adversely affect the quality of data derived from the collection and analysis of samples. Develops, enforces, and monitors corrective action measures to ensure contractors meet deadlines and scheduled commitments.

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.

SAN ANTONIO RIVER AUTHORITY

Rebecca S. Reeves
San Antonio River Authority 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 San Antonio River Authority 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.

Christopher Vaughn
San Antonio River Authority Watershed Monitoring Supervisor
Responsible for the sample collection activities and ensures that they are performed in accordance with the appropriate Clean Rivers Program requirements. Schedules sampling runs to meet the monitoring outlines in the Coordinated Monitoring Schedule. Ensures that the CRP Project Manager and/or QA staff are notified of deficiencies or corrective actions, and that issues are resolved.

Patricia M. Carvajal
San Antonio River Authority Quality Assurance Officer
Responsible for coordinating the implementation of the QA program. Responsible for writing and maintaining the QAPP and monitoring its implementation. Responsible for maintaining records of QAPP distribution, including appendices and amendments. Responsible for maintaining written records of sub-tier commitment to requirements specified in this QAPP. Responsible for identifying, receiving, and maintaining project QA records. Responsible for coordinating with the CRP Project QAS to resolve QA-related issues. Notifies the San Antonio River Authority 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. Ensures that monitoring systems audits are performed 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.

Nicholas Johnson
San Antonio River Authority Quality Assurance Specialist
Responsible for performing data review and validation of data collected in the field including field parameters, field observations, biological, habitat and benthic macroinvertebrate data. Participates in or conducts assessments of field activities of CRP partners.

Michelle M. Garza
San Antonio River Authority Data Manager
Responsible for delivering monitoring data to TCEQ in accordance with the program's requirements and timelines. Ensures data submittals comply and reconcile with the parameters and monitoring sites identified in the QAPP and amendments and generates data summary reports to document data deliverable content, inconsistencies, and errors. Oversees the transfer and management of program data into San Antonio River Authority public facing water quality viewers.

SARA-REL

Zachary Jendrusch
Laboratory Supervisor
Responsible for overall performance, administration, and reporting of analyses performed by SARA's 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 lab supervisor ensures that all laboratory data is reviewed and verified 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.

Jeanette Hernandez
Laboratory Quality Assurance Officer
Responsible for the overall quality control and quality assurance of analyses performed by SARA's Laboratory. Ensures that internal assessments are performed in accordance with laboratory accreditation requirements. Maintains operating procedures that are in compliance with this QAPP, amendments and appendices. Conducts in-house audits to ensure compliance with written SOPs, NELAP requirements and to identify potential problems. Reviews and verifies laboratory data for integrity and continuity, reasonableness and conformance to project requirements, and then validates against the measurement performance specifications listed in this QAPP.

Bandera County River Authority & Groundwater District

David Mauk
General Manager
Coordinates basin planning activities with the San Antonio River Authority. Ensures SARA CRP project manager and/or QA Specialists are notified of deficiencies and corrective actions, and that issues are resolved. Ensures that field staff is properly trained and that training records are maintained.

Clint Carter
Field Operations Manager
Responsible for conducting routine monitoring in support of this QAPP. Responsible for implementing and monitoring CRP requirements in QAPPs and QAPP amendments and appendices. Responsible for coordinating with the SARA QA staff to resolve QA-related issues. Notifies the SARA QA staff of particular circumstances which may adversely affect the quality of data. Coordinates and monitors deficiencies and corrective action. Coordinates the research and review of technical QA material and data related to water quality monitoring system design and analytical techniques.

DHL Laboratory

John DuPont
General Manager
Responsible for overall performance, administration, and reporting of analyses performed by DHL's 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, ensures that all laboratory data is reviewed and verified 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
Quality Assurance Officer
Maintains operating procedures that are in compliance with this QAPP, amendments and appendices. Responsible for the overall quality control and quality assurance of analyses performed by DHL's Laboratory. Ensures that internal assessments are performed in accordance with laboratory accreditation requirements.

GBRA Laboratory

Miliana Hernandez
Laboratory Lead Analyst
Performs laboratory analyses and notifies the GBRA QAO of particular circumstances which may adversely affect the quality of data. Performs sample custodial duties. Reviews and verifies laboratory data for integrity, continuity, reasonableness, and validates the lab data against the measurement performance specifications listed in this QAPP.

Kylie Gudgell
Quality Assurance Officer
Maintains operating procedures that are in compliance with this QAPP, amendments and appendices. Responsible for the overall quality control and quality assurance of analyses performed by GBRA's Laboratory. Ensures that internal assessments are performed in accordance with laboratory accreditation requirements.

City of Boerne

Ryan Bass
Environmental Planner/Urban Forester
Coordinates basin planning activities with the San Antonio River Authority. Ensures SARA CRP project manager and/or QA Specialists are notified of deficiencies and corrective actions, and that issues are resolved. Responsible for implementing and monitoring CRP requirements in QAPPs and QAPP amendments and appendices. Responsible for conducting monitoring in support of this QAPP. Notifies the SARA QA staff of particular circumstances which may adversely affect the quality of data. Coordinates and monitors deficiencies and corrective action. Coordinates the research and review of technical QA material and data related to water quality monitoring system design and analytical techniques.

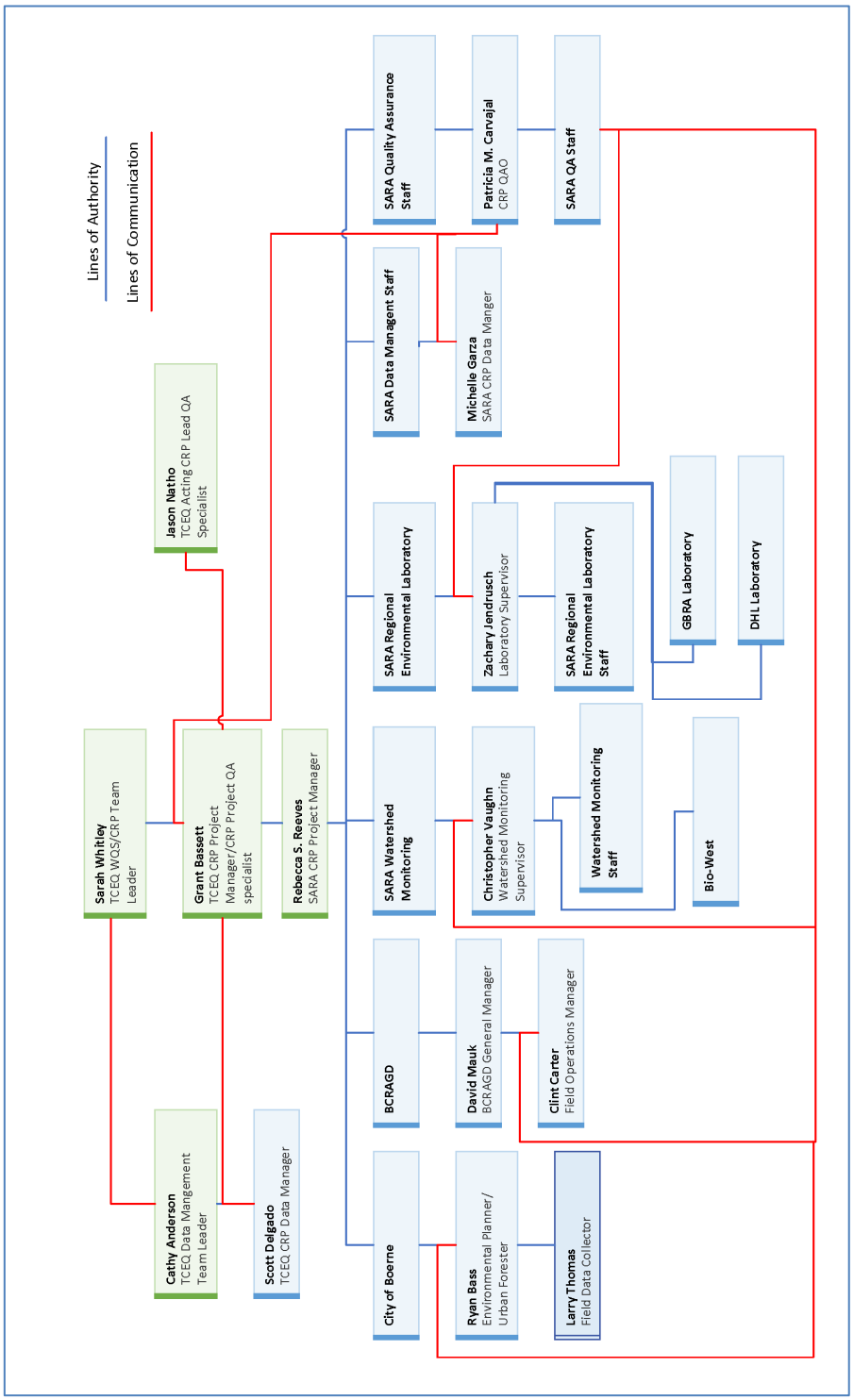
Larry Thomas
Field Data Collector
Responsible for conducting routine monitoring in support of this QAPP. Responsible for implementing and monitoring CRP requirements in QAPPs and QAPP amendments and appendices. Responsible for ensuring that sample documentation is complete, sample containers are labeled, and sites identified. Ensures sample collection is consistent with SOPs and QAPP. Ensures all field documentation and instrument calibration data is complete.

Bio-West

Brad Littrell
Aquatic Ecologist/Project Manager
Responsible for the coordination of benthic macro-invertebrate organism identification activities and ensuring that the information is provided to the SARA Watershed Monitoring Team. Responsible for ensuring SARA staff are notified of issues which may adversely affect the quality of data. Coordinates and monitors deficiencies and corrective action related to the identification of benthic macroinvertebrate samples.

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 San Antonio River Authority and the TCEQ to carry out the activities mandated by the legislation. The QAPP was developed and will be implemented in accordance with provisions of the TCEQ Quality Management Plan, January 2023 or most recent version (QMP).

The purpose of this QAPP is to clearly delineate San Antonio River Authority QA policy, management structure, and procedures which will be used to implement the QA requirements necessary to verify and validate the surface water quality data collected. The QAPP is reviewed by the TCEQ to help ensure that data generated for the purposes described above are 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*.

The design for the current monitoring program was developed through a coordinated monitoring meeting. Representatives from the TCEQ met with SARA staff as well as other partner agencies to determine where there was a need for sampling. Sample sites were determined based on need, taking into account: current and future TMDL collection efforts, USGS sample stations, other data providers and data needs for future 303d lists by assessment units, Basin Highlights Reports and Basin Summary Reports.

A6 Project / Task Description

In support of the TCEQ CRP long term goal to maintain and improve water quality within each river basin in Texas, SARA maintains routine, systematic and biological monitoring stations to help characterize and detect any water quality changes within the San Antonio River Basin. The Bandera County River Authority and Groundwater District (BCRAGD) and city of Boerne (COB), sub-participants under SARA's QAPP, also collect routine water quality data in the basin and submit data to the TCEQ through the SARA CRP. Routine monitoring for FY2024 includes a minimum of 73 stations monitored a minimum of four times per year for field, conventional, and bacteria parameter groups. Routine flow will be collected at 62 sites. Metals in water will be collected at 7 stations, biochemical oxygen demand will be collected at 5 stations and chlorophyll/pheophytin will be collected at 52 stations. In FY2024, habitat, nekton, and flow measurements will be collected at fifteen stations. 24-hour diel measurements will be conducted at 20 stations. Benthic samples will be collected at 7 stations. With input from SARA's CRP Environmental Advisory Committee as well as other entities performing monitoring in the basin, the location, frequency, and variation of all monitoring sites and scheduled parameters are determined at the annual Coordinated Monitoring Meeting. Details of the monitoring schedule, parameters, and sampling locations are included in Appendix B.

GBRA Laboratory and DHL Laboratory are utilized as back-up laboratories and will be used in the event that the SARA Laboratory is unable to analyze samples.

Identification of benthic macroinvertebrate organisms will be performed by Bio-West staff.

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 San Antonio River Authority Project Manager to the CRP Project Manager electronically. The San Antonio River Authority 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 San Antonio River Authority Project Manager, the San Antonio River Authority 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 San Antonio River Authority Clean Rivers Program Quality Assurance Officer. If adherence letters are required, the San Antonio River Authority 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 San Antonio River Authority 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 San Antonio River Authority and the TCEQ Project Manager and TCEQ technical staff. Appendices will be written in an abbreviated format and will reference the Basin QAPP where appropriate. Appendices will be approved by the San Antonio River Authority Project Manager, the San Antonio River Authority 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 San Antonio River Authority to project participants before data collection activities commence. The San Antonio River Authority 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 San Antonio River Authority 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.

The objective of 24-hour sampling is to determine if the designated Aquatic Life Use subcategories are being met for a stream site. Since the lowest dissolved oxygen levels usually occurs during the night and early morning (before daybreak) collecting the dissolved oxygen values during this time is the only way to determine if the Aquatic Life Use dissolved oxygen minimum criteria is being met. Conductivity, pH and temperature are also collected with the 24-hour dissolved oxygen and may assist in the interpretation of results.

Biological sampling (nekton and benthic macroinvertebrates) in conjunction with habitat assessments are used as a holistic approach to determine the health of the stream. Areas where water quality is good, with good habitats, should have diverse and abundant biological communities. Areas where water quality is poor should have biological communities that are primarily composed of pollution tolerant species and exhibit relatively low levels of biodiversity as well as a relative abundance of hybrids and diseased organisms. The purpose of biological sampling is to detect water quality pollutants that are not directly being tested for by the laboratory and field staff.

Metals in water will be performed to characterize the level of dissolved and total metals in the water column of the San Antonio River and its tributaries.

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 San Antonio River Authority will use this information to determine future monitoring priorities. These water quality data and data collected by other organizations (e.g., USGS, TCEQ, etc.), will be subsequently reconciled for use and assessed by the TCEQ.

The 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.
- 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, they are trained by experienced Watershed Monitoring staff in proper instrument calibration, field sampling techniques, and field analysis procedures. The trainer will document the successful field demonstration. This documentation is forwarded to the QA Officer (or designee) who will retain the documentation in the employee's training file. This information will be available during monitoring systems audits.

Training for BCRAGD staff is performed in accordance with the procedures of the BCRAGD.

Training for COB staff is performed in accordance with the procedures of the City of Boerne.

Bio-West training and credentials are retained in accordance with the organization's policies and procedures and provided proof of previous project experience in the identification of benthic macroinvertebrates along with a description of experience for all personnel involved.

Any training provided by SARA staff will be documented by SARA and retained by the SARA QA officer. A copy of the documentation will be provided to the partner organization.

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

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

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	San Antonio River Authority, DHL, BCRAGD, GBRA, COB, Bio-West	Minimum 5 years	Paper/Electronic
Field SOPs	San Antonio River Authority, BCRAGD, COB	Minimum 5 years	Paper/Electronic
Laboratory Quality Manuals	San Antonio River Authority GBRA, DHL	Minimum 5 years	Paper/Electronic
Laboratory SOPs	San Antonio River Authority GBRA, DHL	Minimum 5 years	Paper/Electronic
QAPP distribution documentation	San Antonio River Authority	Minimum 5 years	Paper/Electronic
Field staff training records	San Antonio River Authority, BCRAGD, COB	Minimum 5 years	Paper/Electronic
Field equipment calibration/maintenance logs	San Antonio River Authority, BCRAGD, COB	Minimum 5 years	Paper/Electronic
Field instrument printouts	San Antonio River Authority, BCRAGD, COB	Minimum 5 years	Paper/Electronic
Field notebooks or data sheets	San Antonio River Authority, BCRAGD, COB, Bio-West	Minimum 5 years	Paper/Electronic
Chain of custody records	San Antonio River Authority GBRA, DHL, Bio-West	Minimum 5 years	Paper/Electronic

Document/Record	Location	Retention (yrs)	Format
Laboratory calibration records	San Antonio River Authority GBRA, DHL	Minimum 5 years	Paper/Electronic
Laboratory instrument printouts	San Antonio River Authority GBRA, DHL	Minimum 5 years	Paper/Electronic
Laboratory data reports/results	San Antonio River Authority GBRA, DHL	Minimum 5 years	Paper/Electronic
Laboratory equipment maintenance logs	San Antonio River Authority GBRA, DHL	Minimum 5 years	Paper/Electronic
Corrective Action Documentation	San Antonio River Authority, DHL, BCRAGD, GBRA, COB, Bio-West	Minimum 5 years	Paper/Electronic
Benthic Macroinvertebrate Identification Records	San Antonio River Authority, Bio-West	Minimum 5 years	Paper/Electronic

Laboratory Test Reports

The SARA-REL generates laboratory test reports; these reports are sent to the SARA Project Manager in order to keep them informed as to the progress of the project. The data is entered into the LIMS by the Laboratory personnel, and upon validation, electronic data will be submitted to the TCEQ on or before the deliverable due date.

Analysis performed by a sub-participant laboratory will be reported to the SARA – REL through a laboratory test report that complies with the NELAP requirements listed below. The results are then entered into the SARA LIMS system and identified as being analyzed by the appropriate laboratory.

Laboratory test/data reports from the laboratory document the test results clearly and accurately. Routine data reports are 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 information provided in a test report whether hard copy or electronic includes the following:

- Title;
- Name and address of the laboratory, and the phone number and name of a contact person;
- Unique identification of the test report, date and time stamp at the bottom of the report, on each page and a pagination system that ensures that each page is recognized as part of the test report and a clear identification of the end of the report, such as 3 of 10;
- Name and address of the client if applicable;
- Identification of the test method used;
- Sample matrix;
- Unambiguous identification of the sample(s), including the client identification code (station ID) and sample location;
- Date of sample receipt when it is critical to the validity and application of the results, date and time of sample collection, dates the tests were performed, the time of sample preparation and analysis if the required holding time for either activity is less than or equal to 72 hours;
- Test results with failures identified, units of measurement, an indication of whether results are calculated on a dry weight or wet weight basis;
- The name, function, and signature or an equivalent electronic identification of the person authorizing the test report, and the date of issue;
- Statement to the effect that the results relate only to the samples;
- A statement that the report shall not be reproduced except in full without written approval of the laboratory;

- End depth;
- Holding time for *E. coli*;
- 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);
- Certification that the results are in compliance with the NELAP Standards if accredited to be in compliance or provide reasons and/or justification if they do not comply.

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.

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 San Antonio River Authority '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	Minimum Sample Volume	Holding Time
New Plastic Gallon Cubitainer					
TSS	Water	Cubitainer	Cool to >o ≤ 6ºC	500 mL	7 days
Nitrate-N	Water	Cubitainer	Cool to >o ≤ 6ºC	100** mL	48 hours
Nitrite-N	Water	Cubitainer	Cool to >o ≤ 6ºC	100** mL	48 hours
Sulfate	Water	Cubitainer	Cool to >o ≤ 6ºC	100** mL	28 days
Chloride	Water	Cubitainer	Cool to >o ≤ 6ºC	100** mL	28 days
BOD	Water	Cubitainer	Cool to >o ≤ 6ºC	2 L	48 hours
Whirl -Pak					
E. coli, IDEXX Colilert	Water	Whirl-pack containing Sodium Thiosulfate	Cool to >o ≤ 6ºC	250 mL	8 hrs*
New Plastic Quart Cubitainer					
Total phosphorous	Water	Cubitainer	H_2SO_4 to pH <2 Cool to >o ≤ 6ºC	100 mL	28 days
Total Kjeldahl Nitrogen	Water	Cubitainer	H_2SO_4 to pH <2 Cool to >o ≤ 6ºC	500 mL	28 days
Ammonia, non-distilled	Water	Cubitainer	H_2SO_4 to pH <2 Cool to >o ≤ 6ºC	250 mL	28 days
Total Hardness, Titration	Water	Cubitainer	H_2SO_4 to pH <2 Cool to >o ≤ 6ºC	200 mL	6 months
New Brown Plastic Bottle					
Chlorophyll-a	Water	Amber Plastic	Dark and ice before filtration (within 48 hours) Dark and frozen after filtration (held up to 28 days)	2000 mL***	Filter within 48 hours and hold frozen up to 28 days

Parameter	Matrix	Container	Preservation	Minimum Sample Volume	Holding Time
Pheophytin	Water	Amber Plastic	Dark and ice before filtration (within 48 hours) Dark and frozen after filtration (held up to 28 days)	2000 mL***	Filter within 48 hours and hold frozen up to 28 days
Whirl-Pak					
Benthic Macro-invertebrates	NA	Whirl-pak (once identified and counted, they are placed in plastic bottles)	95% Ethanol	NA	NA (Samples kept for 5 years after processing)
Glass Bottle					
Fish	NA	Glass Bottle	10% Formalin	NA	NA (Samples kept for 5 years after processing)
New 250 mL Plastic Bottle					
Metals	Water	Plastic Bottle	HNO_3† to pH <2	250 mL	6 months
Dissolved Metals	Water	Plastic Bottle	Filtered upon collection; HNO_3† to pH <2	250 mL	6 months
Total Hardness (calculated)	Water	Plastic Bottle	HNO_3† to pH <2	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.
**Sulfate, Chloride, Nitrate and Nitrite are analyzed together using Ion Chromatography; the volume required is a total of 100 mL, not 100 mL per parameter
***Chlorophyll-a and pheophytin are analyzed together, the volume required is a total of 2000 mL
†Samples will be preserved by the SARA laboratory

Sample Containers

Sample containers (cubitainers and amber plastic containers) are purchased pre-cleaned for conventional parameters and are disposable. Whirl-pak bags are used for bacteriological samples and have 1% sodium thiosulfate tablets added. New Amber plastic bottles are used for chlorophyll/pheophytin samples. Certificates are maintained in a notebook by the San Antonio River Authority or by the laboratory that provided them. Sample containers for sub-participants will be provided by the SARA-REL. Metals samples are collected in 250 mL new plastic bottles suitable for metals collections and are single use.

Sample containers for fish voucher samples are glass bottles. Benthic macroinvertebrates are collected into Whirl-pak containers then transferred to glass or plastic vials once cleaned and prepared for identification.

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 including biological sampling are documented on field data sheets or electronic worksheets as presented in Appendix D. Flow worksheets, aquatic life use monitoring checklists, habitat assessment forms, field biological assessment forms, and records of bacteriological analyses (if applicable) are part of the field data record. The following will be recorded for all visits:

- 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
- Recreational 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.
- Electronic worksheets are used by SARA to record data for routine water quality parameters, biological collections and habitat assessments; if corrections are made to the electronic field sheet, these are documented via the LIMS audit trail. In the event that electronic sheets can not be used, hard copy forms are used to record data. Chain of custody is documented through hard copy forms.
- Sub-participants utilize paper field sheets to document field parameters, observations and chain of custody documentation.

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 San Antonio River Authority CRP QAP, in consultation with the San Antonio River Authority CRP Project Manager, to ensure that the actions and resolutions to the problems are documented and that records are maintained in accordance with this QAPP. In addition, these actions and resolutions will be conveyed to the TCEQ CRP Project Manager both verbally and in writing in the project progress reports and by completion of a 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 routine monitoring 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

Biological samples are labeled in the field using a pencil or waterproof ink and paper with a high rag content. The labels are placed inside or on each sample container. The following information is included on the labels or is logged electronically:

Station number and location description
Date and time of collection
Collection method
Preservative added
Estimated number of individuals in subsample for benthic macroinvertebrates
Name of each collector
Container replicate number, if needed

Sample Handling

Water Quality Samples

All samples are collected according to procedures identified in TCEQ's SOP, V1 - *TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods for Water, Sediment, and Tissue, 2012.* The field data sheet is filled out in the field when the sample is collected, and the results of field parameters and flow are posted on this sheet.

Analyses that require acid preservation are collected in containers prepared by field staff. These containers are prepared by dispensing 2 mL of acid in the container at the beginning of the day. The sample container is labeled with a permanent waterproof marker directly on the container and placed in an ice chest where they are covered with ice. Metals in water samples are preserved by the laboratory staff.

Biological Samples

Nekton samples are collected according to TCEQ SOP, V2 - *TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Community and Habitat Data, 2014.* Biological voucher specimens are preserved in accordance with SWQM guidance. Voucher samples are labeled with the site number and collection date upon collection and transported to the laboratory.

Benthic samples are collected according to TCEQ SOP, V2 - *TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Community and Habitat Data, 2014 (or most recent revision).* Samples are labeled with the site number and collection date upon collection and transported to the laboratory.

Both water quality as well as biological samples are transported to the laboratory. Upon arrival at the laboratory, all samples and paperwork are relinquished to the sample custodian. The sample custodian accepts the sample, checking for any abnormalities in the sample(s) (i.e., leaking containers, appropriate labeling, etc.) and notes any abnormalities at log in. The sample custodian also checks and documents the temperature of the samples using an infrared thermometer, and that all acid preserved samples are below 2 S.U. pH. Paperwork is examined for completeness and the sample custodian accepts the sample and documentation by signing the chain of custody (field data sheet) as well as the date and time of acceptance.

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 (access is controlled through the use of programmed access cards) portion of the laboratory. The biological sample containers (if applicable) are returned to field staff for further processing, preservation and identification, and the containers are stored in the field laboratory. Benthics samples are cleaned and then transferred to Bio-West staff for identification. Once identification is complete the specimens will be returned to SARA staff for the required retention timeframe.

Laboratory staff run backlog reports to identify samples that need to be analyzed and identify when sample hold time elapses.

In the event that samples are outsourced the SARA Laboratory Services Coordinator or designee will prepare the samples to be sent to the appropriate laboratory. A COC will be prepared to document the transfer of the sample(s) to the laboratory selected and the analysis that is requested.

Sample Tracking Procedure Deficiencies and Corrective Action

All deficiencies associated with COC procedures, as described in this QAPP, are immediately reported to the San Antonio River Authority QA staff. 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 San Antonio River Authority QA staff consultation with the San Antonio River Authority CRP QAO and the San Antonio River Authority CRP Project Manager 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 appropriate staff assigned to address the CAP, these reports will then be compiled by the QA staff and submitted to San Antonio River Authority CRP Project Manager for inclusion with project progress report submitted to the TCEQ Project Manager.

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 QAMs 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 supervisor and QA staff, who will make the determination and notify the San Antonio River Authority CRP 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 to the San Antonio River Authority CRP Project Manager. The San Antonio River Authority 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

The minimum field QC requirements, and program-specific laboratory QC requirements, are outlined in SWQM Procedures. Specific requirements are outlined below. Field QC sample results are submitted with the laboratory data report (see Section A9.).

Field blank

Field blanks are required for total metals-in-water samples when collected without sample equipment (i.e., as grab samples). A field blank is prepared in the field by filling a clean container with pure deionized water and appropriate preservative, if any, for the specific sampling activity being undertaken. Field blanks are used to assess contamination from field sources, such as airborne materials, containers, or preservatives. Field blanks for total metals-in-water samples will be collected at a frequency of one per day of sampling. Only those samples collected on dates with associated field blanks collected on the same day will be submitted to TCEQ.

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

Field blanks are associated with batches of field samples. In the event of a field blank failure for one or more target analytes, all applicable data associated with the field batch may need to be qualified as not meeting project QC requirements, and these qualified data will not be reported to the TCEQ. These data include all samples collected on that day during that sample run and should not be confused with the laboratory analytical batch.

Field equipment blank

Field equipment blanks are required for metals-in-water samples when collected using sampling equipment. The field equipment blank is a sample of analyte-free media which has been used to rinse common sampling equipment to check the effectiveness of decontamination procedures. It is collected in the same type of container as the environmental sample, preserved in the same manner, and analyzed for the same parameter. Field equipment blanks for dissolved metals-in-water samples will be collected at a frequency of one per day of sampling. Only those samples collected on dates with associated field equipment blanks collected on the same day will be submitted to TCEQ.

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

Field equipment blanks are associated with batches of field samples. In the event of a field equipment blank failure for one or more target analytes, all applicable data associated with the field batch may need to be qualified as not meeting project QC requirements, and these qualified data will not be reported to the TCEQ. These data include all samples collected on that day during that sample run and should not be confused with the laboratory analytical batch.

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 assurance manuals (QAMs). 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 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 a clean sample matrix at a level less than or equal to the LOQ published in Appendix A of this QAPP, for each analyte for each preparation 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 preparation 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. Duplicate results that are near the LOQ will be evaluated to determine if the results will be reported. Results from all samples associated with a 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.

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 San Antonio River Authority CRP QAO 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, the San Antonio River Authority may consider excluding all of the results in the batch related to the analyte that failed recovery.

Method blank

A method blank is a sample of matrix similar to the batch of associated samples (when available) that is free from the analytes of interest and is processed simultaneously with and under the same conditions as the samples through all steps of the analytical procedures, and in which no target analytes or interferences are present at concentrations that impact the analytical results for sample analyses. The method 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 San Antonio River Authority CRP QAP, in consultation with the San Antonio River Authority CRP Project Manager. 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 San Antonio River Authority CRP Project Manager and San Antonio River Authority CRP QAO will be relied upon in evaluating results.

Field blanks and field equipment blanks are associated with batches of field samples. In the event of a field blank or equipment blank failure, any target analytes in the ambient sample associated with the field blank or equipment blank will not be reported.

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 San Antonio River Authority CRP Project Manager and San Antonio River Authority CRP QAO. If applicable, the San Antonio River Authority 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 2016 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 San Antonio River Authority, including review of all applicable QC samples related to CRP data. As stated in section 4.5.5 of the 2016 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 (San Antonio River Authority) 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 Watershed Monitoring staff. 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 SOP(s).

B7 Instrument Calibration and Frequency

Field equipment calibration requirements are contained in the SWQM Procedures and manufacturers equipment manuals. 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 SOP(s).

B8 Inspection/Acceptance of Supplies and Consumables

Inspection and acceptance of supplies and consumables is documented in accordance with the SARA supply ordering procedure.

Records that supplies purchased for the laboratory meet method requirements is documented in a logbook by the individual receiving the item(s) in accordance with the purchasing SOP.

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.

B10 Data Management

Data Management Process

Samples collected by SARA Watershed Monitoring staff and sub-participants are transferred to the SARA-REL for analyses as described in Sections B1, B2 and B3. Sampling metadata (e.g., site location, date, time, sampling depth, etc.) is used to generate a unique sampling event in the LIMS database built on an auto-generated alphanumeric key field. Measurement results from both the field data sheets and laboratory data sheets are entered (by field and laboratory staff, respectively) into the LIMS database for their corresponding event. Customized data entry forms or the use of .csv upload files facilitate accurate data entry. Field data and laboratory data are entered by staff and reviewed by another staff member. For samples collected by sub-participants, field data are entered into the LIMS database by the SARA administrative staff and reviewed by SARA QA staff. SARA QA staff then validate the analyses.

Bio-West will provide data to the SARA Watershed Monitoring team and they will then enter the data into LIMS. The data will then be reviewed by SARA QA staff and validated.

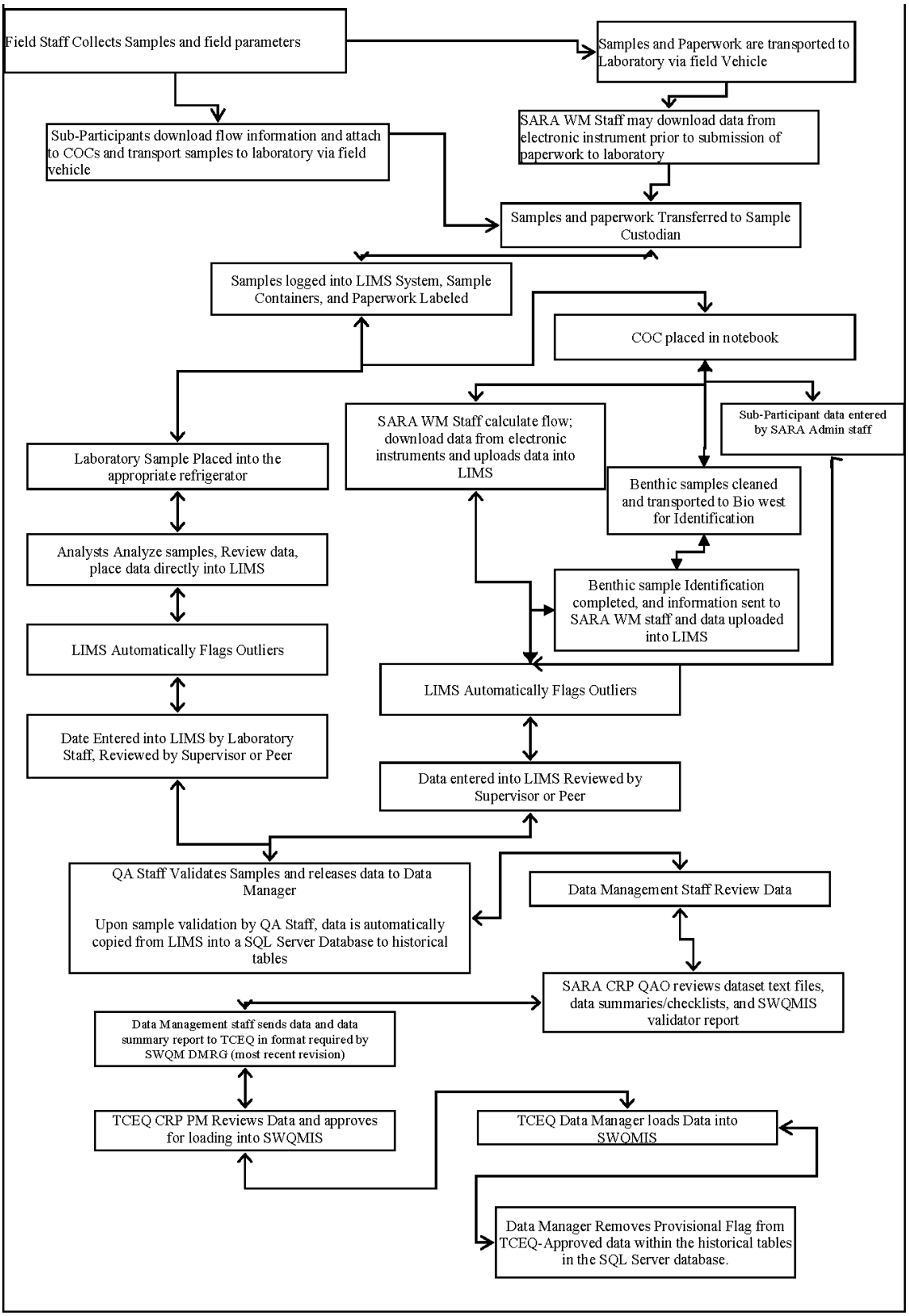
Following data verification and validation by SARA QA staff, SARA Data Management staff then review data and prepare the data for submission to the TCEQ SWQMIS database. The data are exported from the LIMS database into the ESD historical SQL database. Data Management staff then perform checks to confirm parameter codes and sites are contained within the QAPP. Outliers are confirmed, data reasonableness checks are performed and missing, or scratched results are identified to determine percent completeness. Once the checks are complete the data is exported to the Event/Result format required for submission to TCEQ's SWQMIS (as described in the SWQM DMRG, most recent revision). QA staff review data deliverable files once data has been reviewed and files have been prepared. Data Management submit files to TCEQ CRP Project Manager. Once TCEQ approval of the data is obtained, the data are loaded into SWQMIS by TCEQ data managers.

Figure B10.1 is a flow chart identifying the flow of the data at SARA from collection to sending the information to the TCEQ. Although the flow chart may not identify it, at any point in the review of data, the reviewer can send the data back to the prior level for additional work, or documentation.

Analytical data from outsource laboratories is entered into the SARA LIMS by SARA laboratory staff and the laboratory that performed the analysis is identified on the analytical reports. Analytical results are reviewed prior to validation. Analytical reports from outsource laboratories are scanned, filed and retained according to the schedule in Table A9.1.

See Figure B10.1 for the Data Management Process Flow Chart.

Figure B10.1 Data Flow



Systems Design
Stream monitoring data is entered into the SARA LIMS *LabWorks, LLC* ™ Enterprise System by the Aquatic Biologist or by the Administrative Assistant. This data is stored on a SQL server. Once data is exported from the *Labworks* system the data is formatted according to the format specified in the SWQM Data Management Reference Guidance 2019, or latest version.

Data Dictionary
Terminology and field descriptions are included in the DMRG, most recent version. A table outlining the submitting and collecting entities that will be used when submitting data under this QAPP is included below.

Table B10.1 Monitoring Entity

Name of Entity	Tag Prefix	Submitting Entity	Collecting Entity	Monitoring Type(s)
San Antonio River Authority	SA	SA	SA	RT, BS
Bandera County River Authority and Groundwater District	SA	SA	BA	RT, BS
City of Boerne	SA	SA	BC	RT

Data Errors and Loss
Each step of the data collection is reviewed by another analyst, supervisor(s) and/or the QA staff. In the San Antonio River Authority Laboratory, data is reviewed by a peer analyst prior to analysis validation. The SARA QA staff also conducts periodic internal audits; this includes conducting data reviews to ensure proper method, SOP, chemicals and techniques are used in the generation of data. Required quality control and calculations are clearly shown in each analysis's SOP. Generalized procedures are covered by the Laboratory's QAM or General Laboratory SOPs. The Laboratory Supervisor and the Laboratory QAO are provided with the CRP QAPP, so they are familiar with the program specific criteria.

The SARA QA staff conduct periodic data integrity reviews (where traceability and calculations are checked); this includes conducting observations to ensure proper methods and techniques are being used in the collection of field samples. A system is in place that identifies non-conformances and implements corrective actions.

The Data Manager notifies the QA staff when an error is suspected, or information is missing. If an error or missing information is confirmed, the QA staff coordinates corrective actions for resolution. Corrective actions can range from re-sampling, re-analysis, qualifying data, or omitting data from the deliverable. Data loss is identified in the data deliverable process through the Data Summary and Review Checklist (Appendix F). If resolution of errors requires modifying results, data is updated and notated on all associated documents and databases – chain of custody, benchsheets, spreadsheets, LIMS. If errors are found after the data has been submitted and approved by TCEQ, those errors are corrected by the Data Manager per TCEQ's Data Correction Request process.

To mitigate the potential for data loss, the databases and servers are backed up nightly and copies of the files are stored off-site. If the laboratory database or network server fails, the back-up files can be accessed to restore operation or replace corrupted files.

Record Keeping and Data Storage
San Antonio River Authority record keeping and document control procedures are contained in the water quality sampling, laboratory SOPs and this QAPP. Original field and laboratory data sheets are stored in accordance with the record-retention schedule in Section A9. This includes field data collected by BCRAGD and COB. Laboratory data for outsourced laboratory analysis will be retained at their respective facilities in accordance with the schedule in Table A9.1.

Data Handling, Hardware, and Software Requirements

SARA laboratory and field data will be input into SARA's LIMS. This system is the *LabWorks, LLC.* The SARA LIMS relies heavily on Microsoft SQL databases and Excel spreadsheets.

ArcGIS/ArcMap may be used to calculate drainage areas and slope calculations for habitat and biological sample events.

Once the data is ready to be submitted to TCEQ for upload into SWQMIS the data is formatted according to the format specified in the SWQM Data Management Reference Guide, most recent version.

Information Resource Management Requirements

The Data Manager is familiar with the DMRG, and follows the processes described in the document. The work of the Data Manager is reviewed by the SARA QAO and may be audited by the TCEQ as part of the monitoring systems audit. If deficiencies or non-conformances are identified during the monitoring systems audit, the condition is addressed and a corrective action memo outlining the steps taken is sent to the SARA Project Manager for their approval.

Data will be managed in accordance with the DMRG (most recent revision), and applicable San Antonio River Authority 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.

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

Quality Assurance/Quality Control – See Section D of this QAPP

Migration/Transfer/Conversion

SQL Server Integration Services scripts capture required data from LIMS, after QA validation, and append them into designated tables. Validated water quality data sent to the TCEQ under an approved QAPP is displayed on the SARA Water Quality Webviewer with a status of "provisional" to identify data submitted to TCEQ but pending TCEQ review and acceptance.

Microsoft SQL views are utilized to acquire appropriate data sets for each deliverable. The data sets are reviewed and checked for accuracy and compliance with CRP and QAPP data quality requirements. Data sets are submitted to TCEQ in pipe delimited format per the SWQM Data Management Reference Guide using a Microsoft SQL Server Integration Services (SSIS) Package.

Upon TCEQ approval and acceptance of the data deliverable package, the "provisional" status is removed.

Backups and Recovery

- Snapshots are done daily on all application servers and file servers.
- Data servers are copied daily to an off-site location.
- Full server backups are performed and kept for a period of 6 months

In the event data recovery is needed; an IT request is initiated describing the situation and the files that need to be recovered. In the event of a catastrophic systems failure, a backup server will be used to process data until the primary servers are repaired.

Archives/Data Retention – Complete original paperwork, in the form of image scans, is retained on-site by the San Antonio River Authority for a retention period specified in Table A9.1 Project Documents and Records.

The original paperwork is available through Papervision®, which is an electronic system which allows staff to

access electronic scans of the documents. Each staff member has a unique ID and password in order to access the system. These records cannot be manipulated except by authorized staff (QA staff and Administrative Assistants).

Data Verification/Validation

The control mechanisms for detecting and correcting errors and for preventing loss of data during data reduction, data reporting, and data entry are contained in Sections D1, D2, and D3.

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	San Antonio River Authority	Monitoring of the project status and records to ensure requirements are being fulfilled	Report to TCEQ in Quarterly Report
Monitoring Systems Audit of San Antonio River Authority	Dates to be determined by TCEQ CRP	TCEQ	Field sampling, handling and measurement; facility review; and data management as they relate to CRP	30 days to provide corrective actions response to the TCEQ
Monitoring Systems Audit of Program Subparticipants	Dates to be determined by the San Antonio River Authority (once per biennium)	San Antonio River Authority	Field sampling, handling and measurement; facility review; and data management as they relate to CRP	30 days to respond in writing to the San Antonio River Authority. PM 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 San Antonio River Authority 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 San Antonio River Authority Project Manager, in consultation with the San Antonio River Authority 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

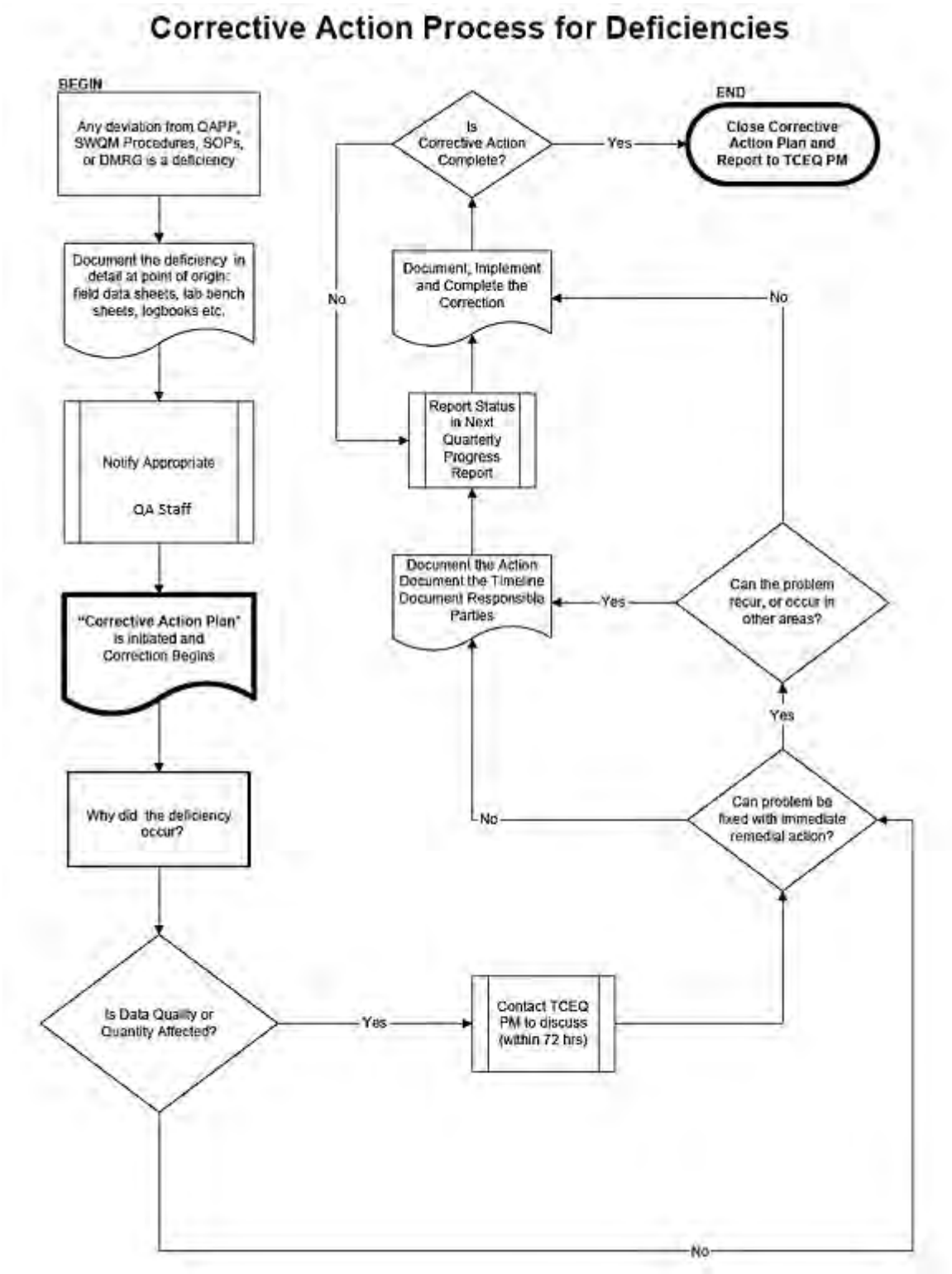
CAPs should:

- 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).

The San Antonio River Authority Environmental Sciences Department has a Non-Conformance Reporting (NCR) System which is used to report and track deficiencies and quality control issues for all work performed. This system is web-based. It documents the items listed above.

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 San Antonio River Authority CRP QAO is responsible for ensuring that corrective actions have been implemented. The San Antonio River Authority CRP Project Manager tracks deficiencies and corrective actions. Records of audit findings and corrective actions are maintained by the San Antonio River Authority CRP QAO. 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	• QA staff • Laboratory Management • Watershed Monitoring Management
CRP Project 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	SARA Project Manager	TCEQ CRP Project Management
Monitoring Systems Audit Report and Response	As Needed	As Needed	San Antonio River Authority QAO	TCEQ CRP Project Management
Data Summary	As Needed	As Needed	San Antonio River Authority Data Manager	TCEQ CRP Project Management

Reports to San Antonio River Authority Project Management

Periodic project status updates are entered into the SARA project management tool.

Reports to TCEQ Project Management

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

Progress Report
Summarizes the San Antonio River Authority '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 San Antonio River Authority QA staff, a report of findings, recommendations and response is sent to the TCEQ in the quarterly progress report.

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

Reports by TCEQ Project Management
Contractor Evaluation
The San Antonio River Authority participates in a Contractor Evaluation by the TCEQ annually for compliance with administrative and programmatic standards. Results of the evaluation are submitted to the TCEQ Financial Administration Division, Procurement and Contracts Section.

D1 Data Review, Verification, and Validation

All field and laboratory data will be reviewed and verified for integrity and continuity, reasonableness, and conformance to project requirements, and then validated against the project objectives and measurement performance specifications which are listed in Section A7 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 San Antonio River Authority Data Manager and SARA CRP 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.

For analyses that are performed by a contract laboratory; data is reviewed prior to reporting the results to the SARA laboratory.

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 San Antonio River Authority Quality Assurance Officer 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 San Antonio River Authority 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.

Table D2.1: Data Review Tasks

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

SARA WMS – SARA Watershed Monitoring Supervisor
SARA LS – Laboratory Supervisor
Lab QAO – Laboratory Quality Assurance Officer
SARA QAO – SARA Quality Assurance Officer
SARA DM – SARA Data Manager
BCRAGD – Bandera County River Authority & Groundwater District Field Operations Manager
COB – City of Boerne Field Sample Collector

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-A7.11)

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.

Table A7.1 through A7.11 - Measurement Performance Specifications

TABLE A7.1 Measurement Performance Specifications for SARA WM/BCRAGD/COB					
Field Parameters					
Parameter	**Units**	**Matrix**	**Method**	**Parameter Code**	**Collecting Organization**
TEMPERATURE, WATER (DEGREES CENTIGRADE)	DEG C	water	SM 2550 B and TCEQ SOP V1	00010	SARA-WM, BCRAGD, COB
TRANSPARENCY, SECCHI DISC (METERS)	meters	water	TCEQ SOP V1	00078	SARA-WM, BCRAGD, COB
SPECIFIC CONDUCTANCE,FIELD (US/CM @ 25C)	us/cm	water	EPA 120.1 and TCEQ SOP, V1	00094	SARA-WM, BCRAGD, COB
OXYGEN, DISSOLVED (MG/L)	mg/L	water	SM 4500-O G and TCEQ SOP V1	00300	SARA-WM, BCRAGD, COB
PH (STANDARD UNITS)	s.u	water	EPA 150.1 and TCEQ SOP V1	00400	SARA-WM, BCRAGD, COB
DAYS SINCE PRECIPITATION EVENT (DAYS)	days	other	TCEQ SOP V1	72053	SARA-WM, BCRAGD, COB
DEPTH OF BOTTOM OF WATER BODY AT SAMPLE SITE[1]	meters	water	TCEQ SOP V2	82903	BCRAGD
RESERVOIR STAGE (FEET ABOVE MEAN SEA LEVEL)***[1]	FT ABOVE MSL	water	TWDB	00052	BCRAGD
RESERVOIR PERCENT FULL***[1]	% RESERVOIR CAPACITY	water	TWDB	00053	BCRAGD
RESERVOIR ACCESS NOT POSSIBLE LEVEL TOO LOW ENTER 1 IF REPORTING[1]	NS	other	TCEQ Drought Guidance	00051	BCRAGD
PRESENT WEATHER (1=CLEAR,2=PTCLDY,3=CLDY,4=RAIN,5=OTHER)	NU	other	NA	89966	SARA-WM, BCRAGD, COB
WATER SURFACE(1=CALM,2=RIPPLE,3=WAVE,4=WHITECAP)[1]	NU	water	NA	89968	BCRAGD
WATER ODOR (1=SEWAGE, 2=OILY/CHEMICAL, 3=ROTTEN EGGS, 4=MUSKY, 5=FISHY, 6=NONE, 7=OTHER (WRITE IN COMMENTS))	NU	water	NA	89971	SARA-WM, BCRAGD, COB
WATER COLOR 1=BRWN 2=RED 3=GRN 4=BLCK 5=CLR 6=OT	NU	water	NA	89969	SARA-WM, BCRAGD, COB

*** As published by the Texas Water Development Board on their website
[1]Reported only by BCRAGD
https://www.waterdatafortexas.org/reservoirs/statewide

References:
United States Environmental Protection Agency (USEPA) Methods for Chemical Analysis of Water and Wastes, Manual #EPA-600/4-79-020
U.S. Code of Federal Regulations (CFR). Title 40: Protection of Environment, Part 136
American Public Health Association (APHA), American Water Works Association (AWWA), and Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 23rd Edition, 2017.
TCEQ SOP, V1 - TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods, 2012 (RG-415).
TCEQ SOP, V2 - TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, 2014 (RG-416).

TABLE A7.2 Measurement Performance Specifications for SARA WM/BCRAGD/COB					
Flow Parameters					
Parameter	**Units**	**Matrix**	**Method**	**Parameter Code**	**Collecting organization**
FLOW STREAM, INSTANTANEOUS (CUBIC FEET PER SEC)	cfs	water	TCEQ SOP V1	00061	SARA-WM, BCRAGD, COB
FLOW SEVERITY:1=No Flow,2=Low,3=Normal,4=Flood,5=High,6=Dry	NU	water	TCEQ SOP V1	01351	SARA-WM, BCRAGD, COB
STREAM FLOW ESTIMATE (CFS)	cfs	Water	TCEQ SOP V1	74069	SARA-WM, BCRAGD, COB
FLOW MTH 1=GAGE 2=ELEC 3=MECH 4=WEIR/FLU 5=DOPPLER	NU	other	TCEQ SOP V1	89835	SARA-WM, BCRAGD, COB

References:

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

U.S. Code of Federal Regulations (CFR). Title 40: Protection of Environment, Part 136

American Public Health Association (APHA), American Water Works Association (AWWA), and Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 23rd Edition, 2017.

TCEQ SOP, V1 - TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods, 2012 (RG-415).

TCEQ SOP, V2 - TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, 2014 (RG-416).

TABLE A7.3 Measurement Performance Specifications for SARA-REL										
Conventional Parameters in Water										
Parameter	Units	Matrix	Method	Parameter Code	TCEQ AWRL	LOQ	LOQ Check Sample %Rec	Precision (RPD)	Bias %Rec. of LCS	Lab
BIOCHEMICAL OXYGEN DEMAND (MG/L, 5 DAY - 20DEG C	mg/L	water	SM 5210B	00310	2	2	NA	NA	NA	SARA-REL
RESIDUE, TOTAL NONFILTRABLE (MG/L)	mg/L	water	SM 2540D	00530	5	1	NA	NA	NA	SARA-REL
NITROGEN, AMMONIA, TOTAL (MG/L AS N)	mg/L	water	SM4500-NH_3 D	00610	0.1	0.1	70-130	20	80-120	SARA-REL
NITRITE NITROGEN, TOTAL (MG/L AS N)	mg/L	water	EPA 300.0 Rev. 2.1 (1993)	00615	0.05	0.05	70-130	20	80-120	SARA-REL
NITRATE NITROGEN, TOTAL (MG/L AS N)	mg/L	water	EPA 300.0 Rev. 2.1 (1993)	00620	0.05	0.05	70-130	20	80-120	SARA-REL
NITROGEN, KJELDAHL, TOTAL (MG/L AS N)	mg/L	water	EPA 351.2	00625	0.2	0.2	70-130	20	80-120	SARA-REL
PHOSPHORUS, TOTAL, WET METHOD (MG/L AS P)	mg/L	water	EPA 365.3	00665	0.06	0.02	70-130	20	80-120	SARA-REL
HARDNESS, TOTAL (MG/L AS CACO3)*, [1]	mg/L	water	SM 2340 C	00900	5	5	NA	20	80-120	SARA-REL
CHLORIDE (MG/L AS CL)	mg/L	water	EPA 300.0 Rev. 2.1 (1993)	00940	5	5	70-130	20	80-120	SARA-REL
SULFATE (MG/L AS SO4)	mg/L	water	EPA 300.0 Rev. 2.1 (1993)	00945	5	5	70-130	20	80-120	SARA-REL
CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH	ug/L	water	SM 10200-H	32211	3	1	NA	20	80-120	SARA-REL
PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	µg/L	water	SM 10200-H	32218	3	1	NA	NA	NA	SARA-REL

*Hardness is not used for regulatory purposes but is used to assess metals in water at inland sites (estuarine sites do not require hardness analysis).

[1]Only monitored for site 12883

References:

United States Environmental Protection Agency (USEPA) Methods for Chemical Analysis of Water and Wastes, Manual #EPA-600/4-79-020
U.S. Code of Federal Regulations (CFR). Title 40: Protection of Environment, Part 136
TCEQ SOP, V1 - TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods, 2012 (RG-415).
TCEQ SOP, V2 - TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, 2014 (RG-416).

TABLE A7.4 Measurement Performance Specifications for SARA-REL										
Bacteriological Parameters in Water										
Parameter	**Units**	**Matrix**	**Method**	**Parameter Code**	**TCEQ AWRL**	**LOQ**	**LOQ Check Sample %Rec**	**Log Difference of Duplicates**	**Bias %Rec. of LCS**	**Lab**
E. COLI, COLILERT, IDEXX METHOD, MPN/100ML	MPN/100 mL	water	SM 9223-B**	31699	1	1	NA	0.50*	NA	SARA-REL
E. COLI, COLILERT, IDEXX, HOLDING TIME	hours	water	NA	31704	NA	NA	NA	NA	NA	SARA-REL

* This value is not expressed as a relative percent difference. It represents the maximum allowable difference between the logarithm of the result of a sample and the logarithm of the duplicate result. See Section B5.
** *E.coli* samples analyzed by these methods should always be processed as soon as possible and within 8 hours. When transport conditions necessitate delays in delivery longer than 6 hours, the holding time may be extended and samples must be processed as soon as possible and within 30 hours.

References:
United States Environmental Protection Agency (USEPA) Methods for Chemical Analysis of Water and Wastes, Manual #EPA-600/4-79-020
U.S. Code of Federal Regulations (CFR). Title 40: Protection of Environment, Part 136

TCEQ SOP, V1 - TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods, 2012 (RG-415).
TCEQ SOP, V2 - TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, 2014 (RG-416).

TABLE A7.5 Measurement Performance Specifications for SARA-REL										
Metals in Water										
Parameter	Units	Matrix	Method	Parameter Code	TCEQ AWRL	LOQ	LOQ Check Sample %Rec	Precision (RPD)	Bias %Rec. of LCS	Lab
HARDNESS, TOTAL, CALCULATED (MG/L AS CACO3)*	mg/L	water	SM 2340 B	82394	5	5	NA	20	80-120	SARA-REL
CALCIUM, TOTAL (MG/L AS CA)	mg/L	water	EPA 200.8	00916	0.5	0.1	70-130	20	80-120	SARA-REL
MAGNESIUM, TOTAL (MG/L AS MG)	mg/L	water	EPA 200.8	00927	0.5	0.1	70-130	20	80-120	SARA-REL
SODIUM, TOTAL (MG/L AS NA)	mg/L	water	EPA 200.8	00929	NA	0.1	70-130	20	80-120	SARA-REL
POTASSIUM, TOTAL (MG/L AS K)	mg/L	water	EPA 200.8	00937	NA	0.1	70-130	20	80-120	SARA-REL
ARSENIC, TOTAL (UG/l AS AS)	ug/L	water	EPA 200.8	01002	NA	1	70-130	20	80-120	SARA-REL
BARIUM, TOTAL (UG/L AS BA)	µg/L	water	EPA 200.8	01007	NA	1	70-130	20	80-120	SARA-REL
CHROMIUM, TOTAL (UG/L AS CR)	µg/L	water	EPA 200.8	01034	NA	1	70-130	20	80-120	SARA-REL
COPPER, TOTAL (UG/L AS CU)	µg/L	water	EPA 200.8	01042	NA	1	70-130	20	80-120	SARA-REL
LEAD, TOTAL (UG/l AS PB)	ug/L	water	EPA 200.8	01051	NA	1	70-130	20	80-120	SARA-REL
MANGANESE, TOTAL (UG/L AS MN)	µg/L	water	EPA 200.8	01055	50	1	70-130	20	80-120	SARA-REL
MOLYBDENUM, TOTAL (UG/L AS MO)	µg/L	water	EPA 200.8	01062	NA	1	70-130	20	80-120	SARA-REL
NICKEL, TOTAL (UG/L AS NI)	µg/L	water	EPA 200.8	01067	NA	5	70-130	20	80-120	SARA-REL
ZINC, TOTAL (UG/L AS ZN)	µg/L	water	EPA 200.8	01092	NA	5	70-130	20	80-120	SARA-REL
ALUMINUM, TOTAL (UG/l AS AL)	ug/L	water	EPA 200.8	01105	NA	10	70-130	20	80-120	SARA-REL
IRON, TOTAL (MG/l AS FE)	mg/L	water	EPA 200.8	74010	NA	0.1	70-130	20	80-120	SARA-REL
CADMIUM, TOTAL (UG/L AS CD)	ug/L	water	EPA 200.8	01027	NA	1	70-130	20	80-120	SARA-REL
SELENIUM, TOTAL (UG/L AS SE)	ug/L	water	EPA 200.8	01147	2	1	70-130	20	80-120	SARA-REL
SILVER, TOTAL (UG/L AS AG)	ug/L	water	EPA 200.8	01077	NA	1	70-130	20	80-120	SARA-REL
ANTIMONY, TOTAL (UG/L AS SB)	ug/L	water	EPA 200.8	01097	NA	5	70-130	20	80-120	SARA-REL
THALLIUM, TOTAL (UG/L AS TL)	ug/L	water	EPA 200.8	01059	NA	1	70-130	20	80-120	SARA-REL
ALUMINUM, DISSOLVED (UG/L AS AL)	ug/L	water	EPA 200.8	01106	200	10.0	70-130	20	80-120	SARA-REL
ARSENIC, DISSOLVED (UG/L AS AS)	µg/L	water	EPA 200.8	01000	5	1.0	70-130	20	80-120	SARA-REL
BARIUM, DISSOLVED (UG/L AS BA)	µg/L	water	EPA 200.8	01005	1000	1.0	70-130	20	80-120	SARA-REL
CADMIUM, DISSOLVED (UG/L AS CD)	µg/L	water	EPA 200.8	01025	0.1 for waters <50mg/L hardness ------- 0.3 for waters >50mg/L hardness[1]	0.3	70-130	20	80-120	SARA-REL
CALCIUM, DISSOLVED (MG/L AS CA)	mg/L	water	EPA 200.8	00915	NA	0.1	70-130	20	80-120	SARA-REL
CHROMIUM, DISSOLVED (UG/L AS CR)	µg/L	water	EPA 200.8	01030	10	1.0	70-130	20	80-120	SARA-REL
COPPER, DISSOLVED (UG/L AS CU)	µg/L	water	EPA 200.8	01040	1 for waters < 50mg/L hardness ------- 3 for waters >= 50mg/L hardness[1]	1.0	70-130	20	80-120	SARA-REL
IRON, DISSOLVED (UG/L as Fe)	µg/L	water	EPA 200.8	01046	NA	100	70-130	20	80-120	SARA-REL
LEAD, DISSOLVED (UG/L AS PB)	µg/L	water	EPA 200.8	01049	0.1 for waters < 85 mg/L hardness ------- 1 for waters >= 85 mg/L hardness[1]	1.0	70-130	20	80-120	SARA-REL

TABLE A7.5 Measurement Performance Specifications for SARA-REL										
Metals in Water										
Parameter	Units	Matrix	Method	Parameter Code	TCEQ AWRL	LOQ	LOQ Check Sample %Rec	Precision (RPD)	Bias %Rec. of LCS	Lab
MAGNESIUM, DISSOLVED {MG/L AS MG)	mg/L	water	EPA 200.8	00925	NA	0.1	70-130	20	80-120	SARA-REL
MANGANESE, DISSOLVED {UG/L AS MN}	µg/L	water	EPA 200.8	01056	NA	1	70-130	20	80-120	SARA-REL
MOLYBDENUM, DISSOLVED (UG/L AS MO)	µg/L	water	EPA 200.8	01060	NA	1.0	70-130	20	80-120	SARA-REL
NICKEL, DISSOLVED (UG/L AS NI)	ug/L	water	EPA 200.8	01065	10	5.0	70-130	20	80-120	SARA-REL
POTASSIUM, DISSOLVED (MG/L AS K)	mg/L	water	EPA 200.8	00935	NA	0.10	70-130	20	80-120	SARA-REL
SELENIUM, DISSOLVED (UG/L AS SE)	µg/L	water	EPA 200.8	01145	NA	1.0	70-130	20	80-120	SARA-REL
SILVER, DISSOLVED (UG/L AS AG)	ug/L	water	EPA 200.8	01075	0.5	0.5	70-130	20	80-120	SARA-REL
SODIUM, DISSOLVED (MG/L AS NA)	mg/L	water	EPA 200.8	00930	NA	0.10	70-130	20	80-120	SARA-REL
ZINC, DISSOLVED (UG/L AS ZN)	ug/L	water	EPA 200.8	01090	5	5.0	70-130	20	80-120	SARA-REL
ANTIMONY, DISSOLVED {UG/L AS SB}	ug/L	water	EPA 200.8	01095	NA	5	70-130	20	80-120	SARA-REL
THALLIUM, DISSOLVED (UG/L AS TL)	µg/L	water	EPA 200.8	01057	1	1.0	70-130	20	80-120	SARA-REL

*Hardness is not used for regulatory purposes but is used to assess metals in water at inland sites (estuarine sites do not require hardness analysis).
[1]Historical Hardness results in the basin are >100 mg/L.

References:United States Environmental Protection Agency (USEPA) Methods for Chemical Analysis of Water and Wastes, Manual #EPA-600/4-79-020U.S. Code of Federal Regulations (CFR). Title 40: Protection of Environment, Part 136TCEQ SOP, V1 - TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods, 2012 (RG-415).TCEQ SOP, V2 - TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, 2014 (RG-416).

TABLE A7.6 Measurement Performance Specifications for GBRA Laboratory										
Conventional Parameters in Water										
Parameter	Units	Matrix	Method	Parameter Code	TCEQ AWRL	LOQ	LOQ Check Sample %Rec	Precision (RPD)	Bias %Rec. of LCS	Lab
BIOCHEMICAL OXYGEN DEMAND (MG/L, 5 DAY - 20DEG C	mg/L	water	SM 5210B	00310	2	2	NA	NA	NA	GBRA
RESIDUE, TOTAL NONFILTRABLE (MG/L)	mg/L	water	SM 2540D	00530	5	1	NA	NA	NA	GBRA
NITROGEN, AMMONIA, TOTAL (MG/L AS N)	mg/L	water	EPA 350.1	00610	0.1	0.1	70-130	20	80-120	GBRA
NITRITE NITROGEN, TOTAL (MG/L AS N)	mg/L	water	EPA 300.0 Rev. 2.1 (1993)	00615	0.05	0.05	70-130	20	80-120	GBRA
NITRATE NITROGEN, TOTAL (MG/L AS N)	mg/L	water	EPA 300.0 Rev. 2.1 (1993)	00620	0.05	0.05	70-130	20	80-120	GBRA
NITROGEN, KJELDAHL, TOTAL (MG/L AS N)	mg/L	water	EPA 351.2	00625	0.2	0.2	70-130	20	80-120	GBRA
HARDNESS, TOTAL (MG/L AS CACO3)*, [1]	mg/L	water	SM 2340 C	00900	5	5	NA	20	80-120	GBRA
PHOSPHORUS, TOTAL, WET METHOD (MG/L AS P)	mg/L	water	EPA 365.3	00665	0.06	0.02	70-130	20	80-120	GBRA
CHLORIDE (MG/L AS CL)	mg/L	water	EPA 300.0 Rev. 2.1 (1993)	00940	5	1	70-130	20	80-120	GBRA
SULFATE (MG/L AS SO4)	mg/L	water	EPA 300.0 Rev. 2.1 (1993)	00945	5	1	70-130	20	80-120	GBRA
CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH	ug/L	water	SM10200-H	32211	3	1	NA	20	80-120	GBRA
PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	µg/L	water	SM10200-H	32218	3	1	NA	NA	NA	GBRA

*Hardness is not used for regulatory purposes but is used to assess metals in water at inland sites (estuarine sites do not require hardness analysis).
[1]Only monitored for site 12883

References:
United States Environmental Protection Agency (USEPA) Methods for Chemical Analysis of Water and Wastes, Manual #EPA-600/4-79-020
U.S. Code of Federal Regulations (CFR). Title 40: Protection of Environment, Part 136
TCEQ SOP, V1 - TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods, 2012 (RG-415).
TCEQ SOP, V2 - TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, 2014 (RG-416).

TABLE A7.7 Measurement Performance Specifications for DHL Laboratory										
Metals in Water										
Parameter	Units	Matrix	Method	Parameter Code	TCEQ AWRL	LOQ	LOQ Check Sample %Rec	Precision (RPD)	Bias %Rec. of LCS	Lab
HARDNESS, TOTAL CALCULATED (MG/L AS CACO3)*	mg/L	water	SM 2340 B	82394	5	2	NA	NA	NA	DHL Laboratory
CALCIUM, TOTAL (MG/L AS CA)	mg/L	water	EPA 200.8	00916	0.5	0.1	70-130	15	85-115	DHL Laboratory
MAGNESIUM, TOTAL (MG/L AS MG)	mg/L	water	EPA 200.8	00927	0.5	0.1	70-130	15	85-115	DHL Laboratory
SODIUM, TOTAL (MG/L AS NA)	mg/L	water	EPA 200.8	00929	NA	0.1	70-130	20	80-120	DHL Laboratory
POTASSIUM, TOTAL (MG/L AS K)	mg/L	water	EPA 200.8	00937	NA	0.1	70-130	15	85-115	DHL Laboratory
ARSENIC, TOTAL (UG/l AS AS)	ug/L	water	EPA 200.8	01002	NA	1	70-130	15	85-115	DHL Laboratory
BARIUM, TOTAL (UG/L AS BA)	µg/L	water	EPA 200.8	01007	NA	1	70-130	15	85-115	DHL Laboratory
CHROMIUM, TOTAL (UG/L AS CR)	µg/L	water	EPA 200.8	01034	NA	1	70-130	15	85-115	DHL Laboratory
COPPER, TOTAL (UG/L AS CU)	µg/L	water	EPA 200.8	01042	NA	1	70-130	15	85-115	DHL Laboratory
LEAD, TOTAL (UG/l AS PB)	ug/L	water	EPA 200.8	01051	NA	1	70-130	15	85-115	DHL Laboratory
MANGANESE, TOTAL (UG/L AS MN)	µg/L	water	EPA 200.8	01055	50	1	70-130	15	85-115	DHL Laboratory
MOLYBDENUM, TOTAL (UG/L AS MO)	µg/L	water	EPA 200.8	01062	NA	1	70-130	15	85-115	DHL Laboratory
NICKEL, TOTAL (UG/L AS NI)	µg/L	water	EPA 200.8	01067	NA	1	70-130	15	85-115	DHL Laboratory
ZINC, TOTAL (UG/L AS ZN)	µg/L	water	EPA 200.8	01092	NA	5	70-130	15	85-115	DHL Laboratory
ALUMINUM, TOTAL (UG/l AS AL)	ug/L	water	EPA 200.8	01105	NA	10	70-130	15	85-115	DHL Laboratory
IRON, TOTAL (MG/l AS FE)	mg/L	water	EPA 200.8	74010	NA	0.1	70-130	15	85-115	DHL Laboratory
CADMIUM, TOTAL (UG/L AS CD)	ug/L	water	EPA 200.8	01027	NA	1	70-130	15	85-115	DHL Laboratory
SELENIUM, TOTAL (UG/L AS SE)	ug/L	water	EPA 200.8	01147	2	1	70-130	15	85-115	DHL Laboratory
SILVER, TOTAL (UG/L AS AG)	ug/L	water	EPA 200.8	01077	NA	1	70-130	15	85-115	DHL Laboratory
ANTIMONY, TOTAL (UG/L AS SB)	ug/L	water	EPA 200.8	01097	NA	1	70-130	15	85-115	DHL Laboratory
THALLIUM, TOTAL (UG/L AS TL)	ug/L	water	EPA 200.8	01059	NA	1	70-130	15	85-115	DHL Laboratory
ALUMINUM, DISSOLVED (UG/L AS AL)	ug/L	water	EPA 200.8	01106	200	10	70-130	15	85-115	DHL Laboratory
ARSENIC, DISSOLVED (UG/L AS AS)	µg/L	water	EPA 200.8	01000	5	1	70-130	15	85-115	DHL Laboratory
BARIUM, DISSOLVED (UG/L AS BA)	µg/L	water	EPA 200.8	01005	1000	1	70-130	15	85-115	DHL Laboratory

TABLE A7.7 Measurement Performance Specifications for DHL Laboratory										
Metals in Water										
Parameter	Units	Matrix	Method	Parameter Code	TCEQ AWRL	LOQ	LOQ Check Sample %Rec	Precision (RPD)	Bias %Rec. of LCS	Lab
CADMIUM, DISSOLVED (UG/L AS CD)	µg/L	water	EPA 200.8	01025	0.1 for waters <50mg/L hardness ------- 0.3 for waters >50mg/L hardness[1]	0.3	70-130	15	85-115	DHL Laboratory
CALCIUM, DISSOLVED (MG/L AS CA)	mg/L	water	EPA 200.8	00915	NA	0.1	70-130	15	85-115	DHL Laboratory
CHROMIUM, DISSOLVED (UG/L AS CR)	µg/L	water	EPA 200.8	01030	10	1	70-130	15	85-115	DHL Laboratory
COPPER, DISSOLVED (UG/L AS CU)	µg/L	water	EPA 200.8	01040	1 for waters < 50mg/L hardness ------- 3 for waters >= 50mg/L hardness[1]	3	70-130	15	85-115	DHL Laboratory
IRON, DISSOLVED (UG/L as Fe)	µg/L	water	EPA 200.8	01046	NA	0.1	70-130	15	85-115	DHL Laboratory
LEAD, DISSOLVED (UG/L AS PB)	µg/L	water	EPA 200.8	01049	0.1 for waters < 85 mg/L hardness ------- 1 for waters >= 85 mg/L hardness[1]	1	70-130	15	85-115	DHL Laboratory
MAGNESIUM, DISSOLVED {MG/L AS MG)	mg/L	water	EPA 200.8	00925	NA	0.1	70-130	15	85-115	DHL Laboratory
MANGANESE, DISSOLVED {UG/L AS MN}	µg/L	water	EPA 200.8	01056	NA	1	70-130	15	85-115	DHL Laboratory
MOLYBDENUM, DISSOLVED (UG/L AS MO)	µg/L	water	EPA 200.8	01060	NA	1	70-130	15	85-115	DHL Laboratory
NICKEL, DISSOLVED (UG/L AS NI)	ug/L	water	EPA 200.8	01065	10	1	70-130	15	85-115	DHL Laboratory
POTASSIUM, DISSOLVED (MG/L AS K)	mg/L	water	EPA 200.8	00935	NA	0.1	70-130	15	85-115	DHL Laboratory
SELENIUM, DISSOLVED (UG/L AS SE)	µg/L	water	EPA 200.8	01145	NA	1	70-130	15	85-115	DHL Laboratory
SODIUM, DISSOLVED (MG/L AS NA)	mg/L	water	EPA 200.8	00930	NA	0.1	70-130	15	85-115	DHL Laboratory
ZINC, DISSOLVED (UG/L AS ZN)	ug/L	water	EPA 200.8	01090	5	5	70-130	15	85-115	DHL Laboratory
ANTIMONY, DISSOLVED {UG/L AS SB}	ug/L	water	EPA 200.8	01095	NA	5	70-130	15	85-115	DHL Laboratory
THALLIUM, DISSOLVED (UG/L AS TL)	µg/L	water	EPA 200.8	01057	1	1	70-130	15	85-115	DHL Laboratory

*Hardness is not used for regulatory purposes but is used to assess metals in water at inland sites (estuarine sites do not require hardness analysis).
[1]Historical Hardness results in the basin are >100 mg/L
References:
United States Environmental Protection Agency (USEPA) Methods for Chemical Analysis of Water and Wastes, Manual #EPA-600/4-79-020
U.S. Code of Federal Regulations (CFR). Title 40: Protection of Environment, Part 136
TCEQ SOP, V1 - TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods, 2012 (RG-415).
TCEQ SOP, V2 - TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, 2014 (RG-416).

TABLE A7.8 Measurement Performance Specifications for SARA WM/BCRAGD					
24 Hour Parameters in Water					
Parameter	Units	Matrix	Method	Parameter Code	Lab
TEMPERATURE, WATER (DEGREES CENTIGRADE), 24HR AVG	DEG C	Water	TCEQ SOP V1	00209	Field
WATER TEMPERATURE, DEGREES CENTIGRADE, 24HR MAX	DEG C	Water	TCEQ SOP V1	00210	Field
TEMPERATURE, WATER (DEGREES CENTIGRADE) 24HR MIN	DEG C	Water	TCEQ SOP V1	00211	Field
SPECIFIC CONDUCTANCE, US/CM, FIELD, 24HR AVG	uS/cm	Water	TCEQ SOP V1	00212	Field
SPECIFIC CONDUCTANCE, US/CM, FIELD, 24HR MAX	uS/cm	Water	TCEQ SOP V1	00213	Field
SPECIFIC CONDUCTANCE, US/CM, FIELD, 24HR MIN	uS/cm	Water	TCEQ SOP V1	00214	Field
PH, S.U., 24HR MAXIMUM VALUE	std. units	Water	TCEQ SOP V1	00215	Field
PH, S.U., 24HR, MINIMUM VALUE	std. units	Water	TCEQ SOP V1	00216	Field
WATER TEMPERATURE, # OF MEASUREMENTS IN 24-HRS	NU	Water	TCEQ SOP V1	00221	Field
SPECIFIC CONDUCTANCE, # OF MEASUREMENTS IN 24-HRS	NU	Water	TCEQ SOP V1	00222	Field
pH, # OF MEASUREMENTS IN 24-HRS	NU	Water	TCEQ SOP V1	00223	Field
DISSOLVED OXYGEN, 24-HOUR MIN. (MG/L) MIN. 4 MEA	mg/l	Water	TCEQ SOP V1	89855	Field
DISSOLVED OXYGEN, 24-HOUR MAX. (MG/L) MIN. 4 MEA	mg/l	Water	TCEQ SOP V1	89856	Field
DISSOLVED OXYGEN, 24-HOUR AVG. (MG/L) MIN. 4 MEA	mg/l	Water	TCEQ SOP V1	89857	Field
DISSOLVED OXYGEN, # OF MEASUREMENTS IN 24-HRS	NU	Water	TCEQ SOP V1	89858	Field

References:

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

U.S. Code of Federal Regulations (CFR). Title 40: Protection of Environment, Part 136

TCEQ SOP, V1 - TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods, 2012 (RG-415).

TCEQ SOP, V2 - TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, 2014 (RG-416).

TABLE A7.9 Measurement Performance Specifications for SARA-WM				
Biological - Habitat				
Parameter	**Units**	**Matrix**	**Method**	**Parameter Code**
FLOW STREAM, INSTANTANEOUS (CUBIC FEET PER SEC)	cfs	Water	TCEQ SOP V2	00061
FLOW MTH 1=GAGE 2=ELEC 3=MECH 4=WEIR/FLU 5=DOPPLER	NU	Other	TCEQ SOP V2	89835
BIOLOGICAL DATA	NS	Other	NA/Calculation	89888
STREAM TYPE; 1=PERENNIAL 2=INTERMITTENT S/PERENNIAL POOLS 3=INTERMITTENT 4=UNKNOWN	NU	Water	NA/Calculation	89821
STREAMBED SLOPE (M/KM)	M/KM	Other	NA/Calculation	72051
AVERAGE PERCENTAGE INSTREAM COVER	%	Other	TCEQ SOP V2	84159
STREAM ORDER	NU	Water	TCEQ SOP V2	84161
ECOREGION LEVEL III (TEXAS ECOREGION CODE)	NU	Other	TCEQ SOP V1	89961
NUMBER OF LATERAL TRANSECTS MADE	NU	Other	TCEQ SOP V2	89832
TOTAL NUMBER OF STREAM BENDS	NU	Other	TCEQ SOP V2	89839
NUMBER OF WELL DEFINED STREAM BENDS	NU	Other	TCEQ SOP V2	89840
NUMBER OF MODERATELY DEFINED STREAM BENDS	NU	Other	TCEQ SOP V2	89841
NUMBER OF POORLY DEFINED STREAM BENDS	NU	Other	TCEQ SOP V2	89842
TOTAL NUMBER OF RIFFLES	NU	Other	TCEQ SOP V2	89843
DOMINANT SUBSTRATE TYPE(1=CLAY,2=SILT,3=SAND,4=GRAVEL,5=COBBLE,6=BOULDER,7=BEDROCK,8=OTHER)	NU	Sediment	TCEQ SOP V2	89844
AVERAGE PERCENT OF SUBSTRATE GRAVEL SIZE OR LARGER	%	Other	TCEQ SOP V2	89845
AVERAGE STREAM BANK EROSION (%)	%	Other	TCEQ SOP V2	89846
AVERAGE STREAM BANK SLOPE (DEGREES)	deg	Other	TCEQ SOP V2	89847
HABITAT FLOW STATUS, 1=NO FLOW, 2=LOW,3=MOD,4=HIGH	NU	Other	TCEQ SOP V2	89848
AVERAGE PERCENT TREES AS RIPARIAN VEGETATION	%	Other	TCEQ SOP V2	89849
AVERAGE PERCENT SHRUBS AS RIPARIAN VEGETATION	%	Other	TCEQ SOP V2	89850
AVERAGE PERCENT GRASS AS RIPARIAN VEGETATION	%	Other	TCEQ SOP V2	89851
AVERAGE PERCENT CULTIVATED FIELDS AS RIPARIAN VEGETATION	%	Other	TCEQ SOP V2	89852
AVERAGE PERCENT OTHER AS RIPARIAN VEGETATION	%	Other	TCEQ SOP V2	89853
AVERAGE PERCENTAGE OF TREE CANOPY COVERAGE	%	Other	TCEQ SOP V2	89854
DRAINAGE AREA ABOVE MOST DOWNSTREAM TRANSECT*	km2	Other	TCEQ SOP V2	89859
REACH LENGTH OF STREAM EVALUATED (M)	m	Other	NA/Calculation	89884
AVERAGE STREAM WIDTH (METERS)	M	Other	TCEQ SOP V2	89861
AVERAGE STREAM DEPTH (METERS)	M	Other	TCEQ SOP V2	89862
MAXIMUM POOL WIDTH AT TIME OF STUDY (METERS)	M	Other	TCEQ SOP V2	89864
MAXIMUM POOL DEPTH AT TIME OF STUDY(METERS)	M	Other	TCEQ SOP V2	89865
POOL LENGTH, METERS	M	Other	TCEQ SOP V2	89869
AVERAGE WIDTH OF NATURAL RIPARIAN VEGETATION (M)	M	Other	TCEQ SOP V2	89866
AVERAGE WIDTH OF NATURAL RIPARIAN BUFFER ON LEFT BANK (M)	M	Other	NA/Calculation	89872
AVERAGE WIDTH OF NATURAL RIPARIAN BUFFER ON RIGHT BANK (M)	m	Other	NA/Calculation	89873
AESTHETICS OF REACH(1=WILD 2=NAT. 3=COMM. 4=OFF.)	NU	Other	TCEQ SOP V2	89867
NUMBER OF STREAM COVER TYPES	NU	Other	TCEQ SOP V2	89929

TABLE A7.9 Measurement Performance Specifications for SARA-WM				
Biological - Habitat				
Parameter	**Units**	**Matrix**	**Method**	**Parameter Code**
LAND DEVELOP IMPACT (1=UNIMP,2=LOW,3=MOD,4=HIGH)	NU	Other	TCEQ SOP V2	89962
RIPARIAN VEGETATION %; LEFT BANK - TREES	%	Other	NA/Calculation	89822
RIPARIAN VEGETATION %; RIGHT BANK - TREES	%	Other	NA/Calculation	89823
RIPARIAN VEGETATION %; LEFT BANK SHRUBS	%	Other	NA/Calculation	89824
RIPARIAN VEGETATION %; RIGHT BANK - SHRUBS	%	Other	NA/Calculation	89825
RIPARIAN VEGETATION %: LEFT BANK - GRASSES OR FORBS	%	Other	NA/Calculation	89826
RIPARIAN VEGETATION %; RIGHT BANK - GRASSES OR FORBS	%	Other	NA/Calculation	89827
RIPARIAN VEGETATION %: LEFT BANK - CULTIVATED FIELDS	%	Other	NA/Calculation	89828
RIPARIAN VEGETATION %: RIGHT BANK - CULTIVATED FIELDS	%	Other	NA/Calculation	89829
RIPARIAN VEGETATION %: LEFT BANK - OTHER	%	Other	NA/Calculation	89830
RIPARIAN VEGETATION %: RIGHT BANK - OTHER	%	Other	NA/Calculation	89871
AVAILABLE INSTREAM COVER HQI SCORE: 4=ABUNDANT 3=COMMON 2=RARE 1=ABSENT	NU	Other	NA/Calculation	89874
BOTTOM SUBSTRATE STABILITY HQI SCORE: 4=STABLE 3=MODERATELY STABLE 2=MODERATELY UNSTABLE 1=UNSTABLE	NU	Other	NA/Calculation	89875
NUMBER OF RIFFLES HQI SCORE: 4=ABUNDANT 3=COMMON 2=RARE 1=ABSENT	NS	Other	NA/Calculation	89876
DIMENSIONS OF LARGEST POOL HQI SCORE: 4=LARGE 3=MODERATE 2=SMALL 1=ABSENT	NU	Other	NA/Calculation	89877
CHANNEL FLOW STATUS HQI SCORE: 3=HIGH 2=MODERATE 1=LOW 0=NO FLOW	NU	Other	NA/Calculation	89878
BANK STABILITY HQI SCORE: 3=STABLE 2=MODERATELY STABLE 1=MODERATELY UNSTABLE 0=UNSTABLE	NU	Other	NA/Calculation	89879
CHANNEL SINUOSITY HQI SCORE: 3=HIGH 2=MODERATE 1=LOW 0=NONE	NU	Other	NA/Calculation	89880
RIPARIAN BUFFER VEGETATION HQI SCORE: 3=EXTENSIVE 2=WIDE 1=MODERATE 0=NARROW	NU	Other	NA/Calculation	89881
AESTHETICS OF REACH HQI SCORE: 3=WILDERNESS 2=NATURAL AREA 1=COMMON SETTING 0=OFFENSIVE	NU	Other	NA/Calculation	89882
HQI TOTAL SCORE	NU	Other	NA/Calculation	89883

* From USGS map.

References:

United States Environmental Protection Agency (USEPA) Methods for Chemical Analysis of Water and Wastes, Manual #EPA-600/4-79-020
TCEQ SOP, V1 - TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods, 2012 (RG-415).
TCEQ SOP, V2 - TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, 2014 (RG-416).

TABLE A7.10 Measurement Performance Specifications for SARA-WM				
Biological - Benthics (Qualitative)				
Parameter	**Units**	**Matrix**	**Method**	**Parameter Code**
STREAM ORDER	NU	Water	TCEQ SOP, V1	84161
ECOREGION LEVEL III (TEXAS ECOREGION CODE)	NU	Other	TCEQ SOP V1	89961
BIOLOGICAL DATA	NS	Other	NA/Calculation	89888
RAPID BIOASSESSMENT PROTOCOLS BENTHIC MACROINVERTEBRATE IBI SCORE	NS	Other	NA/Calculation	90081
BENTHIC DATA REPORTING UNITS (1=NUMBER OF INDIVIDUALS IN SUB-SAMPLE, 2=NUMBER OF INDIVIDUALS/FT2, 3=NUMBER OF INDIVIDUALS/M2, 4=TOTAL NUMBER OF INDIVIDUALS IN SAMPLE)	NU	Other	TCEQ SOP V2	89899
KICKNET EFFORT,AREA KICKED (SQ.METER)	m2	Other	TCEQ SOP V2	89903
KICKNET EFFORT,MINUTES KICKED (MIN.)	min.	Other	TCEQ SOP V2	89904
NUMBER OF INDIVIDUALS IN BENTHIC SAMPLE	NU	Other	TCEQ SOP V2	89906
GRAVEL BOTTOM AT COLLECTION POINT (%)	%	Sediment	TCEQ SOP V2	89923
SAND BOTTOM AT COLLECTION POINT (%)	%	Sediment	TCEQ SOP V2	89924
SOFT BOTTOM AT COLLECTION POINT (%)	%	Sediment	TCEQ SOP V2	89925
MACROPHYTE BED AT COLLECTION POINT (%)	%	Other	TCEQ SOP V2	89926
SNAGS AND BRUSH AT COLLECTION POINT (%)	%	Other	TCEQ SOP V2	89927
BEDROCK STREAMBED AT COLLECTION POINT (%)	%	Sediment	TCEQ SOP V2	89928
MESH SIZE, ANY NET OR SIEVE, AVERAGE BAR (CM)	cm	Other	TCEQ SOP V2	89946
BENTHIC SAMPLE COLLECTION METHOD (1=SURBER, 2=EKMAN, 3=KICKNET, 4=PETERSON, 5=HESTER DENDY, 6=SNAG, 7=HESS)	NU	Other	TCEQ SOP V2	89950
BENTHOS ORGANISMS -NONE PRESENT (0=NONE PRESENT)	NS	Other	TCEQ SOP V2	90005
HILSENHOFF BIOTIC INDEX (HBI)	NU	Other	TCEQ SOP V2	90007
NUMBER OF EPT INDEX	NU	Other	TCEQ SOP V2	90008
DOMINANT BENTHIC FUNCTIONAL FEEDING GRP, % OF INDIVIDUALS	%	Other	TCEQ SOP V2	90010
BENTHIC GATHERERS, PERCENT OF INDIVIDUALS	%	Other	TCEQ SOP V2	90025
BENTHIC PREDATORS, PERCENT OF INDIVIDUALS	%	Other	TCEQ SOP V2	90036
DOMINANT TAXON, BENTHOS PERCENT OF INDIVIDUALS	%	Other	TCEQ SOP V2	90042
RATIO OF INTOLERANT TO TOLERANT TAXA, BENTHOS	NU	Other	TCEQ SOP V2	90050
NUMBER OF NON-INSECT TAXA	NU	Other	TCEQ SOP V2	90052
ELMIDAE, PERCENT OF INDIVIDUALS	%	Other	TCEQ SOP V2	90054
TOTAL TAXA RICHNESS, BENTHOS	NU	Other	TCEQ SOP V2	90055
CHIRONOMIDAE, PERCENT OF INDIVIDUALS	%	Other	TCEQ SOP V2	90062

TABLE A7.10 Measurement Performance Specifications for SARA-WM				
Biological - Benthics (Qualitative)				
Parameter	**Units**	**Matrix**	**Method**	**Parameter Code**
PERCENT OF TOTAL TRICHOPTERA INDIVIDUALS AS HYDROPSYCHIDAE	%	Other	TCEQ SOP V2	90069
BENTHIC SHREDDERS (% OF COMMUNITY)	%	Other	TCEQ SOP V2	90035
TOTAL # OF FAMILIES IN BENTHIC SAMPLE	NU	Other	TCEQ SOP V2	90012
RAPID BIOASSESSMENT PROTOCOLS REGIONAL BENTHIC MACROINVERTEBRATE IBI SCORE	NS	Other	NA/Calculation	90082
NUMBER OF EPHEMEROPTERA TAXA	NU	Other	TCEQ SOP V2	90057
TOTAL NUMBER OF INTOLERANT TAXA, BENTHOS (aka: Taxa with Tolerance Value <8.5)	NU	Other	TCEQ SOP V2	90058
TOLERANT BENTHOS, PERCENT OF INDIVIDUALS (aka: Tolerance Value ≥8.5)	%	Other	TCEQ SOP V2	90066
PERCENT TRICHOPTERA	%	Other	TCEQ SOP V2	91810
PERCENT DIPTERA	%	Other	TCEQ SOP V2	91812
PERCENT DIPTERA AND NON-INSECT TAXA	%	Other	TCEQ SOP V2	91814
BENTHIC SCRAPERS, PERCENT OF INDIVIDUALS	%	Other	TCEQ SOP V2	91815
PERCENT EPHEMEROPTERA	%	Other	TCEQ SOP V2	91818
Species Enumeration[1]	#	Benthics	N/A Calculation	Various

[1]Species Enumeration performed by Bio-West

References:

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

TCEQ SOP, V1 - TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods, 2012 (RG-415).

TCEQ SOP, V2 - TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, 2014 (RG-416).

TABLE A7.11 Measurement Performance Specifications for SARA-WM				
Biological - Nekton				
Parameter	**Units**	**Matrix**	**Method**	**Parameter Code**
STREAM ORDER	NU	Water	TCEQ SOP V1	84161
NEKTON TEXAS REGIONAL IBI SCORE	NS	Other	NA/Calculation	98123
BIOLOGICAL DATA	NS	Other	NA/Calculation	89888
SEINE, MINIMUM MESH SIZE, AVERAGE BAR, NEKTON,IN	IN	Other	TCEQ SOP V2	89930
SEINE, MAXIMUM MESH SIZE, AVG BAR, NEKTON,INCH	IN	Other	TCEQ SOP V2	89931
NET LENGTH (METERS)	M	Other	TCEQ SOP V2	89941
ELECTROFISHING METHOD 1=BOAT 2=BACKPACK 3=TOTEBARGE	NU	Other	TCEQ SOP V2	89943
ELECTROFISH EFFORT, DURATION OF SHOCKING (SEC)	SEC	Other	TCEQ SOP V2	89944
SEINING EFFORT (# OF SEINE HAULS)	NU	Other	TCEQ SOP V2	89947
COMBINED LENGTH OF SEINE HAULS (METERS)	M	Other	TCEQ SOP V2	89948
SEINING EFFORT, DURATION (MINUTES)	MIN	Other	TCEQ SOP V2	89949
ECOREGION LEVEL III (TEXAS ECOREGION CODE)	NU	Other	TCEQ SOP V1	89961
AREA SEINED (SQ METERS)	M2	Other	TCEQ SOP V2	89976
NUMBER OF SPECIES, FISH	NU	Other	TCEQ SOP V2	98003
NEKTON ORGANISMS-NONE PRESENT (0=NONE PRESENT)	NS	Other	TCEQ SOP V2	98005
TOTAL NUMBER OF SUNFISH SPECIES	NU	Other	TCEQ SOP V2	98008
TOTAL NUMBER OF INTOLERANT SPECIES, FISH	NU	Other	TCEQ SOP V2	98010
PERCENT OF INDIVIDUALS AS OMNIVORES, FISH	%	Other	TCEQ SOP V2	98017
PERCENT OF INDIVIDUALS AS INVERTIVORES, FISH	%	Other	TCEQ SOP V2	98021
PERCENT OF INDIVIDUALS AS PISCIVORES, FISH	%	Other	TCEQ SOP V2	98022
PERCENT OF INDIVIDUALS WITH DISEASE OR ANOMALY	%	Other	TCEQ SOP V2	98030

TABLE A7.11 Measurement Performance Specifications for SARA-WM				
Biological - Nekton				
Parameter	**Units**	**Matrix**	**Method**	**Parameter Code**
TOTAL NUMBER OF NATIVE CYPRINID SPECIES	NU	Other	TCEQ SOP V2	98032
PERCENT INDIVIDUALS AS NON-NATIVE FISH SPECIES (% OF COMMUNITY)	%	Other	TCEQ SOP V2	98033
TOTAL NUMBER OF INDIVIDUALS SEINING	NU	Other	TCEQ SOP V2	98039
TOTAL NUMBER OF INDIVIDUALS ELECTROFISHING	NU	Other	TCEQ SOP V2	98040
TOTAL NUMBER OF BENTHIC INVERTIVORE SPECIES	NU	Other	TCEQ SOP V2	98052
TOTAL NUMBER OF BENTHIC FISH SPECIES	NU	Other	TCEQ SOP V2	98053
NUMBER OF INDIVIDUALS PER SEINE HAUL	NU	Other	TCEQ SOP V2	98062
NUMBER OF INDIVIDUALS PER MINUTE ELECTROFISHING	NU	Other	TCEQ SOP V2	98069
PERCENT INDIVIDUALS AS TOLERANT FISH SPECIES (EXCLUDING WESTERN MOSQUITOFISH)	%	Other	TCEQ SOP V2	98070
TOTAL NUMBER OF SUCKER SPECIES	NU	Other	TCEQ SOP V2	98009
PERCENT OF INDIVIDUALS AS HYBRIDS	%	Other	TCEQ SOP V2	98024
TOTAL NUMBER OF INDIVIDUALS IN SAMPLE, FISH	NU	Other	TCEQ SOP V2	98023
PERCENT OF INDIVIDUALS AS TOLERANTS, FISH	%	Other	TCEQ SOP V2	98016
TOTAL NUMBER OF DARTER SPECIES	NU	Other	TCEQ SOP V2	98004

References:

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

TCEQ SOP, V1 - TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods, 2012 (RG-415).

TCEQ SOP, V2 - TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, 2014 (RG-416).

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

H. QAPP Appendix and Amendment Receipt Acknowledgement and Adherence Letters (if applicable) – no later than 45 days after TCEQ approval of the QAPP, but prior to the monitoring event

I. Participate in TCEQ monitoring systems audit(s) and response to comments (if applicable) - date planned in consultation with TCEQ

J. Conduct on-site oversight assessment of sub-participants, once during each project or once during contract cycle (if applicable) - August 1, 2025

K. On-site project oversight report and response (if applicable) - with the progress report no later than the quarter following the one in which the audit was conducted; if audit was conducted in the last quarter, submit August 15, 2025

L. Corrective action status report (if applicable) – with progress report

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 conduct a basin water quality monitoring program according to the QAPP approved by TCEQ. All monitoring procedures and methods will follow the guidelines prescribed in the Performing Party's QAPP, which will reference the *TCEQ Surface Water Quality Monitoring (SWQM) Procedures, Volume 1: Physical and Chemical Monitoring Methods* (RG-415) and the *TCEQ SWQM Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data* (RG-416).

The Performing Party will complete the following subtasks:

Monitoring Description – In FY 2024, the Performing Party will monitor a minimum of 50 sites under this Contract. Routine and Systematic Sites will be monitored a minimum of four times per year for field, conventional, bacteria, and flow (if possible) parameter groups. Additionally, a minimum of 15 sites will have habitat, nekton, flow and 24-hour diel monitoring conducted at least once per year. Additional details concerning the monitoring activities conducted by the Performing Party are specifically outlined in the Performing Party's basin-wide QAPP. The actual number of monitoring sites, locations, and frequency of collection is dependent on the outcome of the Coordinated Monitoring Meeting.

In FY 2025, the Performing Party will monitor at a similar level of effort as in FY 2024. The actual number of sites, location, frequency, and parameters collected will be based on priorities identified in the Steering Committee (a component of the Performing Party's Environmental Advisory Committee (EAC)), the Coordinated Monitoring Meeting, and will be included in the amended Appendix B monitoring 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.

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, summarize activities, 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, summarize activities, 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 the meeting

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 San Antonio River Authority coordinates closely with the TCEQ and other participants to ensure a comprehensive water monitoring strategy within the watershed.

The TCEQ's Integrated Report (2022 IR) identifies impairments. An impairment is identified when a standard identified in Title 30, Chapter 307 of the Texas Administrative Code is not supported, evaluating the data according to the Guidance for Assessing and Reporting Surface Water Quality in Texas.

According to the 2022 Integrated Report the most common impairment in the San Antonio Watershed is *E. coli* bacteria. *E. coli* bacteria is an indicator of recent fecal contamination, and it is used to determine if the state's primary contact recreation standard is being met. *E. coli* bacteria impairments make of 73% of the impaired AUs in the San Antonio Watershed.

Samples have been collected to determine the source of the fecal contamination. Library dependent analyses were used to determine the sources. In each county tested, including Bexar County, greater than 50% of the isolates came from wildlife. This information can be used to target the source(s), by providing public outreach and education asking that the public not feed the wildlife near waterbodies. Two of the highest levels for *E. coli* bacteria are in Brackenridge Park and along the San Antonio River Walk. These are both areas with excessive wildlife because people are feeding the wildlife.

Fish communities are identified as impaired in 8% of the impaired assessment units and benthic macroinvertebrates are identified as impaired in 4% of the impaired assessment units. It is unclear the cause of these impairments. They may be due to water quality and / or habitat.

Dissolved oxygen is identified as an impairment in 7% of the impaired assessment units. Three out of four assessment units with dissolved oxygen impairments were streams with flows identified as intermittent with pools. The fourth station (Salado Creek) is identified as perennial but often had very low flows. The assessment unit with the impairment for dissolved oxygen is upstream of the re-use water discharge to augment flow in the creek. The dissolved oxygen impairments may be due more to low flows than water quality. PCBs in fish tissues are an impairment on a portion of Leon Creek only. This is believed to be a legacy pollutant released into the environment in and around the Lackland Air Force Base. A fish advisory has been issued advising the public not to eat any fish from a point 100 meters upstream of State Highway 16 northwest of San Antonio in Bexar County to its confluence with the Medina River due to PCB concentrations in fish tissue. Recently, Per-and polyfluoroalkyl substances (PFAS) have also been identified in fish tissue in the same area by the Texas Department of State Health Services.

The most common concerns in this basin are for nutrients (nitrate nitrogen 33%, total phosphorus27%, and ammonia nitrogen 1%). The TCEQ determined each nutrient screening level by determining the 85th percentile from their surface water quality monitoring database. Nutrient standards are needed that are specific for each river and creek to protect the aquatic ecosystem of rivers, creeks, bays and estuaries. Nutrients are needed for the development of aquatic plants and algae. These are the bases for the food web that support the aquatic ecosystems. Elevated levels of nutrients can cause algae blooms and overgrowth of aquatic plants. As algae and aquatic plants die and decompose, they consume oxygen and can cause fish kills, and dead zones. Determining the appropriate nutrient level is a delicate balancing act. If the values are too high, you can create fish kills and dead zones in our rivers, creeks, bays and estuaries. If the nutrient level is too low, you can starve the aquatic ecosystem and harm fisheries in our rivers, creeks, bays and estuaries.

Chlorophyll-a is a pigment found in algae, and plants. Excessive nutrient levels can cause rapid growth, which in turn can cause low dissolved oxygen.

Silver in sediment was found only in one assessment unit on Leon Creek. The origin of this is unknown.

In FY24 monitoring will be conducted similarly to the monitoring conducted in FY23 with the following changes.

Summary of changes for FY24 Monitoring

1. Bimonthly water quality monitoring will be added for Station 20539, Ecleto Creek at FM 81, including conventionals, bacteria, chlorophyll a, field parameters, and flow. TxDOT construction at the site is anticipated to be complete by sampling time.

2. 24-Hour dissolved oxygen sampling will be added to Station 20539, Ecleto Creek at FM 81. This site has concerns for dissolved oxygen minimums and will be sampled for 24-hour dissolved oxygen twice per year.

3. Bimonthly water quality monitoring will be dropped for Station 17862, San Antonio River at US 181, due to unsafe conditions without better access options, poor data quality due to bankside collections, and duplicity within the assessment unit 1901_05.

4. 3x/yr. water quality monitoring will be dropped for Station 16992, Cabeza Creek at FM 2043, due to dry conditions causing infrequent data.

5. Hardness titration and chlorophyll a will be added to the current bimonthly water quality monitoring at Station 12883, San Antonio River at Dietzfield Road. Addition of these parameters will help monitor the CPS Energy Calaveras Lake refresh into the basin.

6. Bimonthly water quality monitoring will be dropped for Station 12880, San Antonio River at FM 541, due to unsafe conditions without better access options and poor data quality due to bankside collections.

7. Bimonthly water quality monitoring will be added for Station 22419, San Antonio River approximately 450 meters downstream of FM 541 to take the place of 12880 – San Antonio River at FM 541 which is being dropped due to unsafe conditions.

8. Bimonthly bacteria and flow monitoring at Station 15722, San Antonio Zoo Outfall #1, will be dropped from CRP. Bacteria monitoring will continue to be collected by the River Authority under an in-house program 6x/yr.

10. Dissolved and total metals sampling will be dropped at Station 12886, San Antonio River downstream of Loop 1604, due to poor metals sampling conditions.

9. Benthic macroinvertebrate sampling will be added to Station 14200, Medina River at CR 484, twice per year. This will be paired with existing biological monitoring at the site and will increase the geographic spread of benthic surveys in the basin.

10. Benthic macroinvertebrate sampling will be added to Station 12916, Medio Creek at Hidden Valley Campground, twice per year. This will be paired with existing biological monitoring at the site and will increase the geographic spread of benthic surveys in the basin.

11. Benthic macroinvertebrate sampling will be added to Station 12844, Leon Creek at Loop 13, twice per year. This is in addition to existing water quality monitoring within the same assessment unit done by TCEQ Region 13 and will increase the geographic spread of benthic surveys in the basin.

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 FY2024

Site Description	Station ID	Waterbody ID	Region	SE	CE	MT	24 hr DO	AqHab	Benthics	Nekton	Metal Water	BOD	Chlorophyll-a/Pheophytin	Conv	Bacteria	Flow	Field	Comments
Segment 1901 Lower San Antonio River | Map																		
SAN ANTONIO RIVER AT US 77 ON REFUGIO-VICTORIA COUNTY LINE | Map	12789	1901	14	SA	SA	RT					2			6	6	6	6	Metals = total and dissolved. Flow reported from USGS gage 08188570
SAN ANTONIO RIVER BRIDGE ON US 77-A AND 183 SOUTHEAST OF GOLIAD | Map	12791	1901	14	SA	SA	RT							6	6	52	52	52	River Recreation Bacteria Station. Flow reported from USGS gage 08188500.
SAN ANTONIO RIVER AT SOUTHERN PACIFIC RR BRIDGE IN GOLIAD | Map	12792	1901	14	SA	SA	BS	2	2		2						2	2	Biologicals collected approximately 150 M upstream of 12792
SAN ANTONIO RIVER AT SH 72 NEAR RUNGE | Map	12794	1901	13	SA	SA	RT						6	6	6	52	52	52	River Recreation Bacteria Station. Flow reported from USGS gage 08188060.
SAN ANTONIO RIVER AT SH 80 SW OF HELENA | Map	12795	1901	13	SA	SA	RT							6	6	6		6	No Flow Possible Safety Issue
SAN ANTONIO RIVER AT CONQUISTA CROSSING 2.4 KM DOWNSTREAM OF FM 791 SW OF FALLS CITY | Map	16580	1901	13	SA	SA	BS	2	2		2								BS samples will be collected along with RT events
SAN ANTONIO RIVER AT CONQUISTA CROSSING 2.4 KM DOWNSTREAM OF FM 791 SW OF FALLS CITY | Map	16580	1901	13	SA	SA	RT						6	6	6	6	6	6	Flow reported from USGS gage station 08183500.
SAN ANTONIO RIVER AT NORTH RIVERDALE RD 15 KM WEST OF GOLIAD TEXAS | Map	17859	1901	14	SA	SA	RT							6	6	52		52	Recreation Bacteria site. Flow severity will be recorded. Flow estimate reported from USGS 08188500.
ESCONDIDO CREEK AT KARNES CR 331 | Map	18402	1901A	13	SA	SA	RT							6	6	6	6	6	
ECLETO CREEK AT FM 81 424 METERS EAST AND 103 METERS NORTH TO THE INTERSECTION OF KARNES CR 334 AND FM 81 | Map	20539	1901F	13	SA	SA	BS	2											BS samples will be collected along with RT events
ECLETO CREEK AT FM 81 424 METERS EAST AND 103 METERS NORTH TO THE INTERSECTION OF KARNES CR 334 AND FM 81 | Map	20539	1901F	13	SA	SA	RT							6	6	6	6	6	

Site Description	Station ID	Waterbody ID	Region	SE	CE	MT	24 hr DO	AqHab	Benthics	Nekton	Metal Water	BOD	Chlorophyll-a/Pheophytin	Conv	Bacteria	Flow	Field	Comments
Segment 1902 Lower Cibolo Creek | Map																		
SANTA CLARA CREEK ON CR 315 SANTA CLARA RD NORTHWEST OF NEW BERLIN 2.19 KM 1.34 MI UPSTREAM OF THE CONFLUENCE WITH CIBOLO CREEK | Map	12784	1902	13	SA	SA	RT							6	6	6	6	6	
CIBOLO CREEK AT FM 81 EAST OF PANNA MARIA | Map	12797	1902	13	SA	SA	RT							6	6	6	6	6	
CIBOLO CREEK AT FM 541 WEST OF KOSCIUSKO | Map	12802	1902	13	SA	SA	BS	2	2		2						2	2	
CIBOLO CREEK AT FM 539 | Map	12805	1902	13	SA	SA	RT					2		6	6	6	6	6	Metals = total and dissolved. Flow reported from USGS gage 08185500.
CIBOLO CREEK AT SCULL CROSSING | Map	14197	1902	13	SA	SA	BS	2	2		2								BS samples will be collected along with RT events
CIBOLO CREEK AT SCULL CROSSING | Map	14197	1902	13	SA	SA	RT							6	6	6	6	6	
CIBOLO CREEK AT CR389 NEAR CESTOHOWA TEXAS | Map	14211	1902	13	SA	SA	BS			2									BS samples will be collected along with RT events
CIBOLO CREEK AT CR389 NEAR CESTOHOWA TEXAS | Map	14211	1902	13	SA	SA	RT						6	6	6	52	52	52	River Recreation Bacteria Station. Flow reported from USGS gage 08186000
MARTINEZ CREEK ON NORTH GABLE ROAD SOUTH OF ZUEHL | Map	12741	1902A	13	SA	SA	BS	2											BS samples will be collected along with RT events
MARTINEZ CREEK ON NORTH GABLE ROAD SOUTH OF ZUEHL | Map	12741	1902A	13	SA	SA	RT								6	6	6	6	Flow reported from USGS gage 08185100
SALATRILLO CREEK AT AUTUMN RUN | Map	14202	1902B	13	SA	SA	RT							6	6	6	6	6	
SAN ANTONIO RIVER AUTHORITY'S SALATRILLO WWTP 249 METERS DWSTRN FROM SCHAEFER RD | Map	14923	1902B	13	SA	SA	RT								6	6	6	6	
CLIFTON BRANCH AT OLD FLORESVILLE ROAD/WILSON COUNTY ROAD 401 2.7 KILOMETERS WEST OF STOCKDALE | Map	20776	1902C	13	SA	SA	RT								6	6	6	6	
Segment 1903 Medina River Below Medina Diversion Lake | Map																		
MEDINA RIVER AT FM 1937 NEAR LOSOYA | Map	12811	1903	13	SA	SA	RT							6	6	6	6	6	

Site Description	Station ID	Waterbody ID	Region	SE	CE	MT	24 hr DO	AqHab	Benthics	Nekton	Metal Water	BOD	Chlorophyll-a/Pheophytin	Conv	Bacteria	Flow	Field	Comments
MEDINA RIVER AT APPLEWHITE ROAD APPROXIMATELY 1.16 KILOMETERS NORTH OF NEAL ROAD AT THE SOUTHERN BOUNDARY OF THE TOYOTA PROPERTY CAMS ID 0769 USGS SITE ID 08180850 | Map	12814	1903	13	SA	SA	RT							6	6	6	6	6	
MEDINA RIVER AT CR 2615 APPROX .5 MI DOWNSTREAM OF DIVERSION DAM NEAR RIO MEDINA | Map	12824	1903	13	SA	BA	RT							6	6	6	6	6	
MEDINA RIVER AT CR 484 | Map	14200	1903	13	SA	SA	BS	2	2	2	2								BS samples will be collected along with RT events
MEDINA RIVER AT CR 484 | Map	14200	1903	13	SA	SA	RT					2		6	6	6	6	6	Metals = total and dissolved.
CITY OF SAN ANTIONIO DOS RIOS WWTP DISCHARGE INTO MEDINA RIVER PERMIT WQ0010137-033 | Map	16584	1903	13	SA	SA	RT								6	6	6	6	
MEDINA RIVER 500 METERS DOWNSTREAM OF PLEASANTON ROAD IN BEXAR COUNTY | Map	22225	1903	13	SA	SA	RT							6	6	6	6	6	
Segment 1904 Medina Lake | Map																		
MEDINA LAKE AT MEDINA LAKE DAM WEST OF SAN ANTONIO | Map	12825	1904	13	SA	BA	RT							4	4	4		4	
MEDINA LAKE NEAR RED COVE | Map	12826	1904	13	SA	BA	RT								4	4		4	
MEDINA LAKE AT MORMON BLUFF | Map	12827	1904	13	SA	BA	RT								4	4		4	
MEDINA LAKE BETWEEN CYPRESS AND SPETTEL COVES | Map	12828	1904	13	SA	BA	RT								4	4		4	
MEDINA LAKE MID LAKE NEAR HEADWATER | Map	12829	1904	13	SA	BA	RT							4	4	4		4	
Segment 1905 Medina River Above Medina Lake | Map																		
MEDINA RIVER AT OLD ENGLISH CROSSING ABOVE BANDERA FALLS | Map	12830	1905	13	SA	BA	RT								4	4	4	4	
MEDINA RIVER AT FM 470 WEST OF BANDERA | Map	12832	1905	13	SA	BA	RT								4	4	4	4	
MEDINA RIVER AT SH 173 1.9 MI UPSTREAM FROM BANDERA CREEK 5.6 MI DOWNSTREAM FROM INDIAN CREEK | Map	13638	1905	13	SA	BA	RT								4	4	4	4	

Site Description	Station ID	Waterbody ID	Region	SE	CE	MT	24 hr DO	AqHab	Benthics	Nekton	Metal Water	BOD	Chlorophyll-a/Pheophytin	Conv	Bacteria	Flow	Field	Comments
WEST PRONG MEDINA RIVER 11M UPSTREAM FROM COALKILN RD 3 KM WEST OF MEDINA AND IMMEDIATELY SOUTH OF SH337 | Map	15736	1905	13	SA	BA	RT								4	4	4	4	
MEDINA RIVER AT PATTERSON AVENUE IN MOFFETT PARK MEDINA TEXAS | Map	21125	1905	13	SA	BA	RT								4	4	4	4	
MEDINA RIVER AT NORTH SIDE OF MAYAN RANCH, WEST OF CITY OF BANDERA AND 2.16 KILOMETERS UPSTREAM OF SCHMIDTKE ROAD CROSSING | Map	21631	1905	13	SA	BA	RT							4	4	4	4	4	
MEDINA RIVER AT NORTH SIDE OF MAYAN RANCH, WEST OF CITY OF BANDERA AND 2.16 KILOMETERS UPSTREAM OF SCHMIDTKE ROAD CROSSING | Map	21631	1905	13	SA	SA	BS	2	2		2								BS samples will be collected along with RT events
NORTH PRONG MEDINA RIVER AKA WALLACE CREEK IMMEDIATELY UPSTREAM OF SH 16 | Map	18447	1905A	13	SA	BA	RT							4	4	4	4	4	
NORTH PRONG MEDINA RIVER AT FM 2107 APPROX 80 METERS NORTHEAST OF THE INTERSECTION OF BREWINGTON CREEK ROAD AND FM 2107 NORTHWEST OF MEDINA TEXAS | Map	21126	1905A	13	SA	BA	RT								4	4	4	4	
Segment 1906 Lower Leon Creek | Map																		
LEON CREEK 24 METERS DOWNSTREAM FROM APPLEWHITE ROAD IN SAN ANTONIO | Map	12835	1906	13	SA	SA	RT								6	6	6	6	For high flow events where instantaneous flow is not possible, flow information will be collected from USGS gage 08181480
LEON CREEK IMMEDIATELY UPSTREAM OF LOOP 13 SOUTH OF SAN ANTONIO | Map	12844	1906	13	SA	SA	BS			2									
LEON CREEK UPSTREAM FROM LEON CREEK WWTP AND APPROX 980 METERS UPSTREAM OF THE CONFLUENCE WITH COMANCHE CREEK | Map	14198	1906	13	SA	SA	BS	2	2		2								BS samples will be collected along with RT events

Site Description	Station ID	Waterbody ID	Region	SE	CE	MT	24 hr DO	AqHab	Benthics	Nekton	Metal Water	BOD	Chlorophyll-a/Pheophytin	Conv	Bacteria	Flow	Field	Comments
LEON CREEK UPSTREAM FROM LEON CREEK WWTP AND APPROX 980 METERS UPSTREAM OF THE CONFLUENCE WITH COMANCHE CREEK | Map	14198	1906	13	SA	SA	RT					2		6	6	6	6	6	Metals = total and dissolved.
Segment 1907 Upper Leon Creek | Map																		
LEON CREEK IN RAYMOND RUSSELL PARK AT LOW WATER BRIDGE | Map	12851	1907	13	SA	SA	RT							6	6	6	6	6	
Segment 1908 Upper Cibolo Creek | Map																		
UPPER CIBOLO CREEK NORTH SHORE 30 METERS UPSTREAM OF DAM AT RIVER ROAD PARK IN BOERNE | Map	20823	1908	13	SA	BC	RT								4	4		4	No flow possible.
Segment 1909 Medina Diversion Lake | Map																		
MEDINA RIVER DOWNSTREAM MEDINA RESERVOIR IN MICO TX AT LOW WATER CROSSING | Map	14205	1909	13	SA	BA	RT								4	4	4	4	
MEDINA DIVERSION LAKE NEAR WEST BANK 40 M UPSTREAM OF DAM AND APPROXIMATELY 1 MI UPSTREAM OF MEDINA RIVER CROSSING AT MEDINA CR 2615 | Map	18407	1909	13	SA	BA	RT							4	4	4		4	No flow possible.
Segment 1910 Salado Creek | Map																		
SALADO CREEK AT SOUTHTON ROAD IN SAN ANTONIO | Map	12861	1910	13	SA	SA	BS	2	2		2								BS samples will be collected along with RT events
SALADO CREEK AT SOUTHTON ROAD IN SAN ANTONIO | Map	12861	1910	13	SA	SA	RT							6	6	6	6	6	
SALADO CREEK AT GEMBLER RD | Map	12870	1910	13	SA	SA	BS	1	1	1	1								BS samples will be collected along with RT events
SALADO CREEK AT GEMBLER RD | Map	12870	1910	13	SA	SA	RT							6	6	6	6	6	
SALADO CREEK AT RITTIMAN ROAD IN SAN ANTONIO | Map	12874	1910	13	SA	SA	BS	2											BS samples will be collected along with RT events
SALADO CREEK AT RITTIMAN ROAD IN SAN ANTONIO | Map	12874	1910	13	SA	SA	RT							6	6	6	6	6	
SALADO CREEK AT EISENHAUER ROAD IN SAN ANTONIO | Map	12875	1910	13	SA	SA	BS	2											BS samples will be collected along with RT events

Site Description	Station ID	Waterbody ID	Region	SE	CE	MT	24 hr DO	AqHab	Benthics	Nekton	Metal Water	BOD	Chlorophyll-a/Pheophytin	Conv	Bacteria	Flow	Field	Comments
SALADO CREEK AT EISENHAUER ROAD IN SAN ANTONIO | Map	12875	1910	13	SA	SA	RT							6	6	6	6	6	
SALADO CREEK AT COMANCHE PARK | Map	14929	1910	13	SA	SA	BS	1	1	1	1								BS samples will be collected along with RT events
SALADO CREEK AT COMANCHE PARK | Map	14929	1910	13	SA	SA	RT					2		6	6	6	6	6	Metals = total and dissolved.
WALZEM CREEK AT HOLBROOK ROAD | Map	12698	1910A	13	SA	SA	RT							6	6	6	6	6	
ROSILLO CREEK AT W.W. WHITE ROAD IN SAN ANTONIO | Map	12690	1910B	13	SA	SA	RT								6	6	6	6	
MENGER CREEK IMMEDIATELY UPSTREAM OF COLISEUM ROAD | Map	12693	1910D	13	SA	SA	RT								6	6	6	6	
Segment 1911 Upper San Antonio River | Map																		
SAN ANTONIO RIVER AT SH 97 NEAR FLORESVILLE | Map	12881	1911	13	SA	SA	RT						6	6	6	52	52	52	River Recreation Bacteria Station. Flow reported from USGS gage 08183200.
SAN ANTONIO RIVER AT DIETZFIELD ROAD CR 117 NORTHWEST OF FLORESVILLE | Map	12883	1911	13	SA	SA	RT							6	6	6	6	6	Hardness titration. Flow reported from USGS 08183200 SAR at Floresville
SAN ANTONIO RIVER MID CHANNEL 30 M DOWNSTREAM OF ST LOOP 1604 WEST OF ELMENDORF RT/CONTINUOUS MONITORING SITE CAMS 715 | Map	12886	1911	13	SA	SA	RT						6	6	6	6	6	6	Flow reported from USGS gage 08181800
SAN ANTONIO RIVER AT IH 410 LOW WATER CROSSING CAMINO COAHUILATECHAN 0.25 KM BELOW THE BRIDGE IN SAN ANTONIO | Map	12897	1911	13	SA	SA	RT							6	6	52	52	52	River Recreation Bacteria Station. Flow reported from USGS gage 08178565.
SAN ANTONIO RIVER AT ALAMO ST IN SAN ANTONIO | Map	12904	1911	13	SA	SA	RT							6	6	6	6	6	
SAN ANTONIO RIVER AT WOODLAWN AVE IN SAN ANTONIO | Map	12908	1911	13	SA	SA	BS	1	1		1								BS samples will be collected along with RT events
SAN ANTONIO RIVER AT WOODLAWN AVE IN SAN ANTONIO | Map	12908	1911	13	SA	SA	RT							6	6	6	6	6	
SAN ANTONIO RIVER AT MULBERRY ST IN SAN ANTONIO | Map	12909	1911	13	SA	SA	BS	1	1		1								BS samples will be collected along with RT events
SAN ANTONIO RIVER AT MULBERRY ST IN SAN ANTONIO | Map	12909	1911	13	SA	SA	RT								6	6	6	6	

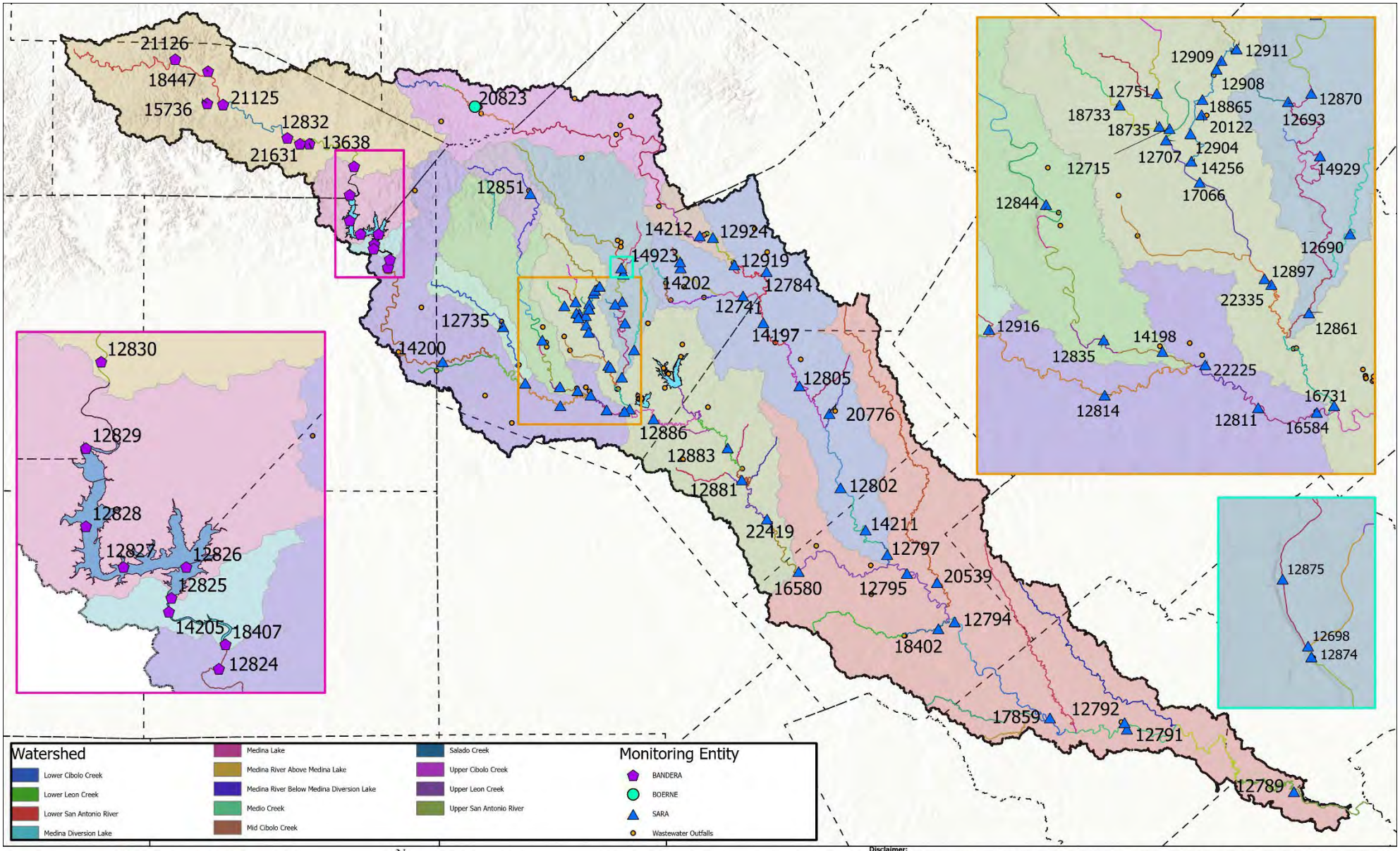
Site Description	Station ID	Waterbody ID	Region	SE	CE	MT	24 hr DO	AqHab	Benthics	Nekton	Metal Water	BOD	Chlorophyll-a/Pheophytin	Conv	Bacteria	Flow	Field	Comments
SAN ANTONIO RIVER AT WELL NO. 2 AT JOSKES PAVILLION | Map	12911	1911	13	SA	SA	RT							6	6	6	6	6	
SAN ANTONIO RIVER AT W. MITCHELL STREET IN DOWNTOWN SAN ANTONIO | Map	14256	1911	13	SA	SA	RT							6	6	52	52	52	River Recreation Bacteria Station. Flow reported from USGS gage 08178050.
SAN ANTONIO RIVER APPROX 835 METERS UPSTREAM OF THE MEDINA RIVER CONFLUENCE | Map	16731	1911	13	SA	SA	BS	2	2		2								BS samples will be collected along with RT events
SAN ANTONIO RIVER APPROX 835 METERS UPSTREAM OF THE MEDINA RIVER CONFLUENCE | Map	16731	1911	13	SA	SA	RT							6	6	6	6	6	
SAN ANTONIO RIVER AT MISSION ROAD IMMEDIATELY UPSTREAM OF RIVERSIDE MUNICIPAL GOLF COURSE 1.65 KM DOWNSTREAM OF SAN ANTONIO RIVER/SAN PEDRO CREEK CONFLUENCE IN SAN ANTONIO TX | Map	17066	1911	13	SA	SA	RT							6	6	52	52	52	River Recreation Bacteria Station. Flow reported from USGS gage 08178050 and 08178500.
SAN ANTONIO RIVER 57 METERS UPSTREAM OF LEXINGTON STREET BRIDGE AND APPROXIMATELY 1.3 KILOMETERS DOWNSTREAM OF IH 35 | Map	18865	1911	13	SA	SA	BS	1											No Flow Possible - Barge Traffic
SAN ANTONIO RIVER 57 METERS UPSTREAM OF LEXINGTON STREET BRIDGE AND APPROXIMATELY 1.3 KILOMETERS DOWNSTREAM OF IH 35 | Map	18865	1911	13	SA	SA	RT							6	6	6		6	No Flow Possible - Barge Traffic
SAN ANTONIO RIVER LOOP 111 METERS DOWNSTREAM OF MARKET STREET AT LITTLE RHEIN STEAKHOUSE IN SAN ANTONIO | Map	20122	1911	13	SA	SA	RT							6	6	6		6	No Flow Possible - Barge Traffic
SAN ANTONIO RIVER 675 METERS DOWNSTREAM OF CAMINO COAHUILTECA IN SAN ANTONIO | Map	22335	1911	13	SA	SA	BS	2	2	2	2						2	2	
SAN ANTONIO RIVER 450 METERS DOWNSTREAM OF FM541 5 KM WEST AND 3.5 KM SOUTH OF POTH | Map	22419	1911	13	SA	SA	RT							6	6	6	6	6	For high flow events where instantaneous flow is not possible, flow information will be collected from USGS gage 08183500 SAR Falls City.

Site Description	Station ID	Waterbody ID	Region	SE	CE	MT	24 hr DO	AqHab	Benthics	Nekton	Metal Water	BOD	Chlorophyll-a/Pheophytin	Conv	Bacteria	Flow	Field	Comments
ELMENDORF LAKE NEAR NORTHEAST BANK 25 M UPSTREAM OF DAM NEAR 19TH STREET BRIDGE | Map	18733	1911B	13	SA	SA	RT							6	6	6		6	No flow possible.
APACHE CREEK AT BRAZOS STREET APPROXIMATELY 0.7 KM UPSTREAM OF THE CONFLUENCE WITH ALAZAN CREEK | Map	18735	1911B	13	SA	SA	RT							6	6	6	6	6	
ALAZAN CREEK AT TAMPICO ST IN SAN ANTONIO | Map	12715	1911C	13	SA	SA	RT							6	6	6	6	6	
SAN PEDRO CREEK AT FURNISH ST IN SAN ANTONIO PERMIT 0000968 UNION STOCK YARDS | Map	12707	1911D	13	SA	SA	RT					2			6	6	6	6	Metals = total and dissolved. Flow reported from 08178500
MARTINEZ CREEK AT RUIZ STREET IN SAN ANTONIO | Map	12751	1911I	13	SA	SA	RT								6	6	6	6	
Segment 1912 Medio Creek | Map																		
MEDIO CREEK AT HIDDEN VALLEY CAMPGROUND | Map	12916	1912	13	SA	SA	BS	2	2	2	2								BS samples will be collected along with RT events
MEDIO CREEK AT HIDDEN VALLEY CAMPGROUND | Map	12916	1912	13	SA	SA	RT					2		6	6	6	6	6	Metals = total and dissolved.
MEDIO CREEK AT US 90 WEST | Map	12735	1912A	13	SA	SA	RT							6	6	6	6	6	
Segment 1913 Mid Cibolo Creek | Map																		
CIBOLO CREEK 40 METERS DOWNSTREAM FROM IH 10/US 90 ON EAST BANK | Map	12919	1913	13	SA	SA	RT							6	6	6	6	6	Flow reported from USGS gage 08185065
CIBOLO CREEK AT SCHAEFFER RD 3 MI EAST OF RANDOLPH AIR FORCE BASE | Map	12924	1913	13	SA	SA	RT							6	6	6	6	6	
CIBOLO CREEK UPSTREAM CIBOLO CREEK MUNICIPAL AUTHORITY'S WWTP PERMIT 0011269-001 OFF RIVER ROAD | Map	14212	1913	13	SA	SA	RT							6	6	6	6	6	

Appendix C: Station Location Maps

Station Location Maps

Maps of stations monitored by the San Antonio River Authority are provided below. The maps were generated by the San Antonio River Authority. 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 Austin Davis at 210-302-3221.


21126
18447
15736
21125
12832
13638
21631
20823
12851
14212
12924
14923
12919
14202
12784
12741
12735
14200
14197
12805
20776
12886
12883
12881
12802
14211
12797
22419
20539
16580
12795
12794
18402
17859
12792
12791
12789
12830
12829
12828
12827
12826
12825
14205
18407
12824
12909
12911
12908
12751
18865
12870
18733
18735
20122
12693
12904
12707
14256
14929
12715
17066
12844
12690
12897
22335
12861
12916
14198
12835
22225
16731
12814
12811
16584
12875
12698
12874
Watershed
Lower Cibolo Creek
Lower Leon Creek
Lower San Antonio River
Medina Diversion Lake
Medina Lake
Medina River Above Medina Lake
Medina River Below Medina Diversion Lake
Medio Creek
Mid Cibolo Creek
Salado Creek
Upper Cibolo Creek
Upper Leon Creek
Upper San Antonio River
Monitoring Entity
BANDERA
BOERNE
SARA
Wastewater Outfalls
N
0 5 10 20 Miles
SAN ANTONIO RIVER AUTHORITY
Disclaimer:
The GIS material included with this transmittal is made available as a public service. The maps and/or data are to be used for reference and/or informational purposes only 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. The data herein shall be used and relied upon only at the user's sole risk, and the user agrees to indemnify and hold harmless the San Antonio River Authority, its officials and employees from any liability arising out of the use of the data or information provided. If there are any questions about the appropriateness of this data, please email saragis@sara-tx.org.
Path: S:\GIS_Data\GIS_Departments\EnvironmentalServices\Field_Staff\QAPP\2023\20230522_FY24_QAPP.aprx

Appendix D: Field Data Sheets

(Most Recent Revision)

SAN ANTONIO RIVER AUTHORITY
Field Data Sheet

Check for Review by Field Staff (Initial/Date) ☐

Sample No.(s):_____ **Matrix:** ☐ NPW ☐ QC ☐Sediment

Station Id: _____-_____ **Station Location:** _____

Program Code: ☐ CRP ☐SARA_SM ☐TXDOT_Storm ☐PC ☐SAR_Loop ☐NPS_Project ☐Storm
☐Special_Request (Specify Requestor in Comments) ☐ (Please Specify)_____

Sample Type: ☐RT ☐BS ☐BF ☐AS ☐BE ☐Pollution Complaint ☐SR ☐SS (Specify in Comments) ☐ _____

Monitoring Type 2: _____ **Collection Method:** ☐ Grab **Instrument #:**_____

Submitting Entity: _____ **Collecting Entity:** _____

Collection Date:_____ **Collection Time:**_____ **End Depth:**_____

Collector(s) Signature(s): _____

# of Containers/Container Type	Type of Field Preservation	Requested Analysis	pH <2 (Y or N)[2]
_____GC - Gallon Cubitainer	☐ Ice ☐ H_2SO_4 ☐ HNO_3 ☐ Filtered		
_____QC - Quart Cubitainer	☐ Ice ☐ H_2SO_4 ☐ HNO_3 ☐ Filtered		
_____LW - Large Whirlpak	☐ Ice ☐ H_2SO_4 ☐ HNO_3 ☐ Filtered		
_____PB - Plastic Bottle	☐ Ice ☐ H_2SO_4 ☐ HNO_3 ☐ Filtered		
_____Other (Specify)_____	☐ Ice ☐ H_2SO_4 ☐ HNO_3 ☐ Filtered		
_____Other (Specify)_____	☐ Ice ☐ H_2SO_4 ☐ HNO_3 ☐ Filtered		

☐ Field Parameters ☐ Flow H_2SO_4 Reagent ID: R_____

[1]Observed/corrected temperature (ID: C01-096) [2] pH Paper R013-72-1 Sample Temperature (°C) [1]: _____/_____

Associated Required Data: ☐ Nekton ☐ Benthic ☐ Habitat ☐ 24Hr DO ☐ Metals ☐Other (Specify in Comments)

FIELD PARAMETERS **Meter:** ☐600 XLM ☐6920V2-2M ☐EXO1 ☐EXO2

Parameter	Code	Value
Dissolved Oxygen	00300	mg/L
Temperature	00010	°C
pH	00400	S.U.
CL_2	50060	mg/L
*Conductivity (temperature compensated value to 25 °C)	00094	µS/cm
Secchi Depth	00078	m
Days Since Last Precipitation Event	72053	days

FIELD OBSERVATIONS

Parameter	Code	Depth Sensor reset to 0.00 (once in collecting first sample of the day): ☐				
Flow Severity	01351	☐ 1 – No Flow ☐ 2 – Low	☐ 3 – Normal ☐ 4 – Flood	☐ 5 – High ☐ 6 - Dry		
Water Color	89969	☐ 1 – Brown ☐ 2 – Reddish	☐ 3 – Green ☐ 4 – Black	☐ 5 – Clear ☐ 6 – Other (Specify in Comments)		
Water Odor	89971	☐ 1 – Sewage ☐ 2 – Oily / Chemical	☐ 3 – H_2S ☐ 4 – Musky	☐ 5 – Fishy ☐ 6 – None	☐ 7 – Other (Specify in Comments)	
Present Weather	89966	☐ 1 – Clear ☐ 2 – Partly Cloudy	☐ 3 – Cloudy ☐ 4 – Rain			
Contact Recreation Observations	SA699	☐ 1 – Primary, Observed ☐ 2 – Secondary Observed	☐ 3 – Non-contact Observed ☐ 4 – Primary, Evidence ☐ 5 – Secondary, Evidence	☐ 6 – Non-Contact evidence ☐ 7 – No Evidence		
# of People Observed	89978		Evidence of Primary Contact Recreation	89979	☐Observed (1) ☐Not observed (0)	
Field Comments:						

CHAIN OF CUSTODY

Relinquished By:_____ Date:_____ Time:_____

Received By:_____ Date:_____ Time:_____

Relinquished By:_____ Date:_____ Time:_____

Received By:_____ Date:_____ Time:_____

Sample Comments:

Fill for Pollution Complaints Only

PC Id (PCAA#####): _____

Event: ☐ Major ☐ Minor ☐ Follow-up

Datum: ☐ WGS84 ☐ NAD83 ☐Other: _____

Latitude & Longitude in Decimal Degrees

Latitude: _____

Longitude: _____

☐ GPS Unit ☐ Map ☐Other: _____

For Special Sample Collections that are not a TCEQ Station

Latitude & Longitude in Decimal Degrees

Latitude: _____ Longitude: _____

☐ GPS Unit ☐ Map ☐Other: _____

Datum: ☐ WGS84 ☐ NAD83 ☐Other: _____

GPS signal obtained at sample location: ☐Yes ☐No

GPS signal comment: _____

Stream Discharge Measurement

Flow Method [89835]: ☐ 1 – Gage ☐ 2 – Elec ☐ 3 - Mech ☐ 4 – Weir/Flume ☐ 5 - Doppler	FLOW STREAM, INSTANTANEOUS cfs [00061]:
STREAM FLOW ESTIMATE [74069]:	

LABELS

Field, SFlow	Additional Label if applicable

P.O. Box 839980
San Antonio, TX 78283
Ph (210) 227-1373 Fax (210) 858-0265

SAN ANTONIO RIVER AUTHORITY
SAMPLING DATA SHEET
Biological Meta Data

Sample No:_____ **Tag Id:**_____ **Matrix:** ☒ NPW

Station Id: _____-_____ **Station Location:** _____

Program Code: ☐CRP ☐Other (Specify): **Sample Type:** ☐ RT ☐ BS ☐Other (Specify)

Collection Method: ☐ Composite

Start Date:_____ **Start Time:**_____ **Start Depth:**_____ **Category:** B **Type:** CN

End Date:_____ **End Time:**_____ **End Depth:**_____

Collector(s) Signature(s):_____

Vouchers Specimens: # of Containers: ____ **Type of Field Preservation:** ☐Ethanol ☐ Formalin ☐ Other: _____

Associated Data (Sample #'s): ☐Seining Sample #: _____ ☐Electrofishing Sample #: _____

COMMENTS:_____

CHAIN OF CUSTODY

Relinquished by:_____ Date:_____ Time:_____

Received by:_____ Date:_____ Time:_____

LABEL

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Station Id:_____ Start Date:_____ Sample No._____ Tag Id:_____

Parameter	Calculation	Result
Biological Data Code [89888]	Not Applicable	1011
Total Number Electrofishing [98040] #		
Total Number Seining [98039] #		
Total Number of Individuals [98023] #		
Nekton None Captured [98005] #	[illegible]	
Number of Diseased Fish [SA909] #		
Number of Hybrids [SA908] #		
Number of Non-Native Species [SA929] #		
Percent Non –Native Individuals [98033]%		
Total Benthic Invertivore Species, fish [98052] #		
Individuals / Minute Electroshocking [98069] #		
Individuals / Seine Haul [98062] #		
Tolerant Individuals (excluding Western Mosquito fish) [98070] %		
Total Native Cyprinid Species [98032] #		
Total number of fish species [98003] #		
Number of darter species [98004] #		
Number of sunfish species* [98008] #		
Number of sucker species [98009] #		
Number of intolerant species [98010] #		
Proportion of cichlid species [SA926] % (calculated for cichlid individuals collected)		
Proportion of omnivores [98017] %		
Proportion of invertivore [98021] %		
Proportion of Piscivore [98022] %		
Proportion of hybrids [98024] %		
Proportion of diseased fish [98030] %		
Proportion of tolerant individuals [98016] %		
Total number of benthic fish species [98053]		
Nekton Texas Regional IBI Score [98123]		
Segment Index of Biotic Integrity (IBI) [SA599]		
Ecoregion [89961]		
Basin Size (drainage area for this sample site)km^2		

*Except bass

***Note Attach appropriate segment IBI Worksheet and TCEQ Ecoregion IBI worksheet**

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Station Id:_____ Start Date:_____ Sample No._____ Tag Id:_____

SAN ANTONIO RIVER AUTHORITY
Part 1 Stream Physical Characteristics Worksheet

Sample No:_____ Tag Id:_____ Matrix: ☐ Habitat

Station Id: _____-_____ Station Location: _____

Program Code: ☐ CRP ☐ SARA_SM ☐ TXDOT_Storm ☐ PC ☐ National Parks Service ☐ Other (Specify) _____

Sample Type: ☐ BS ☐ BE ☐ BF ☐ RT ☐ Pollution Complaint ☐ SS ☐ Other (Specify): _____

Collection Method: ☐ Composite

Start Date:		**Start Time:**		**Start Depth:**		**Category:**	B
End Date:		**End Time:**		**End Depth:**		**Type:**	CN

Collector(s) Signature(s):_____

# of Containers/Container Type: ☒ NA – Not Applicable Type of Field Preservation: ☒ NA – Not Applicable

COMMENTS:_____

CHAIN OF CUSTODY

Relinquished by:_____ Date:_____ Time:_____

Received by:_____ Date:_____ Time:_____

Relinquished by:_____ Date:_____ Time:_____

Received by:_____ Date:_____ Time:_____

Station Id:_____ Start Date:_____ Sample No._____ Tag Id:_____

Observed Stream Uses: _____ Stream Segment Number: _____

Channel Obstructions/Modifications: _____

Stream Type [89821] 1)Perennial 2)Intermittent w/Perennial Pools 3)Intermittent 4)unknown]: _____

Biological Data Code [89888]: 3011

Riparian Vegetation (%)					
	Tree	Shrubs	Grasses, forbs	Cultivated Fields	Other
Left Bank:	[89822]	[89824]	[89826]	[89828]	[89830]
Right Bank:	[89823]	[89825]	[89827]	[89829]	[89871]

Parameter	Code	Value
Maximum pool width	89864	m
Maximum pool depth	89865	m
Pool length	89869	m
Depth of bottom of waterbody at sample point	82903	m
Total stream bends	89839	#
Well-defined stream bends	89840	#
Habitat flow status: 1 – no flow; 2 – low; 3 – moderate; 4 – high	89848	
Moderately defined stream bends	89841	#
Poorly defined stream bends	89842	#
Riffles	89843	#
Aesthetics: 1 – wilderness; 2 – natural; 3 – common; 4 – offensive	89867	
Land development impact: 1 – unimpacted; 2 – low; 3 – moderate; 4 – high	89982	
Number of stream cover types	89929	#

Station Id:_____ Start Date:_____ Sample No._____ Tag Id:_____

Location of Transect: Latitude: Longitude:

Left Bank Slope (°)	Left Bank Erosion Potential (%)	Instream Cover (%)	Percent Gravel Or Larger: >2mm	Macrophytes	Algae	Habitat Type	Right Bank Slope (°)	Right Bank Erosion Potential (%)	Tree Canopy (%) Total:	
				☐Abundant ☐Common ☐Rare ☐Absent	☐Abundant ☐Common ☐Rare ☐Absent	☐Riffle ☐Run ☐Glide ☐Pool			CL	/17
									CR	/17
									LB	/17
									RB	/17

Instream Cover Types:
Undercut Banks ☐ Boulders ☐
Gravel ☐ Ledges ☐
Macrophytes ☐ Tree Roots ☐
Woody Debris ☐ Litter ☐
Overhanging Vegetation ☐
Other☐: _____

☐ RES ☐ LES _____m Increments

Thalweg Depth: _____m Stream Width: _____m

Dominant Substrate Type
☐Mud silt: < 0.06mm
☐Sand 0.06-2mm
☐Gravel > 2-60mm
☐Cobble > 6-25cm
☐Boulders >25-45cm
☐Lg Boulders >45cm
☐Bedrock

Dominant Types Riparian Vegetation: (%)
Left Bank: Grasses, Forbs _____ Trees _____ Shrubs _____ Cult. fields_____ Other:_____
Right Bank: Grasses, Forbs _____ Trees _____ Shrubs _____ Cult. fields_____ Other:_____

Width of Natural Buffer Vegetation:
Left Bank: _____m
Right Bank:_____m

Location of Transect: Latitude: Longitude:

Left Bank Slope (°)	Left Bank Erosion Potential (%)	Instream Cover (%)	Percent Gravel Or Larger: >2mm	Macrophytes	Algae	Habitat Type	Right Bank Slope (°)	Right Bank Erosion Potential (%)	Tree Canopy (%) Total:	
				☐Abundant ☐Common ☐Rare ☐Absent	☐Abundant ☐Common ☐Rare ☐Absent	☐Riffle ☐Run ☐Glide ☐Pool			CL	/17
									CR	/17
									LB	/17
									RB	/17

Instream Cover Types:
Undercut Banks ☐ Boulders ☐
Gravel ☐ Ledges ☐
Macrophytes ☐ Tree Roots ☐
Woody Debris ☐ Litter ☐
Overhanging Vegetation ☐
Other☐: _____

☐ RES ☐ LES _____m Increments

Thalweg Depth: _____m Stream Width: _____m

Dominant Substrate Type
☐Mud silt: < 0.06mm
☐Sand 0.06-2mm
☐Gravel > 2-60mm
☐Cobble > 6-25cm
☐Boulders >25-45cm
☐Lg Boulders >45cm
☐Bedrock

Dominant Types Riparian Vegetation: (%)
Left Bank: Grasses, Forbs _____ Trees _____ Shrubs _____ Cult. fields_____ Other:_____
Right Bank: Grasses, Forbs _____ Trees _____ Shrubs _____ Cult. fields_____ Other:_____

Width of Natural Buffer Vegetation:
Left Bank: _____m
Right Bank:_____m

Station Id:_____ Start Date:_____ Sample No:_____ Tag Id:_____

Location of Transect:			Latitude:				Longitude:			
Left Bank Slope (°)	Left Bank Erosion Potential (%)	Instream Cover (%)	Percent Gravel Or Larger: >2mm	Macrophytes ☐Abundant ☐Common ☐Rare ☐Absent	Algae ☐Abundant ☐Common ☐Rare ☐Absent	Habitat Type ☐Riffle ☐Run ☐Glide ☐Pool	Right Bank Slope (°)	Right Bank Erosion Potential (%)	Tree Canopy (%) Total:	
									CL	/17
									CR	/17
									LB	/17
									RB	/17

Instream Cover Types:
Undercut Banks ☐ Boulders ☐
Gravel ☐ Ledges ☐
Macrophytes ☐ Tree Roots ☐
Woody Debris ☐ Litter ☐
Overhanging Vegetation ☐
Other☐: _____

☐ RES ☐ LES _____m increments

Thalweg Depth: _____m Stream Width: _____m

Dominant Substrate Type
☐Mud silt < 0.06mm
☐Sand 0.06-2mm
☐Gravel > 2-60mm
☐Cobble > 6-25cm
☐Boulders >25-45cm
☐Lg Boulders >45cm
☐Bedrock:

Dominant Types Riparian Vegetation: (%)
Left Bank: Grasses, Forbs _____ Trees _____ Shrubs _____ Cult. fields_____ Other:_____
Right Bank: Grasses, Forbs _____ Trees _____ Shrubs _____ Cult. fields_____ Other:_____

Width of Natural Buffer Vegetation:
Left Bank: _____m
Right Bank:_____m

Location of Transect:			Latitude:				Longitude:			
Left Bank Slope (°)	Left Bank Erosion Potential (%)	Instream Cover (%)	Percent Gravel Or Larger: >2mm	Macrophytes ☐Abundant ☐Common ☐Rare ☐Absent	Algae ☐Abundant ☐Common ☐Rare ☐Absent	Habitat Type ☐Riffle ☐Run ☐Glide ☐Pool	Right Bank Slope (°)	Right Bank Erosion Potential (%)	Tree Canopy (%) Total:	
									CL	/17
									CR	/17
									LB	/17
									RB	/17

Instream Cover Types:
Undercut Banks ☐ Boulders ☐
Gravel ☐ Ledges ☐
Macrophytes ☐ Tree Roots ☐
Woody Debris ☐ Litter ☐
Overhanging Vegetation ☐
Other☐: _____

☐ RES ☐ LES _____m increments

Thalweg Depth: _____m Stream Width: _____m

Dominant Substrate Type
☐Mud silt < 0.06mm
☐Sand 0.06-2mm
☐Gravel > 2-60mm
☐Cobble > 6-25cm
☐Boulders >25-45cm
☐Lg Boulders >45cm
☐Bedrock:

Dominant Types Riparian Vegetation: (%)
Left Bank: Grasses, Forbs _____ Trees _____ Shrubs _____ Cult. fields_____ Other:_____
Right Bank: Grasses, Forbs _____ Trees _____ Shrubs _____ Cult. fields_____ Other:_____

Width of Natural Buffer Vegetation:
Left Bank: _____m
Right Bank:_____m

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Station Id:_____ Start Date:_____ Sample No:_____ Tag Id:_____

Location of Transect:			Latitude:				Longitude:			
Left Bank Slope (°)	Left Bank Erosion Potential (%)	Instream Cover (%)	Percent Gravel Or Larger: >2mm	Macrophytes ☐Abundant ☐Common ☐Rare ☐Absent	Algae ☐Abundant ☐Common ☐Rare ☐Absent	Habitat Type ☐Riffle ☐Run ☐Glide ☐Pool	Right Bank Slope (°)	Right Bank Erosion Potential (%)	Tree Canopy (%) Total:	
									CL	/17
									CR	/17
									LB	/17
									RB	/17

Instream Cover Types:
Undercut Banks ☐ Boulders ☐
Gravel ☐ Ledges ☐
Macrophytes ☐ Tree Roots ☐
Woody Debris ☐ Litter ☐
Overhanging Vegetation ☐
Other☐: _____

☐ RES ☐ LES _____m increments

Thalweg Depth: _____m Stream Width: _____m

Dominant Substrate Type
☐Mud silt < 0.06mm
☐Sand 0.06-2mm
☐Gravel > 2-60mm
☐Cobble > 6-25cm
☐Boulders >25-45cm
☐Lg Boulders >45cm
☐Bedrock:

Dominant Types Riparian Vegetation: (%)
Left Bank: Grasses, Forbs _____ Trees _____ Shrubs _____ Cult. fields_____ Other:_____
Right Bank: Grasses, Forbs _____ Trees _____ Shrubs _____ Cult. fields_____ Other:_____

Width of Natural Buffer Vegetation:
Left Bank: _____m
Right Bank:_____m

Location of Transect:			Latitude:				Longitude:			
Left Bank Slope (°)	Left Bank Erosion Potential (%)	Instream Cover (%)	Percent Gravel Or Larger: >2mm	Macrophytes ☐Abundant ☐Common ☐Rare ☐Absent	Algae ☐Abundant ☐Common ☐Rare ☐Absent	Habitat Type ☐Riffle ☐Run ☐Glide ☐Pool	Right Bank Slope (°)	Right Bank Erosion Potential (%)	Tree Canopy (%) Total:	
									CL	/17
									CR	/17
									LB	/17
									RB	/17

Instream Cover Types:
Undercut Banks ☐ Boulders ☐
Gravel ☐ Ledges ☐
Macrophytes ☐ Tree Roots ☐
Woody Debris ☐ Litter ☐
Overhanging Vegetation ☐
Other☐: _____

☐ RES ☐ LES _____m increments

Thalweg Depth: _____m Stream Width: _____m

Dominant Substrate Type
☐Mud silt < 0.06mm
☐Sand 0.06-2mm
☐Gravel > 2-60mm
☐Cobble > 6-25cm
☐Boulders >25-45cm
☐Lg Boulders >45cm
☐Bedrock:

Dominant Types Riparian Vegetation: (%)
Left Bank: Grasses, Forbs _____ Trees _____ Shrubs _____ Cult. fields_____ Other:_____
Right Bank: Grasses, Forbs _____ Trees _____ Shrubs _____ Cult. fields_____ Other:_____

Width of Natural Buffer Vegetation:
Left Bank: _____m
Right Bank:_____m

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Station Id:_____ Start Date:_____ Sample No._____ Tag Id:_____

SAN ANTONIO RIVER AUTHORITY
PART II SUMMARY OF PHYSICAL CHARACTERISTICS OF WATERBODY

PHYSICAL HABITAT		
Parameter	Code	Value
Streambed slope over evaluated reach	72051	M/KM
Approximate drainage area	89859	km^2
Reach Length of stream evaluated	89884	M
Lateral transects made	89832	#
Average stream width	89861	M
Average stream depth	89862	M
Average percent of substrate gravel > 2mm	89845	%
Dominant substrate: 1 – clay; 2 – silt; 3 – sand; 4 – gravel; 5 – cobble; 6 – boulder; 7 – bedrock; 8 – other	89844	
Average percent stream bank erosion	89846	%
Average stream bank slope	89847	degrees
Average instream cover	84159	%
AVERAGE WIDTH OF NATURAL RIPARIAN BUFFER ON LEFT BANK	89872	M
AVERAGE WIDTH OF NATURAL RIPARIAN BUFFER ON RIGHT BANK (M)	89873	M
Average width natural riparian vegetation	89866	M
Average percent trees as riparian vegetation	84849	%
Average percent shrubs as riparian vegetation	89850	%
Average percent grasses and forbs as riparian vegetation	89851	%
Average percent cultivated fields as riparian vegetation	89852	%
Average percent other as riparian vegetation	89853	%
Average percent tree canopy coverage	89854	%
Stream order	84161	
Texas Ecoregion Code	89961	#

Station Id:_____ Start Date:_____ Sample No._____ Tag Id:_____

SAN ANTONIO RIVER AUTHORITY
Part III Habitat Quality Index

Habitat Parameter	Scoring Category			
Available Instream Cover [89874]	**Abundant** >50% of substrate favorable for colonization and fish cover; good mix of several stable (not new fall or transient) cover types such as snags, cobble, undercut, banks, macrophytes	**Common** 30 – 50% of substrate supports stable habitat; adequate habitat for maintenance of populations; may be limited in the number of different habitat types	**Rare** 10 – 29.9% of substrate supports stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed	**Absent** < 10% of substrate supports stable habitat; lack of habitat is obvious; substrate unstable or lacking
Score: _____	4	3	2	1
Bottom Substrate Stability [89875]	**Stable** > 50% gravel or larger substrate, i.e., gravel, cobble, boulders; dominant substrate type is gravel or larger	**Moderately Stable** 30 – 50% gravel or larger substrate; dominant substrate type is mix of gravel with some finer sediments	**Moderately Unstable** 10 – 29.9% gravel or larger substrate; dominant substrate type is finer than gravel, but may still be a mix of sizes	**Unstable** < 10% gravel or larger substrate; substrate is uniform sand, silt, clay or bedrock
Score: _____	4	3	2	1
Number of Riffles To be counted, riffles must extend > 50% the width of the channel and be at least as long as the channel width **[89876]**	**Abundant** ≥ 5 riffles	**Common** 2 – 4 riffles	**Rare** 1 riffle	**Absent** No riffles
Score: _____	4	3	2	1
Dimensions of Largest Pool [89877]	**Large** Pool covers more than 50% of the channel width; maximum depth is > 1 meter	**Moderate** Pool cover approximately 50% or slightly less of the channel width; maximum depth 0.5 – 1 meter	**Small** Pool covers approximately 25% of the channel width; maximum depth is < 0.5 meter	**Absent** No existing pools; only shallow auxiliary pockets
Score: _____	4	3	2	1
Channel Flow Status [89878]	**High** Water reaches the base of both lower banks; < 5% of channel substrate is exposed	**Moderately** Water fills > 75% of the channel; or < 25% of channel substrate is exposed	**Low** Water fills 25 – 75% of the available channel and/or riffle substrates are mostly exposed	**No flow** Very little water in the channel and mostly present in standing pools or stream is dry
Score: _____	3	2	1	0
Bank Stability [89879]	**Stable** Little evidence (< 10%) of erosion or bank failure; bank angles average < 30°	**Moderately Stable** Some evidence (10 – 29.9%) of erosion or bank failure; small areas of erosion mostly healed over; bank angles average 30 – 39.9°	**Moderately Unstable** Evidence or erosion or bank failure is common (30 – 50%); high potential of erosion during flooding; bank angles average 40 - 60°	**Unstable** Large and frequent evidence (> 50%) of erosion or bank failure; raw areas frequent along steep banks; bank angles average > 60°
Score: _____	3	2	1	0

Station Id:_____ Start Date:_____ Sample No._____ Tag Id:_____

Habitat Parameter	Scoring Category			
Channel Sinuosity [89880]	**High** ≥ 2 well-defined bends with deep outside areas (cut banks) and shallow inside areas (point bars) present	**Moderate** 1 well-defined bend Or ≥ 3 moderately-defined bends present	**Low** < 3 moderately-defined bends Or Only poorly-defined bends present	**None** Straight channel; may be channelized
Score: _____	**3**	**2**	**1**	**0**
Riparian Buffer Vegetation [89881]	**Extensive** Width of natural buffer is > 20 meters	**Wide** Width of natural buffer is 10.1 – 20 meters	**Moderate** Width of natural buffer is 5 – 10 meters	**Narrow** Width of natural buffer is < 5 meters
Score: _____	**3**	**2**	**1**	**0**
Aesthetics of Reach [89882]	**Wilderness** Outstanding natural beauty; usually wooded or unpastured area; water clarity is usually exceptional	**Natural Area** Trees and/or native vegetation are common; some development evident (from fields, pastures, dwellings); water clarity may be slightly turbid	**Common Setting** Not offensive; area is developed, but uncluttered such as in an urban park; water clarity may be turbid or discolored	**Offensive** Stream does not enhance the aesthetics of the area; cluttered; highly developed; may be a dumping area; water clarity is usually turbid or discolored
Score: _____	**3**	**2**	**1**	**0**
TOTAL SCORE [89883]:_____				

Station Id:_____ Start Date:_____ Sample No._____ Tag Id:_____

SAN ANTONIO RIVER AUTHORITY
PART II SUMMARY OF PHYSICAL CHARACTERISTICS OF WATERBODY

PHYSICAL HABITAT		
Parameter	Code	Value
Streambed slope over evaluated reach	72051	M/KM
Approximate drainage area	89859	km^2
Reach Length of stream evaluated	89884	M
Lateral transects made	89832	#
Average stream width	89861	M
Average stream depth	89862	M
Average percent of substrate gravel > 2mm	89845	%
Dominant substrate: 1 – clay; 2 – silt; 3 – sand; 4 – gravel; 5 – cobble; 6 – boulder; 7 – bedrock; 8 – other	89844	
Average percent stream bank erosion	89846	%
Average stream bank slope	89847	degrees
Average instream cover	84159	%
AVERAGE WIDTH OF NATURAL RIPARIAN BUFFER ON LEFT BANK	89872	M
AVERAGE WIDTH OF NATURAL RIPARIAN BUFFER ON RIGHT BANK (M)	89873	M
Average width natural riparian vegetation	89866	M
Average percent trees as riparian vegetation	84849	%
Average percent shrubs as riparian vegetation	89850	%
Average percent grasses and forbs as riparian vegetation	89851	%
Average percent cultivated fields as riparian vegetation	89852	%
Average percent other as riparian vegetation	89853	%
Average percent tree canopy coverage	89854	%
Stream order	84161	
Texas Ecoregion Code	89961	#

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SAN ANTONIO RIVER AUTHORITY
Benthic Worksheet Protocol

Sample No:_____ **Tag Id:**_____ **Matrix:** ☒ Non Potable Water

Station Id: _____-_____ **Station Location:**_____

Program Code: ☐ CRP ☐ SARA_SM ☐ TXDOT_Storm ☐ PC ☐ National Parks Service ☐ Other (Specify): _____

Sample Type: ☐ BS ☐ BE ☐ BF ☐ RT ☐ Pollution Complaint ☐ SS ☐ Other (Specify): _____

Collection Method: ☒ Composite

Start Date:_____ **Start Time:**_____ **Start Depth:**_____ **Category:** B **Type:** CN

End Date:_____ **End Time:**_____ **End Depth:**_____

Collector(s) Signature(s):_____

# of Sub-Samples: _____ **Type of Field Preservation:** ☐ Alcohol

---

Biological Data Code [89888]: 2011

Duration of Collection [89904]: 5 min Area Kicked (0.46 m x Kick Dist.) [89903]:_____ m^2

Biological Reporting Units [89899]:_____ (1=NUMBER OF INDIVIDUALS IN SUB-SAMPLE, 2=NUMBER OF INDIVIDUALS/FT2, 3=NUMBER OF INDIVIDUALS/M2, 4=TOTAL NUMBER OF INDIVIDUALS IN SAMPLE)

Benthic Sampler [89950]: 3 (kicknet)

Mesh Size-Avg Bar [89946]: 0.13 cm Macrophyte bed [89926]:_____ %

Gravel Substrate [89923]:_____ % Snags and brush [89927]:_____ %

Sand Substrate [89924]:_____ % Bedrock [89928]:_____ %

Soft bottom [89925]:_____ % Benthic Kick Net Dist [SA925]:_____ m

---

COMMENTS:_____

CHAIN OF CUSTODY

Relinquished by:_____ Date:_____ Time:_____

Received by:_____ Date:_____ Time:_____

Station Id:_______________ **Sample No.**_______________ **Biologist Processing Sample:**________________________

ORDER	FAMILY	GENUS	SPECIES	Non-Insect TAXA	STORET CODE	NUMBER INDIVIDUALS (A)	TOLERANCE VALUE (B)	FEEDING GROUP	A X B (C)	C/D (E)
				☐						
				☐						
				☐						
				☐						
				☐						
				☐						
				☐						
				☐						
				☐						
				☐						
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				☐						
				☐						
				☐						
				☐						
				☐						
				☐						
				☐						
				☐						
				☐						
				☐						
				☐						
		Total Number of Individuals (D) [89906]						**Biotic Index (∑ E)** [90007]		

Functional Groups: SCR – scrapper; CG – collector gatherer; FC – filtering collector; P – predator; SHR – shredder

[Reference EXCEL Sheet and attach print out]

F114_Rev09 Effective Date: 01/01/2015 Page 2 of 2

Check for Review by Field Staff
(Initial/Date) ☐
_____

SAN ANTONIO RIVER AUTHORITY
24 Hour Composite Field Sheet
(15 Minute Increments)

Sample No.(s):_____ **Tag Id:**_____ **Matrix:** ☐NPW

Station Id: (_____-_____) **Station Location:** _____

Program Code: ☐ CRP ☐SARA_SM ☐TXDOT_Storm ☐PC ☐National Parks Service ☐Other (Specify) _____

Sample Type: ☐ BS ☐ BE ☐BF ☐RT ☐Pollution Complaint ☐SS ☐Other (Specify): _____

Monitoring Type 2: _____ **Collection Method:** ☒Composite

Submitting Entity: _____ **Collecting Entity:** _____

Start Date:_____ **Start Time:**_____ **Start Depth:**_____ **Category:** T **Type:** 97

End Date:_____ **End Time:**_____ **End Depth:**_____

Collector(s) Signature(s):_____

# of Containers/Container Type: NA – Not Applicable

Field Use Only		
Flow Performed at Deployment: ☐	**Flow performed at Retrieval:** ☐	**Flow Sample #:** _____
Electrofishing Sample #:_____	**Seining Sample #:** _____	**Metadata Sample #:** _____
Habitat Sample #: _____	**Benthic Sample #:** _____	
Meter: ☐EXO1 ☐EXO2		

Instrument #:	Instrument Calibration Date: Signature:	Post Calibration Date: Signature:

Date / Time Deployed	Deployed by Signature(s)	Date / Time Retrieved	Retrieved By Signature(s)

FIELD PARAMETERS – 24 Hour

Parameter	Code	Value	Parameter	Code	Value
Maximum Dissolved Oxygen	89856	mg/L	Maximum Conductivity	00213	µS/cm
Mean Dissolved Oxygen	89857	mg/L	Mean Conductivity	00212	µS/cm
Minimum Dissolved Oxygen	89855	mg/L	Minimum Conductivity	00214	µS/cm
Dissolved Oxygen Measurements	89858	#	Conductivity Measurements	00222	#
Maximum Temperature	00210	°C	Maximum pH	00215	S.U.
Mean Temperature	00209	°C	Minimum pH	00216	S.U.
Minimum Temperature	00211	°C	Measurements pH	00223	#
Temperature Measurements	00221	#			

COMMENTS: _____

_____

_____

_____

F116_Rev08 Issued By SARA QA: JH; Effective Date: 1/10/2020 Page 1 of 2

CHAIN OF CUSTODY

Relinquished By:_____ Date:_____ Time:_____

Received By:_____ Date:_____ Time:_____

Relinquished By:_____ Date:_____ Time:_____

Received By:_____ Date:_____ Time:_____

LABELS

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SAN ANTONIO RIVER AUTHORITY
FISH COMMUNITY
IDENTIFICATION SHEET

Sample No:_____ **Tag Id:**_____ **Matrix:** ☐ NPW

Station Id: _____-_____ **Station Location:** _____

Program Code: ☐ CRP ☐ SARA_SM ☐ TXDOT_Storm ☐ PC ☐ National Parks Service ☐ Other (Specify): ____

Sample Type: ☐ BS ☐ BE ☐ BF ☐ RT ☐ Pollution Complaint ☐ SS ☐ Other (Specify): ____

Collection Method: ☐ Composite

Start Date:_____ **Start Time:**_____ **Start Depth:**_____ **Category:** B **Type:** CN

End Date:_____ **End Time:**_____ **End Depth:**_____

Collector(s) Signature(s):_____

Biological Data Code [89888]	☐ **Electrofishing (1012)**		
Electrofishing Method [89943]	☐ 1 – Boat ☐ 2 – Backpack ☐ 3 – Tote barge	# Of Mesohabitats Sampled:	#
		Shocking Duration: [89944]	s
Nekton Organisms None Present by this method if specimens are found enter Not Recorded [98005]:			

Biological Data Code [89888]	☐ **Seining (1013)**		
Net Length [89941]	m	Seining Hauls [89947]	#
Min Mesh Size [89930]	in	Total Length of Hauls [89948] Minimum of 60 meters required, if less note in comment	m
Max Mesh Size [89931]	in	Area Seined [89976]	m^2
Seining Duration [89949]	min	Seining Distance [SA927]	m
Nekton Organisms None Present by this method if specimens are found enter Not Recorded [98005]:			

Associated Data (Sample #'s): ☐ Fish Community Metadata: _____ ☐ Seining Sample #: _____
☐ Electrofishing Sample #: _____

COMMENTS:_____

CHAIN OF CUSTODY

Relinquished by:_____ Date:_____ Time:_____

Received by:_____ Date:_____ Time:_____

LABEL

F172_Rev08 Effective Date: 09/24/2015 Page 1 of 4

Station Id:_____ Start Date:_____ Sample No._____ Tag Id:_____

FAMILY COMMON NAME (Tolerance) - (Trophic Level)	CODE	NUMBER COLLECTED	TOTAL AMOUNT
Lepisosteidae			
Alligator gar (T) – (P)	98344		
Spotted gar (T) – (P)	98340		
Longnose gar (T) – (P)	98341		
Clupeidae			
Threadfin shad (IM) – (O)	98429		
Gizzard shad (T) – (O)	98430		
Characidae			
Mexican tetra (IM) – (IF)	98435		
Cyprinidae			
*Common carp (T) – (O)	98437		
Golden shiner (T) – (IF)	98441		
Speckled chub (IM) – (IF)	98449		
Burrhead chub (IM) – (IF)	98609		
Texas shiner (IM) – (IF)	98459		
Weed shiner (IM) – (IF)	98485		
Pallid shiner (IM) – (IF)	98460		
Blacktail shiner (IM) – (IF)	98487		
Red shiner (T) – (IF)	98474		
Mimic shiner (I) – (IF)	98488		
Ghost shiner (IM) – (IF)	98467		
Sand shiner (IM) – (IF)	98484		
Bullhead minnow (IM) – (IF)	98498		
Fathead minnow (T) – (O)	98497		
Bluntnose minnow (T) – (O)	98499		
Central stoneroller (IM) – (H)	98502		
Catostomidae			
River carpsucker (T) – (O)	98511		
Grey redhorse (IM) – (IF)	98513		
Blacktail redhorse (IM) – (IF)	98515		
Lake chubsucker (IM) – (O)	98520		
Smallmouth Buffalo (IM) – (O)	98507		

Station Id:_____ Start Date:_____ Sample No._____ Tag Id:_____

FAMILY COMMON NAME (Tolerance) - (Trophic Level)	CODE	NUMBER COLLECTED	TOTAL AMOUNT
Ictaluridae			
Channel catfish (T) – (O)	98561		
Blue catfish (IM) – (P)	98562		
Black bullhead (T) – (O)	98563		
Yellow bullhead (IM) – (O)	98564		
Flathead catfish (IM) – (P)	98570		
Freckled madtom (I) – (IF)	98575		
Tadpole madtom (I) – (IF)	98574		
Anguillidae			
American eel (IM) – (P)	98361		
Cyprinodontidae			
Blackstripe topminow (IM) – (IF)	98677		
Poeciliidae			
Western Mosquitofish (T) – (IF)	98713		
Sailfin molly (T) – (O)	98724		
Amazon molly (IM) – (O)	98725		
*Green swordtail (I) – (IF)	98743		
Atherinopsidae			
Inland silversides (IM) – (IF)	98728		
Centrarchidae			
White bass (IM) – (P)	99163		
Spotted bass (IM) – (P)	99089		
Largemouth bass (IM) – (P)	99090		
Guadalupe bass (I) – (P)	99086		
Smallmouth bass (I) – (P)	99091		
Warmouth (T) – (P)	99095		
Green sunfish (T) – (P)	99094		
Redspotted sunfish (IM) – (IF)	99101		
Redear sunfish (IM) – (IF)	99100		
Bluegill sunfish (T) – (IF)	99097		
*Orangespotted Sunfish (IM) – (IF)	99096		

Station Id:_____ Start Date:_____ Sample No._____ Tag Id:_____

FAMILY COMMON NAME (Tolerance) - (Trophic Level)	CODE	NUMBER COLLECTED	TOTAL AMOUNT
Centrarchidae			
*Redbreast sunfish (IM) – (IF)	99093		
Longear sunfish (IM) – (IF)	99099		
White crappie (IM) – (P)	99108		
Percidae			
Texas logperch (I) – (IF)	99060		
River darter (IM) – (IF)	99168		
Logperch (I) – (IF)	99068		
Bigscale logperch (I) – (IF)	99069		
Slough darter (IM) – (IF)	99078		
Orangethroat darter (IM) – (IF)	99085		
Greenthroat darter (I) – (IF)	99081		
Cichlidae			
Rio Grande cichlid (IM) – (IF)	98953		
*Mozambique tilapia (IM) – (O)	98565		
*Blue tilapia (T) – (O)	98583		
*Red belly tilapia (IM) – (O)	98584		
Loricariidae			
*Suckermouth catfish (T) – (H)	98553		
*Sailfin catfish (T) – (H)	98749		
**Pterygoplichthys* sp. (T) – (H)	98748		
		Total Individuals Collected:	

*Non-Native Species

Trophic Level: (P) – Piscivore (H) – Herbivore (O) – Omnivore (IF) – Invertivore **Tolerance:** (I) – Intolerant (T) – Tolerant (IM) – Intermediate

SAN ANTONIO RIVER AUTHORITY
Biological Sampling Chain-of-Custody

Review by Field Staff (Initial/Date)

Collector(s) Signature(s):_____

Biological Data Code (89888)	Tag ID	Sample #	Station ID	Date	Time	Depth	Program Code	Sample Type	Matrix	Category	Type	Collection Method	
1012 Fish Community **Electrofishing**				Start: End:	Start: End:	Start: End:			NPW	B	CN	Composite	
		Field Comments:											
1013 Fish Community **Seining**				Start: End:	Start: End:	Start: End:			NPW	B	CN	Composite	
		Field Comments:											
1011 Biological **Metadata**				Start: End:	Start: End:	Start: End:			NPW	B	CN	Composite	**Voucher Specimens:** # of Containers: _____ Preservation: ☐ Ethanol ☐ Formalin ☐ Other
		Field Comments:											
2011 **Benthic** Worksheet				Start: End:	Start: End:	Start: End:			NPW	B	CN	Composite	# of Subsamples ___ Preservation Method ☐ Alcohol
		Field Comments:											
3011 Stream Physical **Habitat**				Start: End:	Start: End:	Start: End:			Habitat	B	CN	Composite	# of Containers N/A Preservation Method ☒ N/A
		Field Comments:											

COC Comments (Applies to ALL samples on page):
Monitoring Type 2:

F301_Rev03 Issued By SARA QA: JH; Effective: 1/10/2020 Page 1 of 2

CHAIN OF CUSTODY

Relinquished by: _____ Date: _____ Time: _____

Received by: _____ Date: _____ Time: _____

Relinquished by: _____ Date: _____ Time: _____

Received by: _____ Date: _____ Time: _____

Bandera River Authority and Groundwater District
Field Data Sheet

Sample No.(s):_____ **Tag Id:**_____ **Matrix:** ☐ NPW ☐ QC

Station Id: _____-_____ **Station Location:** _____

Program Code: ☐ CRP ☐ (Please Specify) _____

Sample Type: ☐RT ☐BS ☐BF ☐AS ☐BE ☐SR ☐SS (Specify in Comments) ☐ _____

Collection Method: ☐ Grab **Instrument #:** _____

Submitting Entity: SA **Collecting Entity:** BA

Collection Date:_____ **Collection Time:**_____ **End Depth:**_____

Collector(s) Signature(s): _____

# of Containers/Container Type	Type of Field Preservation	Requested Analysis	pH <2 (Y or N)[2]
_____GC - Gallon Cubitainer	☐ Ice ☐ H_2SO_4 ☐ HNO_3 ☐ Filtered		
_____QC - Quart Cubitainer	☐ Ice ☐ H_2SO_4 ☐ HNO_3 ☐ Filtered		
_____LW - Large Whirlpak (Lot: _____)	☐ Ice		
_____AP – Amber Plastic Bottle	☐ Ice ☐ H_2SO_4 ☐ HNO_3 ☐ Filtered		
_____Other (Specify)_____	☐ Ice ☐ H_2SO_4 ☐ HNO_3 ☐ Filtered		
_____Other (Specify)_____	☐ Ice ☐ H_2SO_4 ☐ HNO_3 ☐ Filtered		

[1]Observed/corrected temperature (ID:C01-_____) [2]pH Paper _____ ☐ Field Parameters ☐ Flow Sample Temperature (°C)[1]: _____/_____

Associated Required Data: ☐ Nekton ☐ Benthic ☐ Habitat ☐ 24Hr DO ☐ Metals ☐Other (Specify in Comments)

FIELD PARAMETERS **Meter:** ☐YSI ProQuatro ☐EXO1 ☐_____

Parameter	Code	Value
Dissolved Oxygen	00300	mg/L
Temperature	00010	°C
pH	00400	S.U.
*Conductivity (temperature compensated value to 25 °C)	00094	µS/cm
Secchi Depth	00078	m
Days Since Last Precipitation Event	72053	days

FIELD OBSERVATIONS

Parameter	Code	Depth Sensor reset to 0.00 (prior to collecting first sample of the day): ☐		
Flow Severity	01351	☐ 1 – No Flow ☐ 2 – Low	☐ 3 – Normal ☐ 4 – Flood	☐ 5 – High ☐ 6 - Dry
Water Color	89969	☐ 1 – Brown ☐ 2 – Reddish	☐ 3 – Green ☐ 4 – Black	☐ 5 – Clear ☐ 6 – Other (Specify in Comments)
Water Odor	89971	☐ 1 – Sewage ☐ 2 – Oily / Chemical	☐ 3 – H_2S ☐ 4 – Musky	☐ 5 – Fishy ☐ 7 – Other (Specify in Comments) ☐ 6 – None
Present Weather	89966	☐ 1 – Clear ☐ 2 – Partly Cloudy	☐ 3 – Cloudy ☐ 4 – Rain	
Contact Recreation Observations	SA699	☐ 1 – Primary, Observed ☐ 2 – Secondary Observed	☐ 3 – Non-contact Observed ☐ 4 – Primary, Evidence ☐ 5 – Secondary, Evidence	☐ 6 – Non-Contact evidence ☐ 7 – No Evidence

Effective Date:9/1/2023

CHAIN OF CUSTODY

Field Comments:

Relinquished By:_____ Date:_____ Time:_____

Received By:_____ Date:_____ Time:_____

Relinquished By:_____ Date:_____ Time:_____

Received By:_____ Date:_____ Time:_____

Sample Comments:

Stream Discharge Measurement

Measurement Method [89835]: ☐ 1 – Gage ☐ 2 – Elec ☐ 3 - Mech ☐ 4 – Weir/Flume ☐ 5 - Doppler	Total Discharge (∑Q) cfs [00061]:
Estimated Flow [74069]:	

LABELS

$Field, $Flow	Additional Label if applicable

Bandera River Authority and Groundwater District
Reservoir Sampling Data Sheet

Check for Review by Field Staff (Initial/Date) ☐

Sample No.(s):_____ **Tag Id:**_____ **Matrix:** ☐ NPW

Station Id: _____-_____ **Station Location:** _____

Program Code: ☐ CRP ☐Special Request (Specify Requestor in Comments) ☐ (Please Specify) _____

Sample Type: ☐RT ☐BS ☐BF ☐BE ☐ _____

Collection Method: ☐ Grab **Instrument #:**_____

Submitting Entity: SA_____ **Collecting Entity:** BA_____

Collection Date:_____ **Collection Time:**_____ **End Depth:**_____

Collector(s) Signature(s): _____

# of Containers/Container Type	Type of Field Preservation	Requested Analysis	pH <2 (Y or N)[2]
_____GC - Gallon Cubitainer	☐ Ice ☐ H_2SO_4 ☐ HNO_3 ☐ Filtered		
_____QC - Quart Cubitainer	☐ Ice ☐ H_2SO_4 ☐ HNO_3 ☐ Filtered		
_____LW - Large Whirlpak (Lot: _____)	☐ Ice		
_____PB - Plastic Bottle	☐ Ice ☐ H_2SO_4 ☐ HNO_3 ☐ Filtered		
_____Other (Specify)_____	☐ Ice ☐ H_2SO_4 ☐ HNO_3 ☐ Filtered		
_____Other (Specify)_____	☐ Ice ☐ H_2SO_4 ☐ HNO_3 ☐ Filtered		

[1]Observed/corrected temperature (ID:_C01-_____) [2] pH Paper: _____ ☐ Field Parameters Sample Temperature (°C)[1]: _____/_____

FIELD PARAMETERS

Meter: ☐YSI ProQuatro ☐EXO1 ☐_____ Depth Sensor reset to 0.00 (prior to collecting first sample of the day): ☐

Parameter	Code	Value	Parameter	Code	Value
Dissolved Oxygen (mg/L)	00300	mg/L	Reservoir Stage (feet above MSL)	00052	ft
Temperature	00010	°C			
pH	00400	S.U.	Reservoir % Full	00053	%
*Conductivity (temperature compensated value to 25 °C)	00094	µS/cm			
Secchi Depth	00078	m	Depth of reservoir bottom at sample point	82903	m
Days Since Last Precipitation Event	72053	days			

Water Color	89969	☐ 1 – Brown ☐ 2 – Reddish ☐ 3 – Green	☐ 4 – Black ☐ 5 – Clear ☐ 6 – Other (Specify in Comments)	Water Surface	89968	☐ 1 – Calm ☐ 2 – Ripple	☐ 3 – Wave ☐ 4 – White Cap
Water Odor	89971	☐ 1 – Sewage ☐ 2 – Oily/Chemical ☐ 3 – H_2S ☐ 4 – Musky	☐ 5 – Fishy ☐ 6 – None ☐ 7 – Other (Specify in Comments)				
Present Weather	89966	☐ 1 – Clear ☐ 2 – Partly Cloudy	☐ 3 – Cloudy ☐ 4 – Rain	Reservoir Access not possible level too low Enter 1 if level is too low, otherwise Not Recorded	00051	☐ 1 ☐ Not Recorded	

Field Comments:

Effective Date: 9/1/2023

≥3 m depth – take readings at 0.3 m, 1 m, and every 1 m thereafter >18 m total depth, can take readings at 2 or 3 m intervals Final reading taken 0.3 m from bottom								
Sample #	#	Collection Time	Depth m	Temperature °C	Conductivity µS/cm	pH S.U.	Dissolved Oxygen mg/L	Tag ID
Record on front	0	Record on front	0.3	Record on front				Record on front
	1		1.0					
	2							
	3							
	4							
	5							
	6							
	7							
	8							
	9							
	10							
	11							
	12							
	13							
	14							
	15							
	16							
	17							
	18							
	19							
	20							
	21							
	22							
	23							
	24							
	25							
	26							

CHAIN OF CUSTODY

Relinquished By:_____ Date:_____ Time:_____

Received By:_____ Date:_____ Time:_____

Relinquished By:_____ Date:_____ Time:_____

Received By:_____ Date:_____ Time:_____

Sample Comments:

Effective Date: 9/1/2023

City of Boerne
Field Data Sheet

Sample No.(s):_____ Tag Id:_____ Matrix: ☐ NPW ☐ QC

Station Id: _____-_____ Station Location: _____

Program Code: ☐ CRP ☐ (Please Specify) _____

Sample Type: ☐RT ☐SS (Specify in Comments) ☐ _____

Collection Method: ☐ Grab Instrument #_____

Submitting Entity: SA Collecting Entity: BC

Collection Date:_____ Collection Time:_____ End Depth:_____

Collector(s) Signature(s): _____

# of Containers/Container Type	Type of Field Preservation	Requested Analysis	pH <2 (Y or N)[2]
_____GC - Gallon Cubitainer	☐ Ice ☐ H_2SO_4 ☐ HNO_3 ☐ Filtered		
_____QC - Quart Cubitainer	☐ Ice ☐ H_2SO_4 ☐ HNO_3 ☐ Filtered		
_____LW - Large Whirlpak Lot #:	☐ Ice ☐ H_2SO_4 ☐ HNO_3 ☐ Filtered		
_____AP – Amber Plastic Bottle	☐ Ice ☐ H_2SO_4 ☐ HNO_3 ☐ Filtered		
_____Other (Specify)_____	☐ Ice ☐ H_2SO_4 ☐ HNO_3 ☐ Filtered		
_____Other (Specify)	☐ Ice ☐ H_2SO_4 ☐ HNO_3 ☐ Filtered		

[1]Observed/corrected temperature (ID:C01-_____) [2] (H Paper: _____) ☐ Field Parameters ☐ Flow Sample Temperature (°C)[1]: _____/_____

Associated Required Data: ☐ Nekton ☐ Benthic ☐ Habitat ☐ 24Hr DO ☐ Metals ☐Other (Specify in Comments)

FIELD PARAMETERS Meter: ☐600 XLM ☐6920V2-2M ☐_____

Parameter	Code	Value
Dissolved Oxygen	00300	mg/L
Temperature	00010	°C
pH	00400	S.U.
*Conductivity (temperature compensated value to 25 °C)	00094	µS/cm
Secchi Depth	00078	m
Days Since Last Precipitation Event	72053	days

FIELD OBSERVATIONS

Parameter	Code	Depth Sensor reset to 0.00 (prior to collecting first sample of the day): ☐		
Flow Severity	01351	☐ 1 – No Flow ☐ 2 – Low	☐ 3 – Normal ☐ 4 – Flood	☐ 5 – High ☐ 6 - Dry
Water Color	89969	☐ 1 – Brown ☐ 2 – Reddish	☐ 3 – Green ☐ 4 – Black	☐ 5 – Clear ☐ 6 – Other (Specify in Comments)
Water Odor	89971	☐ 1 – Sewage ☐ 2 – Oily / Chemical	☐ 3 – H_2S ☐ 4 – Musky	☐ 5 – Fishy ☐ 7 – Other (Specify in Comments) ☐ 6 – None
Present Weather	89966	☐ 1 – Clear ☐ 2 – Partly Cloudy	☐ 3 – Cloudy ☐ 4 – Rain	

Field Comments

Effective Date: 09/01/2023

Page 1 of 2

CHAIN OF CUSTODY

Relinquished By:_____ Date:_____ Time:_____

Received By:_____ Date:_____ Time:_____

Relinquished By:_____ Date:_____ Time:_____

Received By:_____ Date:_____ Time:_____

Sample Comments:

Stream Discharge Measurement

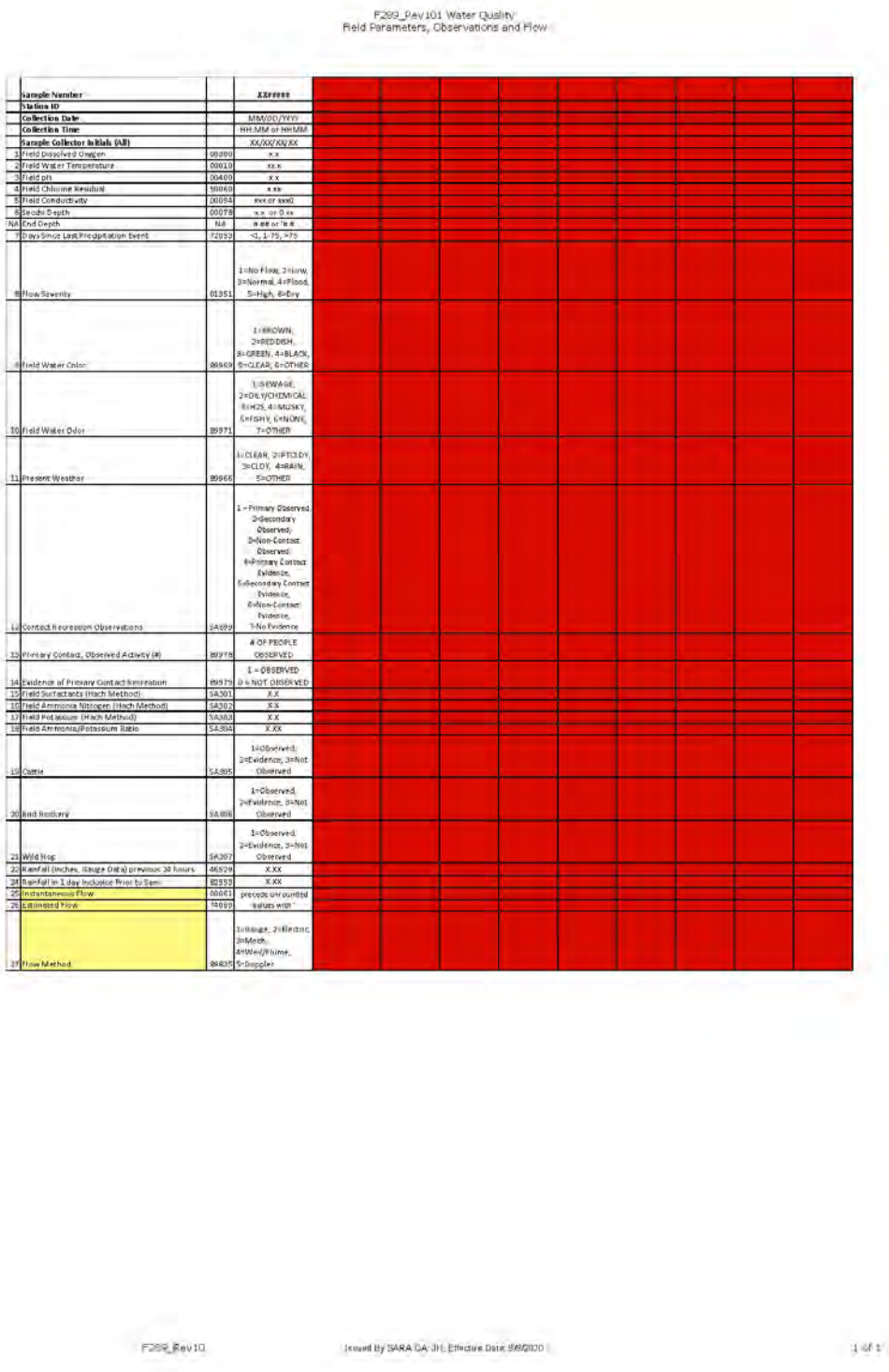
Measurement Method [89835]: ☐ 1 – Gage ☐ 2 – Elec ☐ 3 - Mech ☐ 4 – Weir/Flume ☐ 5 - Doppler	Total Discharge (∑Q) cfs [00061]:
Estimated Flow [74069]:	

LABELS

$Field, $Flow	Additional Label if applicable

Electronic Field Data Sheets

Routine Water Quality Electronic Sheet



F299_Rev101 Water Quality
Field Parameters, Observations and Flow

	Sample Number		XXr####
	Station ID		
	Collection Date		MM/DD/YYY
	Collection Time		HH:MM or HHMM
	Sample Collector Initials (All)		XX/XX/XX/XX
1	Field Dissolved Oxygen	00300	x.x
2	Field Water Temperature	00010	xx.x
3	Field pH	00400	x.x
4	Field Chlorine Residual	50060	x.xx
5	Field Conductivity	00094	xxx or xxx0
6	Secchi Depth	00078	x.x or 0.xx
NA	End Depth	NA	x.xx or 'n a'
7	Days Since Last Precipitation Event	72053	<1, 1-75, >75
8	Flow Severity	01351	1=No Flow, 2=Low, 3=Normal, 4=Flood, 5=High, 6=Dry
9	Field Water Color	88969	1=BROWN, 2=REDDISH, 3=GREEN, 4=BLACK, 5=CLEAR, 6=OTHER
10	Field Water Odor	89971	1=SEWAGE, 2=OIL Y/CHEMICAL, 3=H2S, 4=MUSKY, 5=FISHY, 6=NONE, 7=OTHER
11	Present Weather	89966	1=CLEAR, 2=PTCLDY, 3=CLDY, 4=RAIN, 5=OTHER
12	Contact Recreation Observations	SA099	1 = Primary Observed, 2=Secondary Observed, 3=Non-Contact Observed, 4=Primary Contact Evidence, 5=Secondary Contact Evidence, 6=Non-Contact Evidence, 7=No Evidence
13	Primary Contact, Observed Activity (#)	89975	# OF PEOPLE OBSERVED
14	Evidence of Primary Contact Recreation	89979	1 = OBSERVED 0 = NOT OBSERVED
15	Field Surfactants (Hach Method)	SA301	X.X
16	Field Ammonia Nitrogen (Hach Method)	SA302	X.X
17	Field Potassium (Hach Method)	SA303	X.X
18	Field Ammonia/Potassium Ratio	SA304	X.XX
19	Cattle	SA305	1=Observed, 2=Evidence, 3=Not Observed
20	Bird Rookery	SA306	1=Observed, 2=Evidence, 3=Not Observed
21	Wild Hog	SA307	1=Observed, 2=Evidence, 3=Not Observed
22	Rainfall (inches, Gauge Data) previous 24 hours	46529	X.XX
24	Rainfall in 1 day Inclusive Prior to Sam	82353	X.XX
25	Instantaneous Flow	00061	precede unr ounded values with '
26	Estimated Flow	74069	
27	Flow Method	89835	1=Gauge, 2=Electric, 3=Mech, 4=Weir/Flume, 5=Doppler

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Benthic Electronic Sheet

Site Information

Station ID:	
Sample # (XX######):	
Collectors:	
# of Sub-Samples:	
Eco-Region	

	Date	Time	Depth
Start			
End			

Biological Data Code (89888):	2011	
Duration of Collection (89904):	5	minutes
Benthic Sampler (89950):	3	(kicknet)
Mesh Size-Avg Bar (89946):	0.13	cm
Biological Reporting Units (89899)		1) # Individuals in Sub-Sample 2) # Individuals/ft^2 3) # individuals/m^2 4) total # of individuals in sample
Benthic Kick Net Dist (SA925)		m
Area Kicked (0.46m x dist) (89903)	0	m^2

Gravel Substrate (89923)		%
Sand Substrate (89924)		%
Soft Bottom (89925)		%
Macrophyte bed (89926)		%
Snags and brush (89927)		%
Bedrock (89928)		%

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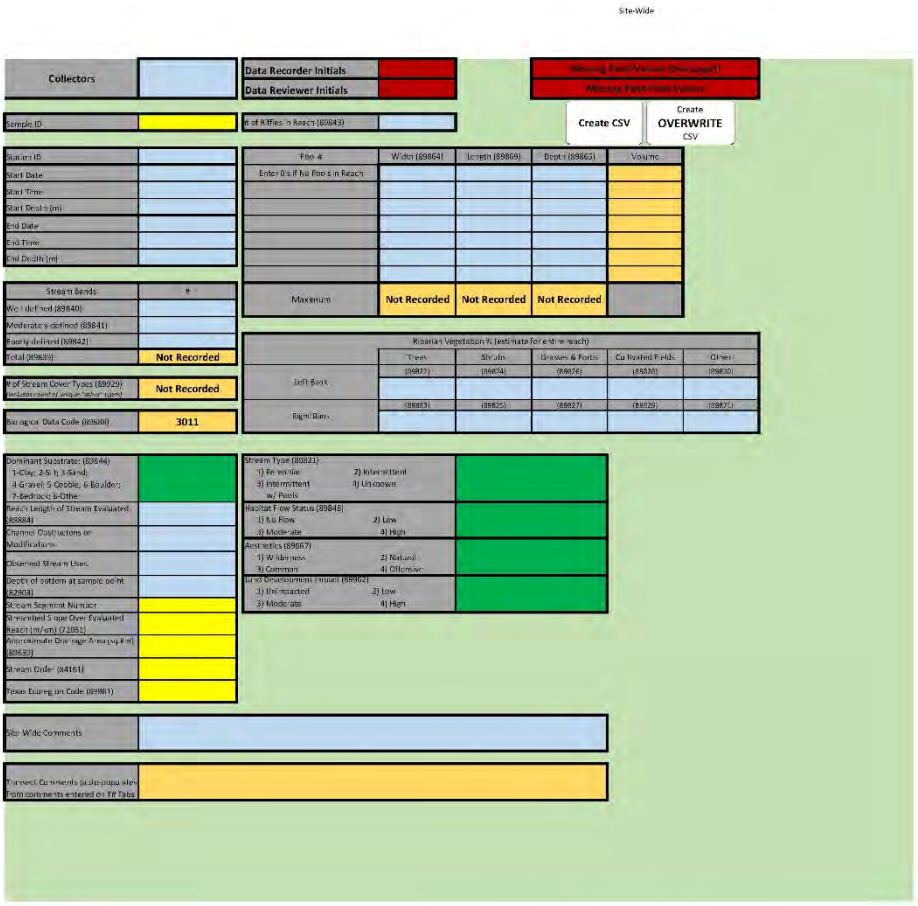
Image of the Site Information for a Benthic Macroinvertebrate sample. Information includes Station ID, collectors, number of subsamples, ecoregion, duration of sampling, type of sampler used, biological reporting units, benthic kick-net distance, area kicked, percent gravel substrate, percent sand substrate, percent soft bottom, percent macrophyte bed, percent snags and brush, and percent bedrock.

Station I.D.			Sample No. =			Biologist :			
ORDER	FAMILY	GENUS	Non-Insect	Storet Code	# Individuals (A)	Tolerance Values (B)	*F F Group	C = A X B	E = C / D
		Total Number of Individuals (D) {89906}			0				
Functional Feeding Groups - SCR-scraper, CG-Collector gatherer, FC-filtering collector, SHR-shredder, P-predator									
							Biotic Index {90007}	(sum of E)=	0.0000

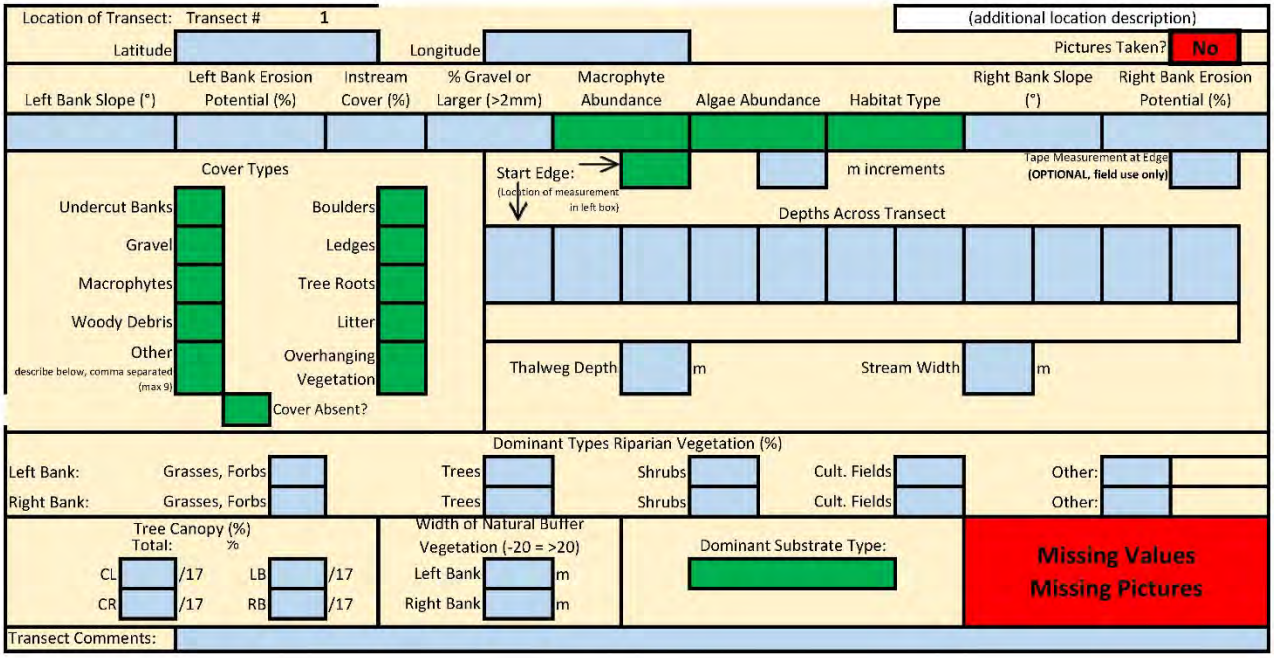
Parameter	Codes		VALUES
Total Number of Families (#)	90012	# families	0
EPT Index	90008	# of distinct EPT families	0
Dominant FFG	90010	Ratio, %	#DIV/0!
Predators	90036	Ratio, %	#DIV/0!
Trichoptera as Hydropsychidae	90069	Ratio, %	#DIV/0!
Percent Individuals Chironomidae	90062	Ratio, %	#DIV/0!
Total Taxa Richness, Benthos	90055	Total	0
Collectors-Gatherers	90025	Ratio, %	#DIV/0!
Dominant Taxon	90042	Ratio, %	#DIV/0!
Ratio : Intolerant / Tolerant Individuals	90050	Ratio	#DIV/0!
Non - Insect Taxa	90052	Total	0
% Total Number Elmidae	90054	Ratio, %	#DIV/0!
Eco-Region	89961	N/A	

The following image is a habitat Excel template used to document habitat data collection.



The following image is a habitat Excel template used to document habitat transect data collection.

T1



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The following image is a habitat Excel template used to document habitat transect data collection.

T2

Location of Transect:	Transect #	2		meters		Transect 1	(additional location description)	
Latitude			Longitude				Pictures Taken?	No

Left Bank Slope (°)	Left Bank Erosion Potential (%)	Instream Cover (%)	% Gravel or Larger (>2mm)	Macrophyte Abundance	Algae Abundance	Habitat Type	Right Bank Slope (°)	Right Bank Erosion Potential (%)

Cover Types

Undercut Banks		Boulders	
Gravel		Ledges	
Macrophytes		Tree Roots	
Woody Debris		Litter	
Other (describe below, comma separated (max 9))		Overhanging Vegetation	
	Cover Absent?		

Start Edge: (Location of measurement in left box) → | m increments | Tape Measurement at Edge (OPTIONAL, field use only)

Depths Across Transect

Thalweg Depth m | Stream Width m

Dominant Types Riparian Vegetation (%)

	Grasses, Forbs	Trees	Shrubs	Cult. Fields	Other:	
Left Bank:						
Right Bank:						

Tree Canopy (%) Total: %

CL	/17	LB	/17
CR	/17	RB	/17

Width of Natural Buffer Vegetation (-20 = >20)

Left Bank	m
Right Bank	m

Dominant Substrate Type:

Missing Values
Missing Pictures

Transcribe Comments:

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The following image is a habitat Excel template used to document habitat transect data collection.

T3

Location of Transect:	Transect # 3		meters		Transect 1	(additional location description)		
Latitude		Longitude				Pictures Taken?	No	

Left Bank Slope (°)	Left Bank Erosion Potential (%)	Instream Cover (%)	% Gravel or Larger (>2mm)	Macrophyte Abundance	Algae Abundance	Habitat Type	Right Bank Slope (°)	Right Bank Erosion Potential (%)

Cover Types

Undercut Banks		Boulders	
Gravel		Ledges	
Macrophytes		Tree Roots	
Woody Debris		Litter	
Other (describe below, comma separated (max 9))		Overhanging Vegetation	
	Cover Absent?		

Start Edge: (Location of measurement in left box) | m increments | Tape Measurement at Edge (OPTIONAL, field use only)

Depths Across Transect

Thalweg Depth m | Stream Width m

Dominant Types Riparian Vegetation (%)

	Grasses, Forbs	Trees	Shrubs	Cult. Fields	Other:	
Left Bank:						
Right Bank:						

Tree Canopy (%) Total: %

CL	/17	LB	/17
CR	/17	RB	/17

Width of Natural Buffer Vegetation (-20 = >20)

Left Bank	m
Right Bank	m

Dominant Substrate Type:

Missing Values
Missing Pictures

Transcribe Comments:

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The following image is a habitat Excel template used to document habitat transect data collection.

T4

Location of Transect:	Transect # 4		meters		Transect 1	(additional location description)		
Latitude		Longitude				Pictures Taken?	No	

Left Bank Slope (°)	Left Bank Erosion Potential (%)	Instream Cover (%)	% Gravel or Larger (>2mm)	Macrophyte Abundance	Algae Abundance	Habitat Type	Right Bank Slope (°)	Right Bank Erosion Potential (%)

Cover Types

Undercut Banks		Boulders	
Gravel		Ledges	
Macrophytes		Tree Roots	
Woody Debris		Litter	
Other (describe below, comma separated (max 9))		Overhanging Vegetation	
	Cover Absent?		

Start Edge: (Location of measurement in left box) | m increments | Tape Measurement at Edge (OPTIONAL, field use only)

Depths Across Transect

Thalweg Depth m | Stream Width m

Dominant Types Riparian Vegetation (%)

	Grasses, Forbs	Trees	Shrubs	Cult. Fields	Other:	
Left Bank:						
Right Bank:						

Tree Canopy (%) Total: %

CL	/17	LB	/17
CR	/17	RB	/17

Width of Natural Buffer Vegetation (-20 = >20)

Left Bank	m
Right Bank	m

Dominant Substrate Type:

Missing Values
Missing Pictures

Transcribe Comments:

F303_Rev07 Issued By SARA QA: JH; Effective: 3/13/2020 Page 1

The following are image is a habitat excel template used to document habitat transect data collection.

T5

Location of Transect: Transect # 5 meters Transect 1 (additional location description)

Latitude Longitude Pictures Taken? No

Left Bank Slope (°)	Left Bank Erosion Potential (%)	Instream Cover (%)	% Gravel or Larger (>2mm)	Macrophyte Abundance	Algae Abundance	Habitat Type	Right Bank Slope (°)	Right Bank Erosion Potential (%)

Cover Types

Undercut Banks, Gravel, Macrophytes, Woody Debris, Other (describe below, comma separated (max 9)), Boulders, Ledges, Tree Roots, Litter, Overhanging Vegetation, Cover Absent?

Start Edge: (Location of measurement in left box) m increments Tape Measurement at Edge (OPTIONAL, field use only)

Depths Across Transect

Thalweg Depth m Stream Width m

Dominant Types Riparian Vegetation (%)

	Grasses, Forbs	Trees	Shrubs	Cult. Fields	Other:
Left Bank:					
Right Bank:					

Tree Canopy (%) Total: %

CL /17 LB /17

CR /17 RB /17

Width of Natural Buffer Vegetation (-20 = >20)

Left Bank m

Right Bank m

Dominant Substrate Type:

Missing Values
Missing Pictures

Transect Comments:

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The following image is a habitat Excel template used to document habitat transect data collection.

T6

Location of Transect:	Transect # 6		meters		Transect 1	(additional location description)		
Latitude		Longitude				Pictures Taken?	No	

Left Bank Slope (°)	Left Bank Erosion Potential (%)	Instream Cover (%)	% Gravel or Larger (>2mm)	Macrophyte Abundance	Algae Abundance	Habitat Type	Right Bank Slope (°)	Right Bank Erosion Potential (%)

Cover Types

Undercut Banks		Boulders	
Gravel		Ledges	
Macrophytes		Tree Roots	
Woody Debris		Litter	
Other (describe below, comma separated (max 9))		Overhanging Vegetation	
	Cover Absent?		

Start Edge: (Location of measurement in left box) | m increments | Tape Measurement at Edge (OPTIONAL, field use only)

Depths Across Transect

Thalweg Depth m | Stream Width m

Dominant Types Riparian Vegetation (%)

	Grasses, Forbs	Trees	Shrubs	Cult. Fields	Other:	
Left Bank:						
Right Bank:						

Tree Canopy (%) Total: %

CL	/17	LB	/17
CR	/17	RB	/17

Width of Natural Buffer Vegetation (-20 = >20)

Left Bank	m
Right Bank	m

Dominant Substrate Type:

Missing Values
Missing Pictures

Transcribe Comments:

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Habitat Calculations and HQI

Parameter	Code	Recorded Value
Lateral Transects Made	89812	Not Recorded #
Average stream width	89803	Not Recorded m
Average stream depth	89804	Not Recorded m
Average percent of substrate gravel (>2mm)	89845	Not Recorded %
Average percent stream bank slope	89846	Not Recorded %
Average stream bank slope	89847	Not Recorded degrees
Average instream cover	89819	Not Recorded %
Average width of natural riparian buffer on left bank	89872	Not Recorded m
Average width of natural riparian buffer on right bank	89871	Not Recorded m
Average width of natural riparian vegetation	89865	Not Recorded m
Average percent trees as riparian vegetation	89849	Not Recorded %
Average percent shrubs as riparian vegetation	89850	Not Recorded %
Average percent grasses and forbes (native) vegetation	89851	Not Recorded %
Average percent cultivated fields as riparian vegetation	89852	Not Recorded %
Average percent other as riparian vegetation	89853	Not Recorded %
Average percent tree canopy coverage	89854	Not Recorded %

The following image is a habitat Excel template used to document habitat transect data collection.

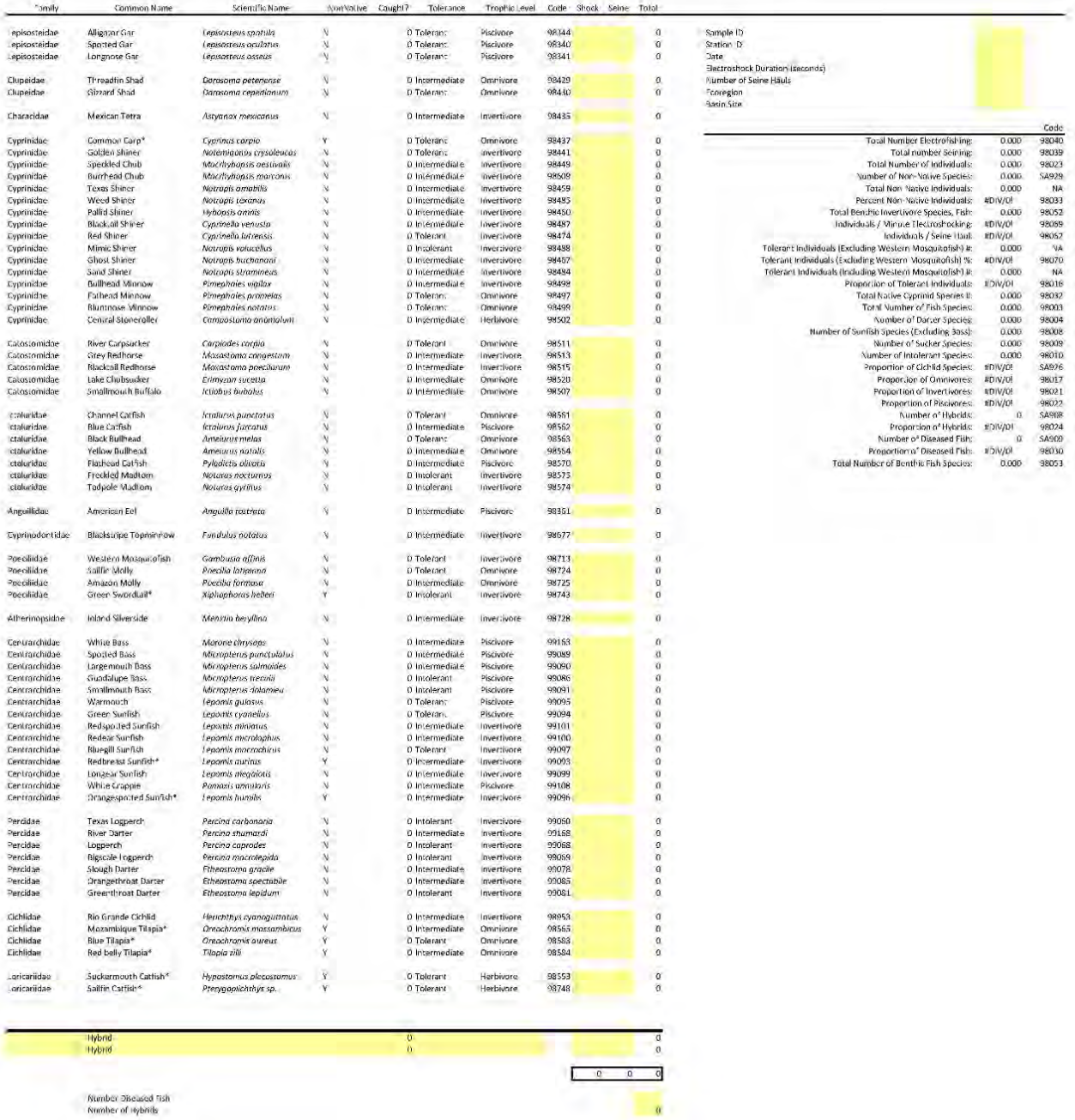
Habitat Parameter	Scoring Category				Applicable Metrics
Available Instream Cover (89874)	**Abundant** >50% of substrate favorable for colonization and fish cover; good mix of several stable (not new fall or transient) cover types such as snags, cobble, undercut banks, macrophytes	**Common** 30-50% of substrate supports stable habitat; adequate habitat for maintenance of populations; may be limited in the number of different habitat types	**Rare** 10-29.9% of substrate supports stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed	**Absent** <10% of substrate supports stable habitat; lack of habitat is obvious; substrate unstable or lacking	Instream cover = N/A Unique Cover Types = Not Recorded
Score:	4	3	2	1	
Bottom Substrate Stability (89875)	**Stable** >50% gravel or larger substrate; i.e., gravel, cobble, boulders; dominant substrate type is gravel or larger	**Moderately Stable** 30-50% gravel or larger substrate; dominant substrate type is mix of gravel with some finer sediments	**Moderately Unstable** 10-29.9% gravel or larger substrate; dominant substrate type is finer than gravel, but may still be a mix of sizes	**Unstable** <10% gravel or larger substrate; substrate is uniform sand, silt, clay, or bedrock	Gravel or larger = N/A Dominant Substrate Type = N/A
Score:	4	3	2	1	
Number of Riffles To be counted, riffles must extend >50% the width of the channel and be at least as long as the channel width **(89876)**	**Abundant** ≥ 5 riffles	**Common** 2-4 riffles	**Rare** 1 riffle	**Absent** No riffles	Number of riffles = N/A
Score:	4	3	2	1	
Dimensions of Largest Pool (89877)	**Large** Pool covers more than 50% of the channel width; maximum depth is ≥ 1 meter	**Moderate** Pool covers approximately 50% or slightly less of the channel width; maximum depth 0.5-1 meter	**Small** Pool covers approximately 25% of the channel width; maximum depth is <0.5 meters	**Absent** No existing pools; only shallow auxiliary pockets	Max Pool Width = N/A Max Pool Length = N/A Max Pool Depth = N/A
Score:	4	3	2	1	
Channel Flow Status (89878)	**High** Water reaches the base of both lower banks; ≤5% of channel substrate is exposed	**Moderately Stable** Water fills >75% of the channel; or <25% of channel substrate is exposed	**Low** Water fills 25-75% of the available channel and/or riffle substrates are mostly exposed	**No flow** Very little water in the channel and mostly present in standing pools or stream is dry	Habitat Flow Status = N/A
Score:	3	2	1	0	
Bank Stability (89879)	**Stable** Little evidence (<30%) of erosion or bank failure; bank angles average < 30°	**Moderately Stable** Some evidence (30-29.9%) of erosion or bank failure; small areas of erosion mostly healed over; bank angles average 30-39.9°	**Moderately Unstable** Evidence of erosion or bank failure is common (30-50%); high potential of erosion during flooding; bank angles average 40-60°	**Unstable** Large and frequent evidence (>50%) or erosion or bank failure; raw areas frequent along steep banks; bank angles average >60°	Erosion Potential = N/A Bank Slope = N/A
Score:	3	2	1	0	
Channel Sinuosity (89880)	**High** >2 well-defined bends with deep outside pools (cut banks) and shallow inside areas (point bars) present	**Moderate** 1 well-defined bend OR ≥1 moderately-defined bends present	**Low** <1 moderately-defined bends OR Only poorly-defined bends present	**None** Straight channel; may be channelized	Well-defined bends = N/A Moderately-defined bends = N/A Poorly-defined bends = N/A Total bends = N/A
Score:	3	2	1	0	
Riparian Buffer Vegetation (89881)	**Extensive** Width of natural buffer ≥ 20 meters	**Wide** Width of natural buffer is 10-19 meters	**Moderate** Width of natural buffer is 5-10 meters	**Narrow** Width of natural buffer is < 5 meters	Left Buffer = N/A Right Buffer = N/A Average minimum buffer = N/A
Score:	3	2	1	0	
Aesthetics of Reach (89874)	**Wilderness** Outstanding natural beauty; usually wooded or unpastured area; water clarity is usually exceptional	**Natural Area** Trees and/or native vegetation are common; some development evident (from fields, pastures, dwellings); water clarity may be slightly turbid	**Common Setting** Not offensive; area is developed, but uncluttered such as in an urban park; water clarity may be turbid or discolored	**Offensive** Stream does not enhance aesthetics of the area; cluttered; highly developed; may be a dumping area; water clarity is usually turbid or discolored	Aesthetics = N/A
Score:	3	2	1	0	
HQI Total Score	**Not Recorded**				
HQI Rounded Score	**Not Recorded**				
Habitat Quality Index	**Not Recorded**				

FILE_NAME

Issued by SARA QA/QC Effective: 3/13/2020

Page 1

Excel sheet that summarized the fish capture by electrofishing and seining during a biological sampling event and calculated the summary statistics that are used to determine the health of the fish community



Family	Common Name	Scientific Name	Non-Native	Caught?	Tolerance	Trophic Level	Code	Shock	Seine	Total
Lepisosteidae	Alligator Gar	*Lepisosteus spatula*	N		0 Tolerant	Piscivore	98344			0
Lepisosteidae	Spotted Gar	*Lepisosteus oculatus*	N		0 Tolerant	Piscivore	98340			0
Lepisosteidae	Longnose Gar	*Lepisosteus osseus*	N		0 Tolerant	Piscivore	98341			0
Clupeidae	Threadfin Shad	*Dorosoma petenense*	N		0 Intermediate	Omnivore	98429			0
Clupeidae	Gizzard Shad	*Dorosoma cepedianum*	N		0 Tolerant	Omnivore	98430			0
Characidae	Mexican Tetra	*Astyanax mexicanus*	N		0 Intermediate	Invertivore	98435			0
Cyprinidae	Common Carp*	*Cyprinus carpio*	Y		0 Tolerant	Omnivore	98437			0
Cyprinidae	Golden Shiner	*Notemigonus crysoleucas*	N		0 Tolerant	Invertivore	98441			0
Cyprinidae	Speckled Chub	*Macrhybopsis aestivalis*	N		0 Intermediate	Invertivore	98449			0
Cyprinidae	Burrhead Chub	*Macrhybopsis marconis*	N		0 Intermediate	Invertivore	98509			0
Cyprinidae	Texas Shiner	*Notropis amabilis*	N		0 Intermediate	Invertivore	98459			0
Cyprinidae	Weed Shiner	*Notropis texanus*	N		0 Intermediate	Invertivore	98485			0
Cyprinidae	Pallid Shiner	*Hybopsis amnis*	N		0 Intermediate	Invertivore	98450			0
Cyprinidae	Blacktail Shiner	*Cyprinella venusta*	N		0 Intermediate	Invertivore	98487			0
Cyprinidae	Red Shiner	*Cyprinella lutrensis*	N		0 Tolerant	Invertivore	98474			0
Cyprinidae	Mimic Shiner	*Notropis volucellus*	N		0 Intolerant	Invertivore	98488			0
Cyprinidae	Ghost Shiner	*Notropis buchanani*	N		0 Intermediate	Invertivore	98467			0
Cyprinidae	Sand Shiner	*Notropis stramineus*	N		0 Intermediate	Invertivore	98484			0
Cyprinidae	Bullhead Minnow	*Pimephales vigilax*	N		0 Intermediate	Invertivore	98498			0
Cyprinidae	Fathead Minnow	*Pimephales promelas*	N		0 Tolerant	Omnivore	98497			0
Cyprinidae	Bluntnose Minnow	*Pimephales notatus*	N		0 Tolerant	Omnivore	98499			0
Cyprinidae	Central Stoneroller	*Campostoma anomalum*	N		0 Intermediate	Herbivore	98502			0
Catostomidae	River Carpsucker	*Carpiodes carpio*	N		0 Tolerant	Omnivore	98511			0
Catostomidae	Grey Redhorse	*Moxostoma congestum*	N		0 Intermediate	Invertivore	98513			0
Catostomidae	Blacktail Redhorse	*Moxostoma poecilurum*	N		0 Intermediate	Invertivore	98515			0
Catostomidae	Lake Chubsucker	*Erimyzon sucetta*	N		0 Intermediate	Omnivore	98520			0
Catostomidae	Smallmouth Buffalo	*Ictiobus bubalus*	N		0 Intermediate	Omnivore	98507			0
Ictaluridae	Channel Catfish	*Ictalurus punctatus*	N		0 Tolerant	Omnivore	98561			0
Ictaluridae	Blue Catfish	*Ictalurus furcatus*	N		0 Intermediate	Piscivore	98562			0
Ictaluridae	Black Bullhead	*Ameiurus melas*	N		0 Tolerant	Omnivore	98563			0
Ictaluridae	Yellow Bullhead	*Ameiurus natalis*	N		0 Intermediate	Omnivore	98564			0
Ictaluridae	Flathead Catfish	*Pylodictis olivaris*	N		0 Intermediate	Piscivore	98570			0
Ictaluridae	Freckled Madtom	*Noturus nocturnus*	N		0 Intolerant	Invertivore	98573			0
Ictaluridae	Tadpole Madtom	*Noturus gyrinus*	N		0 Intolerant	Invertivore	98574			0
Anguillidae	American Eel	*Anguilla rostrata*	N		0 Intermediate	Piscivore	98351			0
Cyprinodontidae	Blackstripe Topminnow	*Fundulus notatus*	N		0 Intermediate	Invertivore	98677			0
Poeciliidae	Western Mosquitofish	*Gambusia affinis*	N		0 Tolerant	Invertivore	98713			0
Poeciliidae	Sailfin Molly	*Poecilia latipinna*	N		0 Tolerant	Omnivore	98724			0
Poeciliidae	Amazon Molly	*Poecilia formosa*	N		0 Intermediate	Omnivore	98725			0
Poeciliidae	Green Swordtail*	*Xiphophorus helleri*	Y		0 Intolerant	Invertivore	98743			0
Atherinopsidae	Inland Silverside	*Menidia beryllina*	N		0 Intermediate	Invertivore	98728			0
Centrarchidae	White Bass	*Morone chrysops*	N		0 Intermediate	Piscivore	99163			0
Centrarchidae	Spotted Bass	*Micropterus punctulatus*	N		0 Intermediate	Piscivore	99089			0
Centrarchidae	Largemouth Bass	*Micropterus salmoides*	N		0 Intermediate	Piscivore	99090			0
Centrarchidae	Guadalupe Bass	*Micropterus treculii*	N		0 Intolerant	Piscivore	99086			0
Centrarchidae	Smallmouth Bass	*Micropterus dolomieu*	N		0 Intolerant	Piscivore	99091			0
Centrarchidae	Warmouth	*Lepomis gulosus*	N		0 Tolerant	Piscivore	99095			0
Centrarchidae	Green Sunfish	*Lepomis cyanellus*	N		0 Tolerant	Piscivore	99094			0
Centrarchidae	Redspotted Sunfish	*Lepomis miniatus*	N		0 Intermediate	Invertivore	99101			0
Centrarchidae	Redear Sunfish	*Lepomis microlophus*	N		0 Intermediate	Invertivore	99100			0
Centrarchidae	Bluegill Sunfish	*Lepomis macrochirus*	N		0 Tolerant	Invertivore	99097			0
Centrarchidae	Redbreast Sunfish*	*Lepomis auritus*	Y		0 Intermediate	Invertivore	99093			0
Centrarchidae	Longear Sunfish	*Lepomis megalotis*	N		0 Intermediate	Invertivore	99099			0
Centrarchidae	White Crappie	*Pomoxis annularis*	N		0 Intermediate	Piscivore	99108			0
Centrarchidae	Orangespotted Sunfish*	*Lepomis humilis*	Y		0 Intermediate	Invertivore	99096			0
Percidae	Texas Logperch	*Percina carbonaria*	N		0 Intolerant	Invertivore	99060			0
Percidae	River Darter	*Percina shumardi*	N		0 Intermediate	Invertivore	99168			0
Percidae	Logperch	*Percina caprodes*	N		0 Intolerant	Invertivore	99068			0
Percidae	Bigscale Logperch	*Percina macrolepida*	N		0 Intolerant	Invertivore	99069			0
Percidae	Slough Darter	*Etheostoma gracile*	N		0 Intermediate	Invertivore	99078			0
Percidae	Orangethroat Darter	*Etheostoma spectabile*	N		0 Intermediate	Invertivore	99085			0
Percidae	Greenthroat Darter	*Etheostoma lepidum*	N		0 Intolerant	Invertivore	99081			0
Cichlidae	Rio Grande Cichlid	*Herichthys cyanoguttatus*	N		0 Intermediate	Invertivore	98853			0
Cichlidae	Mozambique Tilapia*	*Oreochromis mossambicus*	Y		0 Intermediate	Omnivore	98565			0
Cichlidae	Blue Tilapia*	*Oreochromis aureus*	Y		0 Tolerant	Omnivore	98583			0
Cichlidae	Red belly Tilapia*	*Tilapia zilli*	Y		0 Intermediate	Omnivore	98584			0
Loricariidae	Suckermouth Catfish*	*Hypostomus plecostomus*	Y		0 Tolerant	Herbivore	98553			0
Loricariidae	Sailfin Catfish*	*Pterygoplichthys sp.*	Y		0 Tolerant	Herbivore	98748			0
	Hybrid				0					0
	Hybrid				0					0
								0	0	0
	Number Diseased Fish									
	Number of Hybrids									0

		Code
Sample ID		
Station ID		
Date		
Electroshock Duration (seconds)		
Number of Seine Hauls		
Ecoregion		
Basin Size		
Total Number Electrofishing:	0.000	98040
Total number Seining:	0.000	98039
Total Number of Individuals:	0.000	98023
Number of Non-Native Species:	0.000	SA929
Total Non-Native Individuals:	0.000	NA
Percent Non-Native Individuals:	#DIV/0!	98033
Total Benthic Invertivore Species, Fish:	0.000	98052
Individuals / Minute Electroshocking:	#DIV/0!	98059
Individuals / Seine Haul:	#DIV/0!	98062
Tolerant Individuals (Excluding Western Mosquitofish) #:	0.000	NA
Tolerant Individuals (Excluding Western Mosquitofish) %:	#DIV/0!	98070
Tolerant Individuals (Including Western Mosquitofish) #:	0.000	NA
Proportion of Tolerant Individuals:	#DIV/0!	98016
Total Native Cyprinid Species #:	0.000	98092
Total Number of Fish Species:	0.000	98003
Number of Darter Species:	0.000	98004
Number of Sunfish Species (Excluding Bass):	0.000	98008
Number of Sucker Species:	0.000	98009
Number of Intolerant Species:	0.000	98010
Proportion of Cichlid Species:	#DIV/0!	SA976
Proportion of Omnivores:	#DIV/0!	98017
Proportion of Invertivores:	#DIV/0!	98021
Proportion of Piscivores:	#DIV/0!	98022
Number of Hybrids:	0	SA908
Proportion of Hybrids:	#DIV/0!	98024
Number of Diseased Fish:	0	SA909
Proportion of Diseased Fish:	#DIV/0!	98030
Total Number of Benthic Fish Species:	0.000	98053

An image of the worksheet that determines the fish community metrics for Ecoregions 27, 29 and 32

An image of the worksheet that determines the fish community metrics for Ecoregion 30

Sample #
Station ID
Date
Ecoregion
Basin Size
Electroshock Duration (seconds)
Number of Seine Hauls

Metric Category	Metric Name	Raw Value	Scoring Criteria 5	3	1	IBI Score
Species Richness & Composition	Total Number of Fish Species		#VALUE!	#VALUE!	#VALUE!	#VALUE!
	Number of Native Cyprinid Species					0
	Number of Benthic Invertivore Species					0
	Number of Sunfish Species					0
	Number of Intolerant Species					0
	% Individuals as Tolerant Species (excluding Western Mosquitofish)					0
Trophic Composition	% Individuals as Omnivores					0
	% Individuals as Invertivores					0
	% Individuals as Piscivores					0
Fish Abundance & Condition	Number of Individuals per Seine Haul					0
	Number of Individuals per Minute Electrofishing					0
	% Individuals as Non-Native Species					0
	% Individuals w/Disease or other Anomaly					0
					TOTAL	#VALUE!
					A.U	
					Designation	#VALUE!

Species Richness/Watershed Area regression lines solved for species given the watershed area.

5	#VALUE!
3	#VALUE!
1	#VALUE!

Ecoregion 30

Species Richness

Basin Size (km2)

5 y = 0.9294ln(x) + 11.24

3 y = 0.8469ln(x) + 7

1 y = 0.4508ln(x) + 3.68

	.1	10	100	1000	#N/A
Line 1	3.7	4.8	5.9	7.1	
Line 2	7	8.9	11	12.8	
Line 3	12.2	13.4	15.6	17.6	
This Site					

Criteria

Metric Category	Metric Name	5	3	1
Species Richness & Composition	Total Number of Fish Species		See Figure	
	Number of Native Cyprinid Species	≥4	3-4	<3
	Number of Benthic Invertivore Species	>1	1	0
	Number of Sunfish Species	≥3	2-3	<2
	Number of Intolerant Species	>1	1	0
	% Individuals as Tolerant Species (excluding Western Mosquitofish)	<20%	20-50%	>50%
Trophic Composition	% Individuals as Omnivores	<45%	45-65%	>65%
	% Individuals as Invertivores	>55%	33-55%	<33%
	% Individuals as Piscivores	>8%	3.0-8.0%	<3.0%
Fish Abundance & Condition	Number of Individuals per Seine Haul	>48	37-48	<37
	Number of Individuals per Minute Electrofishing	>5	2.5-5	<2.5
	% Individuals as Non-Native Species	<1.4%	1.4-2.7%	>2.7%
	% Individuals w/Disease or other Anomaly	<0.6%	0.6-1.0%	>1.0

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An image of the worksheet that determines the fish community metrics for Ecoregions 33 and 35

Sample #:
Station ID
Date
Ecoregion
Basin Size
Electroshock Duration (seconds)
Number of Seine Hauls

Metric Category	Metric Name	Raw Value	Scoring Criteria 5	3	1	IBI Score
Species Richness & Composition	Total Number of Fish Species		#VALUE!	#VALUE!	#VALUE!	#VALUE!
	Number of Native Cyprinid Species					0
	Number of Sensitive Invertivore Species					0
	Number of Sunfish Species					0
	Number of Intolerant Species					0
	% individuals as Tolerant Species (excluding Western Mosquitofish)					0
Trophic Composition	% individuals as Omnivores					0
	% individuals as Invertivores					0
	% individuals as Piscivores					0
Fish Abundance & Condition	Number of individuals per Seine Haul					0
	Number of individuals per Minute Electrofishing					0
	% individuals as Non-Native Species					0
	% individuals w/Disease or other Anomaly					0
					TOTAL	#VALUE!
					A.U. Designation	#VALUE!

Metric Category	Metric Name	Criteria 5	3	1
Species Richness & Composition	Total Number of Fish Species		See Figure	
	Number of Native Cyprinid Species	>4	2-4	<2
	Number of Sensitive Invertivore Species	>4	3-4	<3
	Number of Sunfish Species	>4	3-4	<3
	Number of Intolerant Species	>3	2-3	<2
	% individuals as Tolerant Species (excluding Western Mosquitofish)	<20%	20-50%	>50%
Trophic Composition	% individuals as Omnivores	<8%	9-16%	>16%
	% individuals as Invertivores	>65%	33-65%	<33%
	% individuals as Piscivores	>8%	5-8%	<5%
Fish Abundance & Condition	Number of individuals per Seine Haul	>28	14-28	<14
	Number of individuals per Minute Electrofishing	>7.3	3.0-7.3	<3.0
	% individuals as Non-Native Species	<1.4%	1.4-2.7%	>2.7%
	% individuals w/Disease or other Anomaly	<0.6%	0.6-1.0%	>1.0

	1	10	100	1000	TMI/Site
Line 1	4.5	6.5	8.5	11	
Line 2	9.9	13	16	18	
Line 3	15	19	23	28	
This Site					

Species Richness/Watershed Area regression lines solved for species given the watershed area.
5 #VALUE!
3 #VALUE!
1 #VALUE!

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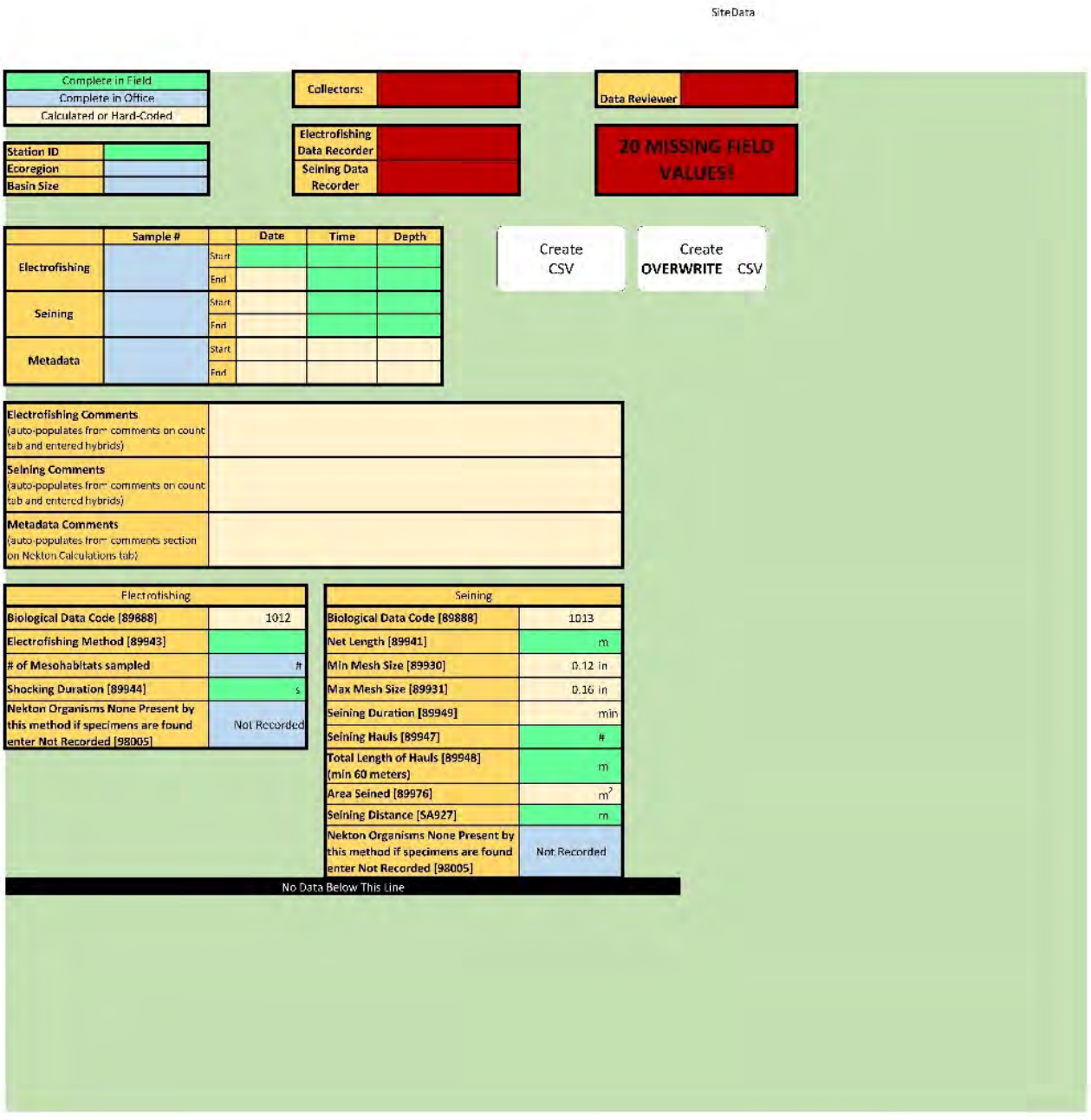
Image of the summary page for the Biological Seining and shocking electronic data sheet. The form includes the site, date and time of sampling. The method of shocking, the number of mesohabitats sampled, the duration of shocking and whether no organisms were present. The seining information collected includes net length, minimum and maximum mesh size, seining duration, number of seine hauls, total length of seine hauls, area seined distance and whether no organisms were detected.



SiteData

Complete in Field
Complete in Office
Calculated or Hard-Coded

Collectors:

Data Reviewer

Station ID
Ecoregion
Basin Size

Electrofishing Data Recorder
Seining Data Recorder

20 MISSING FIELD VALUES!

	Sample #		Date	Time	Depth
Electrofishing		Start			
		End			
Seining		Start			
		End			
Metadata		Start			
		End			

Create CSV

Create OVERWRITE CSV

Electrofishing Comments (auto-populates from comments on count tab and entered hybrids)	
Seining Comments (auto-populates from comments on count tab and entered hybrids)	
Metadata Comments (auto-populates from comments section on Nekton Calculations tab)	

Electrofishing	
Biological Data Code [89888]	1012
Electrofishing Method [89943]	
# of Mesohabitats sampled	#
Shocking Duration [89944]	s
Nekton Organisms None Present by this method if specimens are found enter Not Recorded [98005]	Not Recorded

Seining	
Biological Data Code [89888]	1013
Net Length [89941]	m
Min Mesh Size [89930]	0.12 in
Max Mesh Size [89931]	0.16 in
Seining Duration [89949]	min
Seining Hauls [89947]	#
Total Length of Hauls [89948] (min 60 meters)	m
Area Seined [89976]	m^2
Seining Distance [SA927]	m
Nekton Organisms None Present by this method if specimens are found enter Not Recorded [98005]	Not Recorded

No Data Below This Line

F302_Rev07

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Image of the data entry page used to document fish species found during electrofishing sampling.

ElectroCount

Electrofishing Fish Community Data

Help

0 | +1 | +5 | -1 | -5 | Clear/Reset

Recent Changes to Fish Counts (newest to oldest)

Common Carp	Mimic Shiner	Spotted Bass	Channel Catfish	Suckermouth Catfish
Golden Shiner	Ghost Shiner	Largemouth Bass	Blue Catfish	*Pterygoplichthys* sp.
Burrhead Chub	Sand Shiner	Guadalupe Bass	Black Bullhead	Rio Grande Cichlid
Texas Shiner	Bullhead Minnow	Smallmouth Bass	Yellow Bullhead	Mozambique Tilapia
Ribbon Shiner	Fathead Minnow	Warmouth	Flathead Catfish	Blue Tilapia
Blacktail Shiner	Central Stoneroller	Green Sunfish	Tadpole Madtom	Red Belly Tilapia
Red Shiner	Goldfish	Redspotted Sunfish	Freckled Madtom	American Eel
Weed Shiner	Western Mosquitofish	Redear Sunfish	Texas Logperch	Blackstripe Topminnow
River Carpsucker	Sailfin Molly	Bluegill Sunfish	Bigscale Logperch	Inland Silverside
Grey Redhorse	Amazon Molly	Orangespotted Sunfish	River Darter	Mexican Tetra
Smallmouth Buffalo	Green Swordtail	Redbreast Sunfish	Orangethroat Darter	Alligator Gar
Mountain Mullet	Gizzard Shad	Longear Sunfish	Greenthroat Darter	Spotted Gar
White Mullet	Threadfin Shad	White Crappie	Slough Darter	Longnose Gar
Striped Mullet	White Bass	Freshwater Drum		
New Hybrid	New Hybrid	New Hybrid	New Disease	New Disease

Electrofishing Comments:

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Image of the data entry page used to document fish species found during seine sampling.

Appendix E: Chain of Custody Forms

(Most Recent Revision)

Check for Review by Field Staff
(Initial/Date) ☐
_____

SAN ANTONIO RIVER AUTHORITY
24 Hour Composite Field Sheet
(15 Minute Increments)

Sample No.(s):_____ **Tag Id:**_____ **Matrix:** ☐NPW

Station Id: (_____-_____) **Station Location:** _____

Program Code: ☐ CRP ☐SARA_SM ☐TXDOT_Storm ☐PC ☐National Parks Service ☐Other (Specify) _____

Sample Type: ☐ BS ☐ BE ☐BF ☐RT ☐Pollution Complaint ☐SS ☐Other (Specify): _____

Monitoring Type 2: _____ **Collection Method:** ☒Composite

Submitting Entity: _____ **Collecting Entity:** _____

Start Date:_____ **Start Time:**_____ **Start Depth:**_____ **Category:** T **Type:** 97

End Date:_____ **End Time:**_____ **End Depth:**_____

Collector(s) Signature(s):_____

# of Containers/Container Type: NA – Not Applicable

Field Use Only		
Flow Performed at Deployment: ☐	**Flow performed at Retrieval:** ☐	**Flow Sample #:** _____
Electrofishing Sample #:_____	**Seining Sample #:** _____	**Metadata Sample #:** _____
Habitat Sample #: _____	**Benthic Sample #:** _____	
Meter: ☐EXO1 ☐EXO2		

Instrument #:	Instrument Calibration Date: Signature:	Post Calibration Date: Signature:

Date / Time Deployed	Deployed by Signature(s)	Date / Time Retrieved	Retrieved By Signature(s)

FIELD PARAMETERS – 24 Hour

Parameter	Code	Value	Parameter	Code	Value
Maximum Dissolved Oxygen	89856	mg/L	Maximum Conductivity	00213	µS/cm
Mean Dissolved Oxygen	89857	mg/L	Mean Conductivity	00212	µS/cm
Minimum Dissolved Oxygen	89855	mg/L	Minimum Conductivity	00214	µS/cm
Dissolved Oxygen Measurements	89858	#	Conductivity Measurements	00222	#
Maximum Temperature	00210	°C	Maximum pH	00215	S.U.
Mean Temperature	00209	°C	Minimum pH	00216	S.U.
Minimum Temperature	00211	°C	Measurements pH	00223	#
Temperature Measurements	00221	#			

COMMENTS: _____

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CHAIN OF CUSTODY

Relinquished By:_____ Date:_____ Time:_____

Received By:_____ Date:_____ Time:_____

Relinquished By:_____ Date:_____ Time:_____

Received By:_____ Date:_____ Time:_____

LABELS

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SAN ANTONIO RIVER AUTHORITY
Biological Sampling Chain-of-Custody

Review by Field Staff (Initial/Date)

Collector(s) Signature(s):_____

Biological Data Code (89888)	Tag ID	Sample #	Station ID	Date	Time	Depth	Program Code	Sample Type	Matrix	Category	Type	Collection Method	
1012 Fish Community **Electrofishing**				Start: End:	Start: End:	Start: End:			NPW	B	CN	Composite	
		Field Comments:											
1013 Fish Community **Seining**				Start: End:	Start: End:	Start: End:			NPW	B	CN	Composite	
		Field Comments:											
1011 Biological **Metadata**				Start: End:	Start: End:	Start: End:			NPW	B	CN	Composite	**Voucher Specimens:** # of Containers: _____ Preservation: ☐ Ethanol ☐ Formalin ☐ Other
		Field Comments:											
2011 **Benthic** Worksheet				Start: End:	Start: End:	Start: End:			NPW	B	CN	Composite	# of Subsamples ___ Preservation Method ☐ Alcohol
		Field Comments:											
3011 Stream Physical **Habitat**				Start: End:	Start: End:	Start: End:			Habitat	B	CN	Composite	# of Containers N/A Preservation Method ☒ N/A
		Field Comments:											

COC Comments (Applies to ALL samples on page):
Monitoring Type 2:

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CHAIN OF CUSTODY

Relinquished by: _____ Date: _____ Time: _____

Received by: _____ Date: _____ Time: _____

Relinquished by: _____ Date: _____ Time: _____

Received by: _____ Date: _____ Time: _____

SAN ANTONIO RIVER AUTHORITY

Routine Watershed Monitoring Chain-of-Custody

Check for Review by Field Staff (Initial/Date)

Collector(s) Signature(s): ______________________ Instrument # ____________

[1] Observed/corrected temperature (ID: C01-096) [2] pH Paper F013-22.1 Sample Temperature (°C)[1]: ____ / ____ H_2SO_4 Reagent #: R ________ [3] Specify container type for Other

Sample #	Station ID	Collection Date	Collection Time	Program Code	Sample Type	Monitoring Type 2	Collection Method	Matrix	End Depth	# of Containers/ Container Type/Container ID	Type of Field Preservation	Requested Analysis	pH <2 (Y/N/ NA)[2]
										GC – Gallon Cubitainer	Ice HNO_3 H_2SO_4 Filtered		
Field Comments:										QC – Quart Cubitainer	Ice HNO_3 H_2SO_4 Filtered		
										LW – Large Whirlpak (Lot: ____)	Ice		
										AB – Amber Plastic	Ice HNO_3 H_2SO_4 Filtered		
										Other[3]	Ice HNO_3 H_2SO_4 Filtered		
Lab Comments:										Other[3]	Ice HNO_3 H_2SO_4 Filtered		
										☐Field Parameters	☐Flow		
										GC – Gallon Cubitainer	Ice HNO_3 H_2SO_4 Filtered		
Field Comments:										QC – Quart Cubitainer	Ice HNO_3 H_2SO_4 Filtered		
										LW – Large Whirlpak (Lot: ____)	Ice		
										AB – Amber Plastic	Ice HNO_3 H_2SO_4 Filtered		
										Other[3]	Ice HNO_3 H_2SO_4 Filtered		
Lab Comments:										Other[3]	Ice HNO_3 H_2SO_4 Filtered		
										☐Field Parameters	☐Flow		
										GC – Gallon Cubitainer	Ice HNO_3 H_2SO_4 Filtered		
Field Comments:										QC – Quart Cubitainer	Ice HNO_3 H_2SO_4 Filtered		
										LW – Large Whirlpak (Lot: ____)	Ice		
										AB – Amber Plastic	Ice HNO_3 H_2SO_4 Filtered		
										Other[3]	Ice HNO_3 H_2SO_4 Filtered		
Lab Comments:										Other[3]	Ice HNO_3 H_2SO_4 Filtered		
										☐Field Parameters	☐Flow		
										GC – Gallon Cubitainer	Ice HNO_3 H_2SO_4 Filtered		
Field Comments:										QC – Quart Cubitainer	Ice HNO_3 H_2SO_4 Filtered		
										LW – Large Whirlpak (Lot: ____)	Ice		
										AB – Amber Plastic	Ice HNO_3 H_2SO_4 Filtered		
										Other[3]	Ice HNO_3 H_2SO_4 Filtered		
Lab Comments:										Other[3]	Ice HNO_3 H_2SO_4 Filtered		
										☐Field Parameters	☐Flow		
										GC – Gallon Cubitainer	Ice HNO_3 H_2SO_4 Filtered		
Field Comments:										QC – Quart Cubitainer	Ice HNO_3 H_2SO_4 Filtered		
										LW – Large Whirlpak (Lot: ____)	Ice		
										AB – Amber Plastic	Ice HNO_3 H_2SO_4 Filtered		
										Other[3]	Ice HNO_3 H_2SO_4 Filtered		
Lab Comments:										Other[3]	Ice HNO_3 H_2SO_4 Filtered		
										☐Field Parameters	☐Flow		

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Sample #	Station ID	Collection Date	Collection Time	Program Code	Sample Type	Monitoring Type 2	Collection Method	Matrix	End Depth	# of Containers/ Container Type/Container ID	Type of Field Preservation	Requested Analysis	pH <2 (Y/N/ NA)[1]
										GC – Gallon Cubitainer	Ice HNO_3 H_2SO_4 Filtered		
Field Comments:										QC – Quart Cubitainer	Ice HNO_3 H_2SO_4 Filtered		
										LW – Large Whirlpak (Lot:)	Ice		
										AB – Amber Plastic	Ice HNO_3 H_2SO_4 Filtered		
										Other[2]	Ice HNO_3 H_2SO_4 Filtered		
Lab Comments:										Other[2]	Ice HNO_3 H_2SO_4 Filtered		
										☐Field Parameters	☐Flow		
										GC – Gallon Cubitainer	Ice HNO_3 H_2SO_4 Filtered		
Field Comments:										QC – Quart Cubitainer	Ice HNO_3 H_2SO_4 Filtered		
										LW – Large Whirlpak (Lot:)	Ice		
										AB – Amber Plastic	Ice HNO_3 H_2SO_4 Filtered		
										Other[2]	Ice HNO_3 H_2SO_4 Filtered		
Lab Comments:										Other[2]	Ice HNO_3 H_2SO_4 Filtered		
										☐Field Parameters	☐Flow		
										GC – Gallon Cubitainer	Ice HNO_3 H_2SO_4 Filtered		
Field Comments:										QC – Quart Cubitainer	Ice HNO_3 H_2SO_4 Filtered		
										LW – Large Whirlpak (Lot:)	Ice		
										AB – Amber Plastic	Ice HNO_3 H_2SO_4 Filtered		
										Other[2]	Ice HNO_3 H_2SO_4 Filtered		
Lab Comments:										Other[2]	Ice HNO_3 H_2SO_4 Filtered		
										☐Field Parameters	☐Flow		
										GC – Gallon Cubitainer	Ice HNO_3 H_2SO_4 Filtered		
Field Comments:										QC – Quart Cubitainer	Ice HNO_3 H_2SO_4 Filtered		
										LW – Large Whirlpak (Lot:)	Ice		
										AB – Amber Plastic	Ice HNO_3 H_2SO_4 Filtered		
										Other[2]	Ice HNO_3 H_2SO_4 Filtered		
Lab Comments:										Other[2]	Ice HNO_3 H_2SO_4 Filtered		
										☐Field Parameters	☐Flow		

CHAIN OF CUSTODY

Relinquished By:____________________ Date:__________ Time:__________

Received By:____________________ Date:__________ Time:__________

Relinquished By:____________________ Date:__________ Time:__________

Received By:____________________ Date:__________ Time:__________

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Benthic Macroinvertebrate Chain-of-Custody

SAN ANTONIO RIVER AUTHORITY

Station ID	Sample ID	Relinquish (SARA) Date/Time/Initials	Received (Bio-West) Date/Time/Initials	Relinquish (Bio-West) Date/Time/Initials	Received (SARA) Date/Time/Initials

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Appendix F: Data Review Checklist and Summary Shells

Data Review Checklist

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

Data Format and Structure	Y, N, or N/A
Are there any duplicate Tag Id numbers in the Events file?	
Do the Tag prefixes correctly represent the entity providing the data?	
Have any Tag Id numbers been used in previous data submissions?	
Are Tag IDs associated with a valid SLOC?	
Are sampling Dates in the correct format, MM/DD/YYYY with leading zeros?	
Are sampling Times based on the 24 hr clock (e.g., 09:04) with leading zeros?	
Is the Comments field filled in where appropriate (e.g., unusual occurrence, sampling problems, unrepresentative of ambient water quality)?	
Are Submitting Entity, Collecting Entity, and Monitoring Type codes used correctly?	
Do sampling dates in the Results file match those in the Events file for each Tag Id?	
Are values represented by a valid parameter code with the correct units?	
Are there any duplicate parameter codes for the same Tag Id?	
Are there any invalid symbols in the Greater Than/Less Than (GT/LT) field?	
Are there any Tag Ids in the Results file that are not in the Events file or vice versa?	
Data Quality Review	Y, N, or N/A
Are “less-than” values reported at the LOQ? If no, explain in Data Summary.	
Have the outliers been verified and a "1" placed in the Verify_flg field?	
Have checks on correctness of analysis or data reasonableness been performed? e.g., Is ortho-phosphorus less than total phosphorus? Are dissolved metal concentrations less than or equal to total metals? Is the minimum 24 hour DO less than the maximum 24 hour DO? Do the values appear to be consistent with what is expected for site?	
Have at least 10% of the data in the data set been reviewed against the field and laboratory data sheets?	
Are all parameter codes in the data set listed in the QAPP?	
Are all stations in the data set listed in the QAPP?	
Documentation Review	Y, N, or N/A
Are blank results acceptable as specified in the QAPP?	
Were control charts used to determine the acceptability of lab duplicates (if applicable)?	
Was documentation of any unusual occurrences that may affect water quality included in the Event file’s Comments field?	
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.	
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.	
Was the laboratory’s NELAP Accreditation current for analysis conducted?	
Did participants follow the requirements of this QAPP in the collection, analysis, and reporting of data?	

Data Summary
Data Set Information

Data Source: _____

Date Submitted: _____

Tag_id Range: _____

Date Range: _____

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

Planning Agency Data Manager: _____ Date: _____

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

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

Dataset ___ contains data from FY__ QAPP Submitting Entity code __ and collecting entity __. This is field and lab data that was collected by the (collecting entity). Analyses were performed by the (lab name). The following tables explain discrepancies or missing data as well as calculated data loss.

Discrepancies or missing data for the listed tag ID:

Tag ID	Station ID	Date	Parameters	Type of Problem	Comment/PreCAPs/CAPs

Data Loss

Parameter	Missing Data points out of Total	Percent Data Loss for this Dataset	Parameter	Missing Data points out of Total	Percent Data Loss for this Dataset