From: Jason Natho <Jason.Natho@tceq.texas.gov>
Sent: Tuesday, May 30, 2023 9:18 AM
To: Marcella Lanzillotti <Marcella.Lanzillotti@tceq.texas.gov>
Cc: Samantha Litchke <Samantha.Litchke@tceq.texas.gov>; Jody Koehler <Jody.Koehler@tceq.texas.gov>; Heather Robinson <Heather.Robinson@tceq.texas.gov>; Maria Trevino <Maria.Trevino@tceq.texas.gov>
Subject: RE: Amendment #1 to Texas Stream Team Monitoring QAPP R1 (Expedited)

Good morning Marcella,

The subject amendment is approved effective today, May 30, 2023. Please cc Jody and I when you send to EPA.

Thank you,

Jason Natho
NPS Lead Quality Assurance Specialist
Quality Assurance Team
Laboratory and Quality Assurance Section

From: Marcella Lanzillotti <Marcella.Lanzillotti@tceq.texas.gov>
Sent: Thursday, May 18, 2023 11:51 AM
To: Jason Natho <Jason.Natho@tceq.texas.gov>
Cc: Samantha Litchke <Samantha.Litchke@tceq.texas.gov>; Jody Koehler <Jody.Koehler@tceq.texas.gov>
Subject: Amendment #1 to Texas Stream Team Monitoring QAPP R1 (Expedited)

Hi Jason,

Please see below for an amendment 1 to the Texas Stream Team Program Surface Water Quality Monitoring QAPP R1. I have formatted this as an expedited amendment. If you would like this changed or have any questions, please let me know.

As a reminder, the contractor does not submit their community scientist water quality data to TCEQ, only to EPA. Therefore, DM&A does not need to review the amendment.

Thank you,
Marcella
--
Marcella Lanzillotti (she/her)
Project Manager | Nonpoint Source Program
Texas Commission on Environmental Quality
marcella.lanzillotti@tceq.texas.gov | (512) 239-1712

Amendment 1
to the Texas Stream Team Program Surface Water Quality Monitoring Quality Assurance Project Plan (QAPP)
Revision #1

The Meadows Center for Water and the Environment, Texas State University
San Marcos, Texas 78666

Funding Source: Nonpoint Source Program CWA §319(h)

Prepared in cooperation with the Texas Commission on Environmental Quality
and the U.S. Environmental Protection Agency
Federal ID #~~99614623, 99614624,~~ 99614625, 99614626
QTRAK #23-057

Effective Date: Upon date of final approval of the amendment

Questions concerning this QAPP should be directed to:

Aspen Navarro
Project Manager
The Meadows Center for Water and the Environment, Texas State University
601 University Drive, San Marcos, Texas 78666
(512) 245-7376
aspennavarro@txst.edu

Justification:
This QAPP amendment is taking place in response to the Nonconformance Report (#1) and Corrective Action Plan issued February 21, 2023. The 2020 Texas Stream Team Core Water Quality Citizen Scientist Manual, Standard Core Field Guide, and Standard Core Salinity Field Guide were revised with updated pH monitoring protocols. The three revised documents have been uploaded to the Texas Stream Team website and the previous versions of those documents were replaced with the current, revised ones.

Summary of Changes:

Section	QAPP Page #	Change	Justification
Cover Page	1	Removed Federal ID numbers 99614623 and 99614624 (see above).	There are no active QAPPs in the two grant years.
A7	19	Updated Table A7.1 Reference *TST Core Water Quality Citizen Scientist Manual* date from "August 2020" to "May 2023."	To reflect the manual revision.
Appendix F	61	Updated hyperlink and reference to the 2020 Texas Stream Team Core Water Quality Citizen Scientist Manual from "August 2020" to "May 2023."	To reflect manual revision.
Appendix F	61	Updated hyperlink to the Standard Core Field Guide.	To reflect guide revision.
Appendix F	61	Updated hyperlink to the Standard Core Salinity Field Guide.	To reflect guide revision.

Detail of Changes:

A7 QUALITY OBJECTIVES AND CRITERIA

Table A7.1 References

- TST SOP: TST Core Water Quality Citizen Scientist Manual, ~~August 2020~~ May 2023; TST Advanced Water Quality Citizen Scientist Manual, April 2019; TST Field Guide(s).

APPENDIX F. TEXAS STREAM TEAM MANUALS, FIELD GUIDES, TRAINER ENROLLMENT FORM, AND MAINTENANCE GUIDES

Manuals
~~2020 Texas Stream Team Core Water Quality Citizen Scientist Manual (August 2020)~~
2023 Texas Stream Team Core Water Quality Citizen Scientist Manual (May 2023)
E. coli Bacteria Water Quality Citizen Scientist Manual (coming soon)
Texas Stream Advanced Water Quality Citizen Scientist Manual (April 2019)
Texas Stream Team Riparian Evaluation Citizen Scientist Manual (January 2022)

Texas Stream Team Macroinvertebrate Bioassessment Citizen Scientist Manual (coming soon)

Field Guides
~~Standard Core Field Guide~~
Standard Core Field Guide
~~Standard Core Salinity Field Guide~~
Standard Core Salinity Field Guide
Probe Core Field Guide
E. coli Bacteria Field Guide
Advanced Field Guide – Nitrate-Nitrogen & Turbidity
Advanced Field Guide – Orthophosphate
Advanced Field Guide – Streamflow Estimate
Macroinvertebrate Bioassessment Field Guide (coming soon)

Distribution: QAPP Amendments will be distributed to all personnel on the original QAPP by the contractor Project Manager. Records of distribution will be maintained by the Texas State University (TXST), the Texas Stream Program (TST), and documentation of distribution must be available upon request in the event of an audit.

Adherence Letters: The TXST TST will secure written documentation from additional project participants stating the organization's awareness of and commitment to requirements contained in this QAPP amendment if applicable. The TXST TST will maintain this documentation as part of the project's quality assurance records. This documentation will be available for review in the event of an audit. Copies of this documentation will also be submitted as deliverables to the TCEQ NPS Project Manager within 30 days of final TCEQ approval of the QAPP Amendment.

Approval: The changes are effective upon final approval of the amendment. These changes will be incorporated into the full QAPP document during the annual review certification on the QAPP anniversary date. The TCEQ and TXST TST acknowledge and accept these changes by approval through e-mail.

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

December 2, 2022

Aspen Navarro
Project Manager
The Meadows Center for Water and the Environment, Texas State University
601 University Drive
San Marcos, Texas 78666

Re: Approval: Texas Stream Team Program Surface Water Quality Monitoring Project Quality Assurance Project Plan, Revision 1

Federal Grant# 99614623, 99614624, 99614625, and 99614626

Dear Ms. Navarro:

The above-referenced Quality Assurance Project Plan (QAPP) was approved today, December 2, 2022. The Nonpoint Source (NPS) Project Manager will send you the approved QAPP and approval letter.

Please ensure the QAPP and any subsequent amendments are distributed in a timely manner to the appropriate entities listed in Section A3 of the QAPP. Documentation of distribution must be available for review during a quality system audit.

Should you have questions, feel free to contact me at jason.natho@tceq.texas.gov.

Sincerely,

Jason Natho
Lead NPS Quality Assurance Specialist
MC-165

Enclosure

cc: Marcella Lanzillotti, TCEQ NPS Project Manager, MC-203
Samantha Litchke, TCEQ NPS QA Coordinator, MC-203

TEXAS STREAM TEAM PROGRAM
Surface Water Quality Monitoring Project
Quality Assurance Project Plan
Revision 1

Funding Source:

Nonpoint Source Program Clean Water Act §319(h)
Prepared in cooperation with the Texas Commission on Environmental Quality
and the U.S. Environmental Protection Agency
Federal ID #99614623, 99614624, 99614625, 99614626
QTRAK#_____

Effective Period: Three years from date of final approval

Questions concerning this Quality Assurance Project Plan should be directed to:

Aspen Navarro
Project Manager
The Meadows Center for Water and the Environment, Texas State University
601 University Drive, San Marcos, Texas 78666
(512) 245-7376
aspennavarro@txst.edu

A1 APPROVAL PAGE

By signing this document, signatories acknowledge their respective organizations' awareness of and adherence to requirements contained in this Quality Assurance Project Plan (QAPP) in accordance with roles and responsibilities as described in Section A4 Project/Task Organization and throughout.

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY (TCEQ)

Monitoring Division
Laboratory and Quality Assurance Section

D. Jody Koehler — 12/02/2022
D. Jody Koehler — Date
TCEQ Quality Assurance Manager

Jason Natho — 12/2/2022
Jason Natho — Date
Lead Nonpoint Source Quality Assurance Specialist

Water Quality Planning Division

Faith Hambleton — 12/2/2022
Faith Hambleton, Team Leader — Date
Nonpoint Source Program

Samantha Litchke — 12/1/2022
Samantha Litchke, Nonpoint Source Quality Assurance Coordinator — Date
Nonpoint Source Program

Marcella Lanzillotti — 11/17/2022
Marcella Lanzillotti, Nonpoint Source Project Manager — Date
Nonpoint Source Program

Texas State University (TXST), Texas Stream Team (TST) Program

Aspen Navarro 11/16/2022

Aspen Navarro Date
Project Manager

Sandra Arismendez 11/16/2022

Sandra Arismendez Date
Quality Assurance Officer

Laura Parchman 11/16/2022

Laura Parchman Date
Data Manager

A2 TABLE OF CONTENTS

List of Acronyms

AWRL	**Ambient Water Reporting Limit**
BMP	**Best Management Practice**
CAP	**Corrective Action Plan**
CRWN	**Colorado River Watch Network**
EPA	**United States Environmental Protection Agency**
GIS	**Geographic Information System**
LCRA	**Lower Colorado River Authority**
LOQ	**Limit of Quantitation**
NPS	**Nonpoint Source**
QA/QC	**Quality Assurance/Quality Control**
QAO	**Quality Assurance Officer**
QAPP	**Quality Assurance Project Plan**
QAS	**Quality Assurance Specialist**
QMP	**Quality Management Plan**
SOP	**Standard Operating Procedure**
SWQM	**Surface Water Quality Monitoring**
TCEQ	**Texas Commission on Environmental Quality**
TST	**Texas Stream Team**
TXST	**Texas State University**
VWQM	**Volunteer Water Quality Monitoring**
WQX	**Water Quality Exchange**

A3 DISTRIBUTION LIST

The Lead Nonpoint Source Quality Assurance Specialist will provide approved versions of this QAPP and any amendments or revisions to the TCEQ Nonpoint Source Project Manager. The TCEQ Nonpoint Source Project Manager will provide approved copies to the Texas Stream Team (TST) Project Manager and U.S. Environmental Protection Agency Project Officer within two weeks of approval. The TCEQ Nonpoint Source Project Manager will document transmittal of the plan and maintain this documentation as part of the project's quality assurance records. This documentation will be available for review.

Anthony Suttice, Project Officer
U.S. Environmental Protection Agency Region 6
suttice.anthony@epamail.epa.gov
(214) 665-8590

The TST will provide copies of this project plan and any amendments or revisions of this plan to each project participant defined in the list below. The TST will document receipt of the plan by each participant and maintain this documentation as part of the project's quality assurance records. This documentation will be available for review.

Texas Stream Team
The Meadows Center for Water and the Environment
601 University Drive
San Marcos, TX 78666

Aspen Navarro, Project Manager
(512) 245-7376
aspennavarro@txstate.edu

Sandra Arismendez, Quality Assurance Officer
(512) 245-8570
sandra.arismendez@txstate.edu

Laura Parchman, Data Manager
(512) 245-3461
l.parchman@txstate.edu

Texas Stream Team Partners
For a complete list of partners, visit the Partners List on the TST's website at https://www.meadowscenter.txst.edu/Leadership/TexasStreamTeam/Partners.html

A4 PROJECT/TASK ORGANIZATION

TCEQ
Monitoring Division
Jason Natho, Lead Nonpoint Source Quality Assurance Specialist
Assists the TCEQ Nonpoint Source Project Manager in quality assurance related issues. Participates in the planning, development, approval, implementation, and maintenance of the QAPP. Determines conformance with program quality system requirements. Coordinates or performs audits as necessary and using a wide variety of assessment guidelines and tools. Concurs with proposed corrective actions and verifications. Provides technical expertise and/or consultation on quality services. Recommends to TCEQ management that work be stopped to safeguard project and programmatic objectives, worker safety, public health, or environmental protection.

Water Quality Planning Division
Faith Hambleton, Team Leader
Nonpoint Source Program
Responsible for management and oversight of the TCEQ Nonpoint Source Program. Oversees the development of quality assurance guidance for the Nonpoint Source program to be sure it is within pertinent frameworks of the TCEQ. Monitors the effectiveness of the program quality system. Reviews and approves all Nonpoint Source projects, internal quality assurance audits, program corrective actions, work plans, and contracts. Enforces program corrective action, as required. Ensures Nonpoint Source personnel are fully trained and adequately staffed.

Marcella Lanzillotti
TCEQ Nonpoint Source Project Manager
Maintains a thorough knowledge of work activities, commitments, deliverables, and time frames associated with projects. Develops lines of communication and working relationships between the contractor, the TCEQ, and the U.S. Environmental Protection Agency. Tracks deliverables to ensure that tasks are completed as specified in the contract. Responsible for ensuring that the project deliverables are submitted on time and are of acceptable quality and quantity to achieve project objectives. Serves on planning team for Nonpoint Source Program projects. Provides contractor with most recent version of QAPP shell document. Participates in the development, approval, implementation, and maintenance of the QAPP. Conducts independent technical review of the QAPP to ensure compliance with project needs/requirements. Responsible for verifying that the approved QAPP is implemented by the contractor. Notifies the Lead Nonpoint Source Quality Assurance Specialist and Nonpoint Source Data Manager of circumstances which adversely affect the quality of data derived from the collection and analysis of samples. Monitors and enforces corrective action.

Samantha Litchke
Nonpoint Source Quality Assurance Coordinator
Assists Lead Nonpoint Source Quality Assurance Specialist with Nonpoint Source Quality Assurance management. Serves as liaison between Nonpoint Source Program management and TCEQ Quality Assurance management. Responsible for Nonpoint Source guidance development related to program QA. Assists with development and maintenance of data management-related standard operating procedures for Nonpoint Source data management. Participates in the development, approval, implementation, and maintenance of the QAPP. Provides input and oversight regarding corrective actions. Maintains record of corrective actions.

Texas State University
TST

Aspen Navarro
TST Project Manager
Responsible for ensuring tasks and other requirements in the contract are executed on time and are of acceptable quality. Monitors and assesses the quality of work. Coordinates attendance at conference calls, training, meetings, and related project activities with the TCEQ. Responsible for verifying the QAPP is followed, and the project is producing data of known and acceptable quality. Ensures adequate training and supervision of all monitoring and data collection activities. Complies with corrective action requirements.

Sandra Arismendez
TST Quality Assurance Officer
Responsible for coordinating development and implementation of the quality assurance program. Responsible for ensuring the most recent version of the Nonpoint Source Program QAPP shell document is acquired from the TCEQ Nonpoint Source Project Manager and used for writing and maintaining the QAPP. Responsible for maintaining records of QAPP distribution, including appendices and amendments. Responsible for maintaining written records of sub-tier commitment to requirements specified in this QAPP. Responsible for identifying, receiving, and maintaining project quality assurance records. Responsible for coordinating with the TCEQ Nonpoint Source Project Manager to resolve quality assurance issues. Notifies the TST Project Manager and TCEQ Nonpoint Source Project Manager and documents circumstances which may adversely affect the quality of data. Coordinates the research and review of technical quality assurance material and data related to water quality monitoring system design and analytical techniques. Facilitates, conducts, and documents readiness reviews, monitoring and/or technical systems audits.

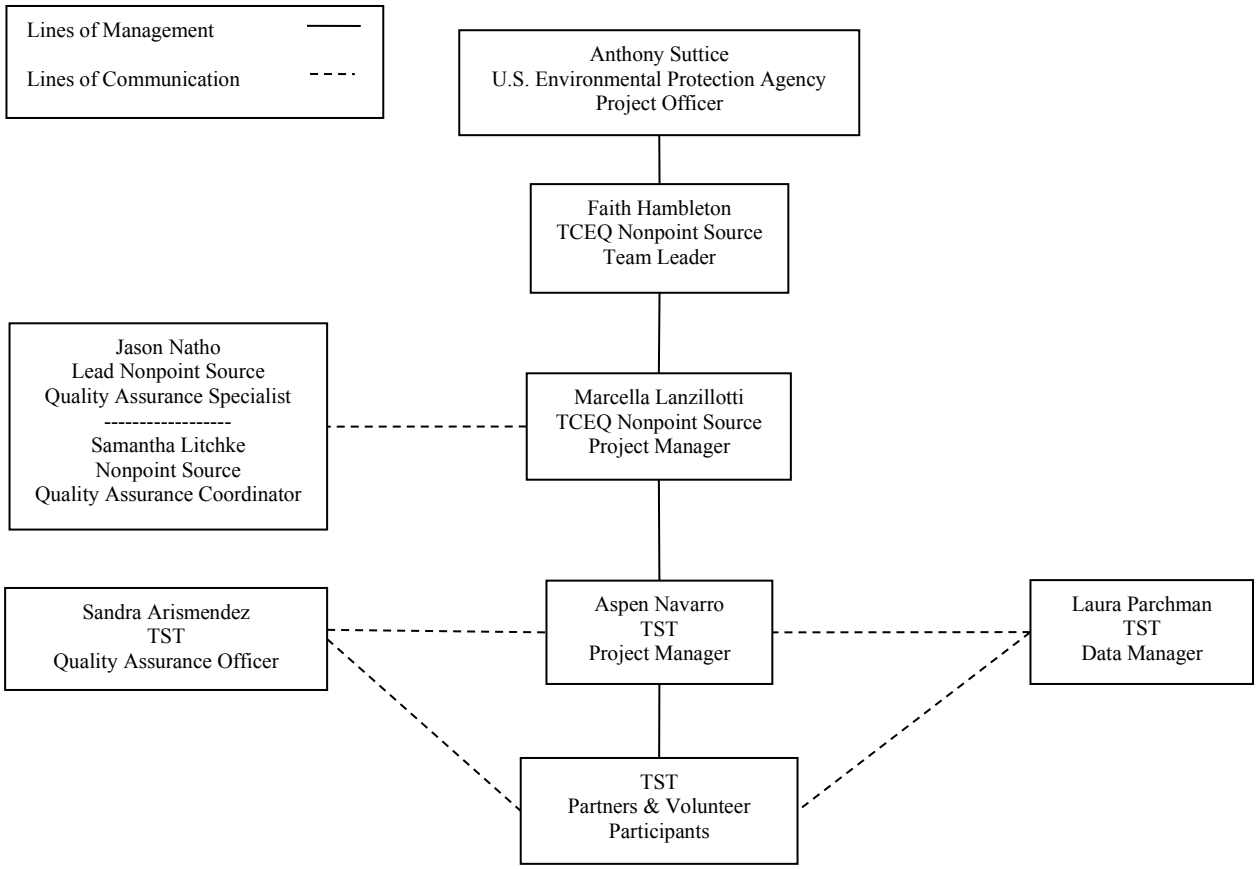
Laura Parchman
TST Data Manager
Oversees data management for the QAPP. Responsible for validation and verification of all data collected and acquired. Responsible for the acquisition, verification, and transfer of data to the U.S. Environmental Protection Agency's Water Quality Exchange database, the mechanism for data partners to submit water monitoring data to U.S. Environmental Protection Agency. Performs data quality assurances prior to transfer of data to Water Quality Exchange. Ensures data are submitted according to QAPP and work plan specifications. Provides the point of contact for the TCEQ Nonpoint Source Project Manager, TST Partners, and participating volunteers to resolve issues related to the data.

TST Partners
Ensure volunteer participants receive the resources and training needed to perform the water quality monitoring and coordinate monitoring activities in accordance with this QAPP. For a complete list of partners, visit the Partner List on the TST's website at https://www.meadowscenter.txst.edu/Leadership/TexasStreamTeam/Partners.html

U.S. Environmental Protection Agency Region 6

Anthony Suttice
U.S. Environmental Protection Agency Project Officer
Responsible for managing the Clean Water Act Section 319 funded grant on behalf of U.S. Environmental Protection Agency. Assists the TCEQ in approving projects that are consistent with the management goals designated under the State's Nonpoint Source Management Plan and meet federal guidance. Coordinates the review of project work plans, draft deliverables, and works with the State in making these items approvable. Meets with the State at least annually to evaluate the progress of each project and, when conditions permit, participates in project site visits. Fosters communication within U.S. Environmental Protection Agency by updating management and others, both verbally and in writing, on the progress of the State's program and on other issues as they arise. Assists in grant close-out procedures ensuring all deliverables have been satisfied prior to closing a grant.

Figure A4.1. Organization Chart - Lines of Communication



A5 PROBLEM DEFINITION/BACKGROUND

Five factors create the need for volunteer environmental monitoring in Texas:

1) Texas has many water bodies (about 11,247 rivers and streams large enough to be named) with 191,228 miles of rivers and streams.
2) Texas's population is projected to increase by 59% through the year 2030.
3) Senate Bill 818, the Clean Rivers Program, states there is a lack of sufficient water quality data for state and local governments to make environmentally sound decisions.
4) Nonpoint source pollution is a leading cause of environmental degradation, and volunteer environmental monitoring is a proven tool for teaching the public about nonpoint source pollution and their role in reducing and preventing it.
5) Many volunteers are becoming increasingly concerned about potentially harmful bacteria in waterways, swimming areas, and drinking water. The *2020 Texas Integrated Report of Surface Water Quality for Clean Water Act Sections 305(b) and 303(d)* assessed Texas water bodies across the state. A total of 1,009 assessed surface waters were identified as impaired by TCEQ for bacteria and may not be achieving designated uses and associated water quality standards.

A growing population and expanding economy have increased the levels of nonpoint source pollution entering Texas waters. Professional monitoring resources increasingly are drawn to water bodies with the most severe problems, straining the field resources responsible for ambient monitoring. TST provides, at an affordable cost, an expanded capacity to collect volunteer ambient water quality data and, consequently, the ability to identify potential environmental impacts associated with nonpoint source pollution. Volunteer monitoring, in effect, can help "free up" professional monitoring resources to address the most severe water quality problems without sacrificing ambient water quality monitoring of less impacted water bodies. The volunteer monitoring data can serve as a means of problem identification, or to direct professional scientists to water quality degradation that is occurring at a particular location.

The purpose of the QAPP is to delineate TST Quality Assurance policies and management structure used to implement the quality assurance requirements necessary to ensure that work products are of known and documented quality and deemed acceptable for their intended use. This process will ensure data submitted to TST have been collected and analyzed in a way that assures its reliability and therefore can be used for educational purposes, local decision-making, research, screening, best management practice effectiveness, a red-flag warning system to aid in problem identification, and other uses deemed appropriate by resource managers and the TCEQ. Data collected within this QAPP are not intended for use in enforcement proceedings. TST is implemented through a partnership between TXST, TCEQ, and the U.S. Environmental Protection Agency to support volunteers in the collection of valid, quality assured volunteer monitoring data. The project is funded through an inter-local contract between

TCEQ and TXST. The source of funds is Federal Clean Water Act Section 319, Nonpoint Source Pollution Program.

TST QAPP is an umbrella document covering volunteer monitoring programs administered under the program. This QAPP will support all participating volunteer groups and individuals who have completed the approved training certifications.

TST will utilize the established network of volunteers and partners to contribute to education, research, screening, problem identification, and planning through the Clean Rivers Program Coordinated Monitoring and Watershed Planning process. TXST's TST will coordinate these activities with local partners who will ensure monitoring, quality control, equipment, and data management conform to the TST QAPP. TXST's TST will recruit volunteers and partner organizations, and initiate trainings statewide as resources permit.

The Lower Colorado River Authority's Colorado River Watch Network (CRWN) is a partner program of TST. CRWN has their set of procedures and quality system for their volunteer monitoring program. CRWN procedures are included in Appendix G. As an independent entity which does not receive funding from the TCEQ or TXST, CRWN manages volunteers, conducts trainings, manages data, and supplies equipment for volunteers within the Colorado River Basin. However, TST has chosen to include CRWN information in this QAPP based on the following points: CRWN is considered part of the TST volunteer monitoring network, CRWN data is included in the TST database and CRWN volunteers and state-funded staff are counted as match for the TST Clean Water Act §319 grant project. Other ways in which TST partners exclusively with CRWN is through the 1) sharing of water quality data and 2) planning events.

This QAPP is reviewed and approved by the TCEQ to help ensure that environmental data generated for the purposes described above are of known and documented quality, deemed accepted for their intended use. This process will ensure that data submitted and uploaded to the TST Dataviewer have been collected and analyzed in a way that guarantees their reliability and can be used by programs deemed appropriate by the TCEQ.

A6 PROJECT/TASK DESCRIPTION

TST will conduct statewide volunteer monitoring using approved training certifications and data collection protocols. Volunteers in the CRWN program will follow CRWN protocols provided in Appendix G.

Monitoring site information in the TST Dataviewer is reviewed and updated throughout the year as needed based on current volunteer monitoring activities. Volunteers and trainers are trained to sample at least monthly as described in the corresponding training manual, field guide, and/or Training Enrollment Form.

Monitoring plans are created either electronically or in paper format when a group/volunteer wants to initiate water quality monitoring within a watershed. For monitoring groups, the following three roles are established and may be performed by one or more group leader:

- The Training Coordinator/Quality Assurance Officer is responsible for serving as the primary point of contact for TST or partner organizations, scheduling trainings and notifying TST of scheduled trainings, recruiting interested participants for trainings, and submitting training materials to TST. The Training Coordinator serves as the QAO and conducts quality control field-audit sessions with volunteer monitors every two-years. Trainers are required to attend the annual TST Trainer meeting or send an alternate if unable to attend. A Training Coordinator/QAO is required of each group. One person may fill two positions, but it is mandatory that the Training Coordinator/QAO and Data Coordinator are filled by different people.
- The Data Coordinator collects monitoring forms from group volunteers and uploads the data to the Waterways Dataviewer after reviewing each monitoring form. Data Coordinators should review and uphold the TST data management protocols described in Section B10. Data Management of this QAPP. However, it is mandatory that the Training Coordinator/QAO and Data Coordinator are filled by different people.
- The Equipment Coordinator is responsible for tracking and maintaining the monitoring equipment, managing kits checked out by monitors, restocking expired reagents and supplies, and conducting regular maintenance on equipment to ensure their longevity.

Monitoring plans include the following information:

- Locations of proposed new TST sites. These descriptions may include detailed written accounts of the exact location of the proposed site(s), the water body that will be monitored, nearby landmarks and whether it is located on private or public property. A latitude/longitude coordinate of each site is either provided by the Group/Partner coordinator or volunteer or is determined by TST staff using written site descriptions to locate the site via the Dataviewer and/or Google Earth.
- Contact information for the volunteer monitoring the site(s)
- Contact information of the three required TST roles, Training Coordinator/Quality Assurance Officer, Data Coordinator, and Equipment Coordinator
- Site ID numbers assigned by TST staff
- Volunteers provide further information about their overall goals, including addressing specific water quality concerns within their watershed as well as any additional groups that may receive water quality data other than TST and for what purpose.

The plans are reviewed for adherence with the QAPP and approved by the TST data manager and the project manager. A copy of the monitoring plan is sent to the participating partner and/or group and is stored electronically at the TST office. All monitoring site metadata are tracked, stored, and maintained within the TST Dataviewer. Monitoring plans are revised as needed depending on volunteer interest, funding, partner input or upon request.

Work associated with the project described in this QAPP has been on-going for several years and was covered under an existing QAPP set to expire on its third annual anniversary on December 17, 2022. We anticipate the tasks described below will start when the previous QAPP expires (December 17, 2022) or when this QAPP is approved, whichever comes first, and is estimated to be completed on December 17, 2025. All task, deliverable, and monitoring dates are estimates.

See Appendix A for a project location map.

For project-related tasks see scope of work and schedule of deliverables for contract #30176 provided as Appendix B.

Amendments

Amendments to the QAPP must be approved to reflect changes in project organization, tasks, schedules, objectives, and methods; address deficiencies and nonconformances; improve operational efficiency; and accommodate unique or unanticipated circumstances. Requests for amendments are directed from the TST Project Manager to the TCEQ NPS Project Manager in writing using the QAPP Amendment shell. The changes are effective immediately upon approval by the TCEQ QA Manager, TCEQ NPS Project Manager, and Lead NPS Quality Assurance Specialist, or their designees.

Amendments to the QAPP and the reasons for the changes will be documented, and full copies of amendments will be forwarded to all persons on the QAPP distribution list by the TST QAO. Amendments shall be reviewed, approved, and incorporated into a revised QAPP during the annual certification process or within 120 days of the initial approval in cases of significant changes.

Annual QAPP Reviews, Certifications, and Revisions

This QAPP shall be reviewed in its entirety and certified annually by the TST Project Manager and NPS Project Manager. A letter certifying this annual review must be submitted to the TCEQ NPS Project Manager no later than 90 days prior to the QAPP anniversary date to prevent QAPP expiration and interruption in work due to issuance of a stop work order. Amendments approved since QAPP approval must be included as an attachment along with the letter. Only nonsubstantive changes not affecting the project design or quality or quantity of work to be performed can be included in the annual certification letter. This includes organizational changes or schedule changes based on a contract amendment that do not impact data deliverables. If changes beyond these are necessary, a QAPP amendment must be submitted and approved

before the changes are implemented and before the annual review may be certified. The TCEQ NPS Project Manager is required to review the QAPP and provide certification of annual reviews to the TCEQ QA Manager and EPA Region 6 Project Officer no later than 30 days before QAPP anniversary date. If the QAPP expires, work described within this document must be halted.

If the project will extend beyond the third QAPP anniversary date, a full QAPP revision is required.

A7 QUALITY OBJECTIVES AND CRITERIA

This project will collect volunteer surface water quality (i.e., standard core, probe core, advanced, *E. coli* bacteria) and non-water quality (i.e., monofilament, riparian, and macroinvertebrate bioassessment) data. Volunteers located within the Lower Colorado Watershed follow the LCRA CRWN procedures and protocols for collecting surface water quality parameters provided in Appendix G. Three differences exist between TST and LCRA CRWN measurement protocols: phosphate, dissolved oxygen, and nitrate-nitrogen. The LCRA CRWN program does not include phosphate as a water quality monitoring parameter. For dissolved oxygen, LCRA CRWN volunteers have the option to perform a third titration if the first and second titrations have a difference larger than 0.5 mg/L. TST requires that Volunteers discard the results and begin again if the difference in the two titrations is larger than 0.5 mg/L. For nitrates, LCRA CRWN allows for an alternative option to measure nitrates using the CHEMets® Colorimeter method as outlined in more detail in the LCRA CRWN manual (Appendix G).

The measurement performance criteria to support the project objectives for the water and non-water quality data types are specified in Tables A7.1 and A7.2.

Table A7.1 Measurement Water Quality Objectives

PARAMETER	UNITS	MATRIX	METHOD	PARAMETER CODE	AWRL	LIMIT OF QUANTITATION (LOQ)	RECOVERY AT LOQs (%)	PRECISION (RPD of LCS/LCS)	BIAS (% Rec. of LCS)	COMPLETENESS (%)
Conductivity	µS/cm	water	TST SOP or CRWN SOP	00094	NA*	NA	NA	NA	NA	90
Air Temperature	°C	air	TST SOP or CRWN SOP	00020	NA*	NA	NA	NA	NA	90
Water Temperature	°C	water	TST SOP or CRWN SOP	00010	NA*	NA	NA	NA	NA	90
Dissolved Oxygen	mg/L	water	TST SOP or CRWN SOP	00300	NA*	NA	NA	0.5	NA	90
pH	Standard Units (s.u.)	water	TST SOP or CRWN SOP	00400	NA*	NA	NA	NA	NA	90
Secchi Depth	Meters (m)	water	TST SOP or CRWN SOP	00078	NA*	NA	NA	NA	NA	90
Transparency Tube	m	water	TST SOP or CRWN SOP	00078	NA	NA	NA	NA	NA	90
Total depth	m	water	TST SOP or CRWN SOP	82903	NA*	NA	NA	NA	NA	90
Flow severity	1-no flow, 2-low, 3-normal, 4-flood, 5-high, 6-dry	water	TST SOP or CRWN SOP	01351	NA*	NA	NA	NA	NA	90
Streamflow	cubic feet per second (cfs)	water	TCEQ SWQM Procedures Manual Vol. 1, TST SOP or CRWN SOP	00061	NA*	NA	NA	NA	NA	90
Flow measurement method	1-gage 2-electric 3-mechanical 4-weir/flume 5-doppler	water	TST SOP or CRWN SOP	89835	NA*	NA	NA	NA	NA	90
Flow estimate	cfs	water	TST SOP or CRWN SOP	74069	NA*	NA	NA	NA	NA	90
Salinity	PPT, tidally influenced sites only	water	TST SOP or CRWN SOP	00480	NA*	NA	NA	NA	NA	90
Algae	1-absent 2-rare 3-common 4-abundant 5-dominant	water	TST SOP or CRWN SOP	NA	NA*	NA	NA	NA	NA	90

Water Color	1-no color 2-light green 3-dark green 4-tan 5-red 6-green/brn 7-black	water	TST SOP or CRWN SOP	NA	NA*	NA	NA	NA	NA	90
Water Clarity	1-clear 2-cloudy 3-turbid	water	TST SOP or CRWN SOP	NA	NA*	NA	NA	NA	NA	90
Water Surface	1-clear 2-scum 3-foam 4-debris 5-sheen	water	TST SOP or CRWN SOP	NA	NA*	NA	NA	NA	NA	90
Water Conditions	1-calm 2-ripples 3-waves 4-white caps	water	TST SOP or CRWN SOP	89968	NA*	NA	NA	NA	NA	90
Water Odor	1-none 2-oil 3-acrid 4-sewage 5-rotten eggs 6-fishy 7-musky	water	TST SOP or CRWN SOP	NA	NA*	NA	NA	NA	NA	90
Present Weather	1-clear 2-cloudy 3-overcast 4-rain	air	TST SOP or CRWN SOP	89966	NA*	NA	NA	NA	NA	90
Days since last significant rainfall	Days	NA	TST SOP or CRWN SOP	72053	NA*	NA	NA	NA	NA	90
Rainfall Accumulation (last 3 days)	Inches	NA	TST SOP or CRWN SOP	NA	NA*	NA	NA	NA	NA	90
Tide Stage	1-low 2-falling 3-slack 4-rising 5-high	water	TST SOP or CRWN SOP	89972	NA*	NA	NA	NA	NA	90
E. coli	Colony forming units (cfu) per 100 mL	water	TST SOP or CRWN SOP	NA	1 cfu per 100 mL	1 cfu per 100 mL	NA	NA	0	90
Nitrate-Nitrogen	mg/L	water	TST SOP or CRWN SOP	NA	0.1 mg/L	NA	NA	NA	NA	90
Phosphate	mg/L	water	TST SOP **	NA	0.02 - 50 mg/L	NA	NA	NA	NA	90
Turbidity	Nephelometric Turbidity Units (NTU)	water	TST SOP **	NA	0.5 NTU	NA	NA	NA	NA	90

*Reporting to be consistent with TST or SWQM guidance and based on measurement capability.
**CRWN Volunteer Water Quality Monitoring (VWQM) do not test for this parameter.

Table A7.1 References

- TST SOP: TST Core Water Quality Citizen Scientist Manual, August 2020; TST Advanced Water Quality Citizen Scientist Manual, April 2019; TST Field Guide(s).
- CRWN SOP: Lower Colorado River Authority, Colorado River Watch Network, Standard Operating Procedures, 9th edition, 2012
- TCEQ SWQM Procedures Manual Vol. 1: Physical and Chemical Monitoring Methods, August 2012.

Table A7.2 Measurement Non-Water Quality Objectives

PARAMETER	UNITS	MATRIX	METHOD
Active floodplain present	Inner Bulls-eye = good Middle Bulls-eye = at risk Outer Bulls-eye = Dysfunctional	Riparian	TST SOP
Energy dissipation	Inner Bulls-eye = good Middle Bulls-eye = at risk Outer Bulls-eye = Dysfunctional	Riparian	TST SOP
New plant colonization	Inner Bulls-eye = good Middle Bulls-eye = at risk Outer Bulls-eye = Dysfunctional	Riparian	TST SOP
Stabilized vegetation	Inner Bulls-eye = good Middle Bulls-eye = at risk Outer Bulls-eye = Dysfunctional	Riparian	TST SOP
Age diversity	Inner Bulls-eye = good Middle Bulls-eye = at risk Outer Bulls-eye = Dysfunctional	Riparian	TST SOP
Species diversity	Inner Bulls-eye = good Middle Bulls-eye = at risk Outer Bulls-eye = Dysfunctional	Riparian	TST SOP
Plant vigor	Inner Bulls-eye = good Middle Bulls-eye = at risk Outer Bulls-eye = Dysfunctional	Riparian	TST SOP
Water storage	Inner Bulls-eye = good Middle Bulls-eye = at risk Outer Bulls-eye = Dysfunctional	Riparian	TST SOP
Bank and channel erosion	Inner Bulls-eye = good Middle Bulls-eye = at risk Outer Bulls-eye = Dysfunctional	Riparian	TST SOP

Sediment deposition	Inner Bulls-eye = good Middle Bulls-eye = at risk Outer Bulls-eye = Dysfunctional	Riparian	TST SOP
Group 1: Animals mostly intolerant of pollution. Their dominance generally signifies good to excellent water quality.	Counts	Macroinvertebrate Bioassessment	TST SOP
Group 2: These animals live in a wide range of water quality conditions.	Counts	Macroinvertebrate Bioassessment	TST SOP
Group 3: These animals are mostly tolerant of pollution. Their dominance generally signifies poor water quality.	Counts	Macroinvertebrate Bioassessment	TST SOP
Monofilament removed	0-5 ft. 6-15 ft. 16+ ft.	Monofilament	Monofilament Finders

Table A7.2 References:

- Monofilament Finders
- TST SOP: TST Riparian Evaluation Citizen Scientist Manual, January 2022; TST Macroinvertebrate Bioassessment Monitoring Form.

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) or sample/duplicate pairs in the case of dissolved oxygen titrations. Precision results are compared against measurement performance specifications and used during evaluation of analytical performance. Program-defined measurement performance specifications for precision are defined in Table A7.1.

Bias

Bias is a statistical measurement of correctness and includes multiple components of systematic error. A measurement is considered unbiased when the value reported does not differ from the true value. Bias is determined through the analysis of laboratory control samples, field blanks and LOQ Check Samples prepared with verified and known amounts of all target analyses 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 Table A7.1.

Representativeness for Routine Sampling

TCEQ SWQM Procedures Vol. 1 and the TST Manuals (Appendix F) provide a reference for site selection, the appropriate sampling regime, the sampling of all pertinent media, and use of only approved analytical methods to TST partners and volunteers. This will assure that the measurement data represents the conditions at the site. Routine monitoring conducted with the intent to collect data for water quality assessment are considered spatially and temporally representative of routine water quality conditions, are collected on a routine frequency, and the monitoring events 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 total representation of the water body will be tempered by the available funding.

Completeness

The completeness of the data is a relationship of how much of the data is available for use compared to the total potential data. Ideally, 100 percent 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.

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 SWQM Procedures Vol. 1. Comparability is also guaranteed by reporting data in standard units, by using accepted rules for significant figures, and by reporting data in a standard format as specified in Section B10.

A8 SPECIAL TRAINING/CERTIFICATION

TXST TST and Partners provide training on field techniques, quality assurance, data management, etc. The training procedures and requirements for certification of TST volunteers are described in the TST Manuals and Field Guides (Appendix F). Although the three-phase format is the same, the LCRA CRWN monitor training differs from the TST training because the monitoring procedures are slightly different as previously described in Section A7 (Appendix G). Procedures and requirements for TST Trainers and Quality Assurance Officers are outlined in the TST Water Quality Monitoring Manuals and Trainer Enrollment Form (Appendix F).

Records of trained staff, trainers, and volunteers including educational credentials, training documentation, demonstrations of competency, assessments, and/or corrective actions are retained by project management and are available for review during a monitoring systems audit.

A9 DOCUMENTS AND RECORDS

Records and Documents Retention Requirements

The documents that describe, specify, report, or certify activities included in this QAPP are listed below. Electronic records are backed up every 24 hours and are maintained on multiple computers and at least one virtual TXST server.

Document/Record	Location	Retention	Form
QAPP, amendments, annual certifications, and appendices	TXST TST	4 years (minimum)	Electronic
QAPP distribution documentation (linked to Training Enrollment Form)	TXST TST	4 years (minimum)	Electronic
Corrective action documentation	TXST TST	4 years (minimum)	Electronic
Training records	TXST TST	4 years (minimum)	Electronic
Monitoring forms (hard copy/electronic)	TXST TST	4 years (minimum)	Electronic
LCRA CRWN monitoring data	TXST TST	4 years (minimum)	Electronic
Field equipment calibration (Included on monitoring form)	TXST TST	4 years (minimum)	Electronic
Field SOPs (manuals and field guides)	TXST TST	4 years (minimum)	Electronic
Training Enrollment Forms	TXST TST	4 years (minimum)	Electronic
Progress report/final report	TXST TST	4 years (minimum)	Electronic

Monitoring Site Request Forms	TXST TST	4 years (minimum)	Electronic
Monitoring Plans	TXST TST	4 years (minimum)	Electronic
Private Property Access Forms	TXST TST	4 years (minimum)	Electronic

B1 SAMPLING PROCESS DESIGN (EXPERIMENTAL DESIGN)

The sample design follows the intent of the EPA, TCEQ NPS Program, and TST to use the data collected using criteria described in the QAPP for education, local decision-making, research, baseline data, screening, BMP effectiveness, and problem identification. TST actively promotes water quality and NPS pollution education and awareness through volunteer activities. Volunteers are instructed to monitor at least monthly, or as defined in their Monitoring Plan and/or Training Enrollment Form. TST staff work with partners to prepare the monitoring plans. The plans are reviewed and approved by the data manager and the project manager. A copy of the monitoring plan is sent to the participating partner and stored at the TST offices.

Additionally, data collected under this QAPP will provide participants the opportunity to access interdisciplinary science-based data collection methods, which combine language arts, earth sciences, geography, mathematics, and chemistry. Efforts are made to identify and/or establish water quality monitoring projects in areas where NPS pollution or other water quality issues are known or suspected. TST, its volunteers, and partners collect environmental data to inform and make Texans aware of water quality, land use, and associated nonpoint source impacts and the role people play in contributing to those impacts. Information collected can also be used to identify water quality trends and to characterize water quality conditions.

This QAPP encompasses all training types conducted by the TST including standard core, probe core, advanced, *E. coli* bacteria, riparian evaluation and macroinvertebrate bioassessment. Each training and monitoring type collect different data types from different media. See Tables A7.1 and A7.2 for a list of parameters associated with each type of monitoring and the method(s) used to measure them.

Site Selection Criteria

Some general guidelines are followed when selecting monitoring sites. Fixed station and systematic monitoring sites are chosen based on the following site selection guidelines:

1. Site should be safely accessible year-round (exception: during major flood events).
2. Site should provide the best representation for the overall water quality conditions of a water body.
3. Site should be free of backwater effects during normal conditions.
4. Perennial flowing streams are preferable to intermittent streams.
5. Lake and estuary locations should be located within major arms and/or near dams.

6. Coastal sites are best situated to allow representative sampling, regardless of the tidal cycle.
7. Before submitting a New Monitoring Site Request Form to establish a new site, go to the Datamap to see if an inactive site exists nearby. It is preferred that existing inactive sites with historical water quality data be reactivated than to create a new site, but if those conditions aren't met, then a new site should be created by submitting a New Monitoring Site Request Form.

Fixed station and systematic monitoring sites are located preferentially according to local interests and concerns and in coordination with TST partners where applicable. TST staff will identify sites that maximize stream or basin spatial coverage.

Monitoring Sites
Monitoring site information submitted to TST is maintained in the Dataviewer. Monitoring site information in the Dataviewer is reviewed and updated throughout the year as needed based on current volunteer monitoring activities. All data are tracked, maintained, and available on the TST Dataviewer.

There are currently around 350 active monitoring sites in the TST program (see Datamap). Sites are designated as "active" if monitoring has taken place at the site within the past year. Based on the voluntary nature of the program, the exact number of monitoring sites being monitored is unknown at the beginning of each year. This information is submitted to TCEQ in the annual report and is available for review on the Texas Stream Dataviewer within 60 days of submission from the volunteer scientist.

Critical vs. non-critical measurements
All data collected in this project and entered into the TST database are considered critical to achievement of the project objectives associated with this QAPP.

B2 SAMPLING METHODS

The field sampling procedures are documented in TST manuals and field guides provided in Appendix F. LCRA CRWN procedures and protocols are provided in Appendix G.

Table B2.1 Sample Storage, Preservation and Handling Requirements

Parameter	Matrix	Container	Sample Volume	Preservation	Holding Time
Dissolved oxygen	water	Glass Mixing Bottle	25 mL	Fixed with manganous sulfate, alkaline potassium iodide azide, and sulfuric acid	4 hours
E. coli	water	Sterile Whirlpack Bag	100	Refrigerate @ 4°C *	6 Hours
Nitrate Nitrogen	water	Plastic Test Tube	10 mL	Refrigerate@ 4°C*	48 Hours
Phosphate Phosphorous	water	Plastic Test Tube	10 mL	Refrigerate@ 4°C*	48 Hours
Turbidity	water	60 or 120 cm Plastic Turbidity Tube	Approx. 1L	NA	NA

*Preservation performed immediately upon collection (within 15 minutes)

Sample Containers

All sample containers will meet the requirements as outlined in Table B2.1. Sterile Whirlpack Bags are used for bacteriological samples and are disposable. Other containers are rinsed twice with DI water after each use before storing them in kit and twice with sample water before filling the container with sample water for testing.

Processes to Prevent Contamination

Procedures documented in TST manuals and field guides or the TCEQ Surface Water Quality Monitoring Procedures Manual, Volume I (August 2012) outline the necessary steps to prevent contamination of samples. These steps may include: direct collection into sample containers when possible, rinsing sample containers twice before/after use as appropriate, and the use of hand sanitizer or disposable gloves. Field QC samples (identified in Appendix F) including field blanks and duplicates are collected to verify that contamination has not occurred.

Documentation of Field Sampling Activities

Monitoring events are documented on the field data sheets or monitoring forms in either hard copy or electronic form as presented in Appendix C. For all monitoring events, station ID, location, sampling time, date, and depth, sample collector's name/signature, group identification number, calibration information (if applicable), and reagent expiration dates (if applicable) are recorded. Additional fields to record for *E. coli* monitoring events include incubation temperature, incubation duration, *E. coli* colony counts, dilution aliquot, field blanks, and media

expiration dates. Values for all measured parameters and field observations are recorded on the monitoring form.

If reagents or media are expired, it is documented on the datasheet. Sampling is not encouraged with expired reagents and bacteria media; if expired, the corresponding values will be flagged in the database and excluded from data reports and EPA WQX submissions (See Section D2). Detailed observational data are recorded including water appearance, weather, field observations such as biological activity and stream uses, algae cover, unusual odors, days since last significant rainfall, and flow severity. Comments related to field measurements, number of participants, total time spent sampling, and total round-trip distance traveled to the sampling site are also recorded.

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

1. Legible writing in ink. Correct errors with a single line through writing, followed by initial and date.
2. Data are submitted via the TST online data entry system (Dataviewer), electronic monitoring form, and/or hard copies are scanned/photographed and submitted via email.

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 equipment malfunctions, calibrations, sample site considerations, etc. Failures or deviations from the QAPP are documented on the field data sheet/QC checklist. The TXST TST Data Manager in consultation with TST QAO will determine if the deviation from the QAPP compromises the validity of the resulting data. For a comprehensive understanding of TST's data validation checks, look to Section D2 of this QAPP.

B3 SAMPLE HANDLING AND CUSTODY

Sample Labeling
Samples from the field are labeled directly on the container with an indelible marker. Label information includes:

1. Site identification or Station ID
2. Date and time of sample collection
3. Type of preservative added, if applicable
4. Indication of field-filtration as applicable
5. Sample type (e.g., analysis(es) to be performed, matrix, fresh or salt water)

Sample Handling

The field sampling procedures are documented in TST manuals and field guides (Appendix F). Standard core and probe parameters are collected as field measurements on site. Advanced and bacteria water samples collected for analysis of *E. coli*, nitrate-nitrogen, phosphate, and turbidity may be transported on ice in extreme situations, but this is not recommended. Once samples have been transported to the destination, they should be processed immediately. All samples will be handled in accordance with the TST manual and field guide**.** LCRA CRWN procedures and protocols are provided in Appendix G.

B4 ANALYTICAL METHODS

The analytical methods are listed in Table A7.l and A7.2 of Section A7. The analyses cited in the table are EPA approved methods as cited in 40 Code of Federal Regulations, Section 136. Part B. LCRA CRWN procedures and protocols are provided in Appendix G.

Standards Traceability

All conductivity standards are produced or purchased by TST, partners, or volunteers as needed. All conductivity standards purchased are traceable to certified reference materials. If conductivity standards are produced by TST, Partners, or volunteers, the following procedures are implemented:

1. Weigh a specific amount of potassium chloride per liter based on the concentration of the standard being prepared.
2. Verify standard concentration with calibrated conductivity meter.
3. The conductivity standard has a one-year shelf life from date made.
4. The conductivity standard should be labeled with the following information: concentration of the standard, date standard was prepared, and initials of the preparer or source of the standard.

Analytical Method Deficiencies and Corrective Actions

Deficiencies in field measurement systems involve, but are not limited to such things as, instrument malfunctions and failures in calibration. In many cases, the volunteer scientist or QAO will be able to correct the problem. If the problem is resolvable by the volunteer scientist or QAO, then they will document the problem on the field data sheet and complete the analysis. If the problem is not resolvable by the volunteer scientist or QAO, the parties will consult with the local partner or TST to determine a solution. See C1 Assessments and Response Actions for more information regarding corrective actions.

B5 QUALITY CONTROL

Sampling Quality Control Requirements and Acceptability Criteria

The field QC protocols are outlined in TST manuals and field guides (Appendix F). LCRA CRWN procedures and protocols are provided in Appendix G.

Quality Control Requirements and Acceptability Criteria
Sampling QC excursions are evaluated by the TST Project Manager, in consultation with the TST QAO. Discrepancies in sample results are used to assess the sampling process, including environmental variability. Rejecting sample results based on wide variability is a possibility. The arbitrary rejection of results based on pre-determined limits is not practical, therefore, the professional judgment of the TST Project Manager and QAO will be relied upon in evaluating results.

Field blanks for *E. coli* bacteria samples and duplicates for dissolved oxygen modified Winkler titrations are scrutinized very closely. *E. coli* field blank values exceeding the acceptance criteria will automatically invalidate the sample, especially in cases where bacteria colony growth occurs which is likely indicative of contamination. The acceptance criteria for the dissolved oxygen duplicate is 0.5 mg/L. If the difference between the duplicates is greater than 0.5 mg/L, then the sample will need to be reanalyzed.

Instrument calibration error limits provided below are also enforced where applicable to ensure instrument is operating effectively. Procedures for conducting, documenting, and checking error limits for calibrations are provided in the TST manuals and field guides (Appendix F). LCRA CRWN procedures and protocols are provided in Appendix G.

Monitoring Type	Parameter	Error Limit
Standard Core and Probe - Freshwater	Conductivity	± 20% of calibration standard solution
Standard Core - Saltwater	Salinity	± 1 ppt
Standard Probe	Dissolved oxygen	± 6% saturation
Standard Probe	pH	± 0.5 s.u.

Best professional judgment will be relied upon in evaluating water quality and non-water quality data. Field values falling outside the acceptance criteria may invalidate the sample. Notations of field blank, duplicate, and calibration error limit excursions are noted on the data sheet for inclusion in the TST database. For a comprehensive understanding of TST's data validation checks, look to Section D2 of this QAPP document.

TST staff members evaluate all volunteer science data submissions based on established quality assurance objectives detailed within the TST manuals and field guides. If data results do not meet the criteria in the manuals and field guides, the data will be flagged in the TST Dataviewer for further review (see Section D2). Additionally, if certain information is omitted on a datasheet, these omissions will automatically be flagged within the TST Dataviewer for further review and follow up with the volunteer submitting the data (see Section D2).

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

B6 INSTRUMENT/EQUIPMENT TESTING, INSPECTION AND MAINTENANCE

All sampling equipment testing and maintenance requirements are detailed in TST manuals, field guides and maintenance guides (Appendix F). Maintenance and inventory records are individually maintained by TST, volunteers, and partners for field equipment and critical spare parts. TST, LCRA, and CRWN procedures and protocols are provided in Appendix G.

B7 INSTRUMENT/EQUIPMENT CALIBRATION AND FREQUENCY

Field equipment calibration requirements are contained in TST manuals and field guides (Appendix F). Post calibration error limits and the disposition resulting from error are adhered to. Data not meeting post-error limit requirements (see Section B5) will be flagged in the TST database for further review by TST staff. LCRA CRWN procedures and protocols are provided in Appendix G.

B8 INSPECTION/ACCEPTANCE OF SUPPLIES AND CONSUMABLES

See B4 for standards requirements. Sampling reagents are used until they surpass the expiration dates prescribed by the manufacturer. At each sampling event, volunteer scientists will note on the field data sheet all expired reagents. All expired reagents are replaced with fresh reagents when a volunteer requests a replacement due to reagent expiration, damage/contamination, or loss. Expired reagents can interfere with the validity of the resulting data, therefore, should not be used for TST calibrations, sampling, or analysis.

Replacement equipment and supplies along with specifications are provided on the TST website for all monitoring types. Volunteers and partners can purchase equipment and supplies from other vendors, but specifications must be compatible. If an entity wishes to purchase supplies and/or equipment from a vendor other than those listed on the TST website, the volunteer will provide the name and specifications of the equipment and supplies to TST Project Manager for documentation.

B9 NON-DIRECT MEASUREMENTS

The TST Dataviewer utilizes map overlays from ESRI as well as data layers from the following sources. Maps published by the TST also utilize data layers from the following sources.

Table B9.1 Data Sources

Data	Source	Link
TCEQ 2022 Segments - Line	TCEQ GIS Team	https://gis-tceq.opendata.arcgis.com/datasets/TCEQ::segments-line/explore?location=31.055290%2C-99.835600%2C6.85
TCEQ 2022 Segments - Poly	TCEQ GIS Team	https://gis-tceq.opendata.arcgis.com/datasets/TCEQ::segments-poly/explore?location=31.055290%2C-99.835600%2C6.85
Permitted Wastewater Outfalls	TCEQ	https://gis-tceq.opendata.arcgis.com/datasets/TCEQ::wastewater-outfalls/explore?location=31.047863%2C-100.088100%2C6.85
Surface Water Quality Monitoring Stations	TCEQ	https://gis-tceq.opendata.arcgis.com/datasets/TCEQ::swqm-stations/explore?location=31.056153%2C-99.835600%2C6.85
StratMap Boundaries	TNRIS	https://data.tnris.org/?pg=1&inc=24#5.5/31.33/-99.341
TxDOT Roadways	TNRIS	https://data.tnris.org/?pg=1&inc=24#5.5/31.33/-99.341
StratMap Transportation	TNRIS	https://data.tnris.org/?pg=1&inc=24#5.5/31.33/-99.341
Hydrologic Unit Code (HUC)	TNRIS	https://data.tnris.org/?pg=1&inc=24#5.5/31.33/-99.341
12 Digit Watershed Boundary Dataset	USDA Geospatial Data Gateway	https://datagateway.nrcs.usda.gov/GDGHome_DirectDownLoad.aspx

B10 DATA MANAGEMENT

Personnel

Aspen Navarro, TXST TST Project Manager - Establishes data management objectives and ensures Quality Assurance system conforms to TCEQ requirements. Makes recommendations for improving current data management system and works to provide resources to the Data Manager and Quality Assurance Officer to execute and improve upon the data management system.

Laura Parchman, TXST TST Data Manager - Receives and reviews electronic data and hard copy paper data sheets. Validates information using the data validation checklist. Maintains and updates TST database to eliminate duplication, data entry errors, and information gaps. Submits recommendations to improve the TST database. Communicates with TST QA Officer and the Project Manager regarding the status of database problems and progress in completing data entry.

Sandra Arismendez, TXST TST Quality Assurance Officer - Reviews data validation checklist and error log to ensure data are properly validated and errors have been corrected or flagged in the database.

Partner and Volunteer - Documents field data on approved data sheet (paper or electronic format) and/or online TST Waterways Dataviewer. Enters data into online entry form for submission to TST database using the Electronic Monitoring form, directly into the WaterWays Dataviewer, or sends physical datasheet to TST or Partner for online entry into TST WaterWays Dataviewer.

Data Management Process

TST monitoring sites are visited at least monthly by volunteers and measurements are collected on-site or water samples are collected and analyzed as described in Sections B1 and B2 and the corresponding training manual or field guide referenced in Appendix F. Results are documented on field data monitoring forms referenced in Appendix C. Paper and electronic monitoring forms are provided as pathways for data entry. Paper forms can be submitted by email as pdf documents or hard copies can be mailed to TST staff. Paper forms can also be submitted to a Data Coordinator for entry into the WaterWays Dataviewer. Electronic monitoring forms can be accessed on the internet via phone or computer and entered directly from the field at the time measurements are collected or from paper forms at a later time. All LCRA CRWN data are entered into the electronic monitoring form by a Data Coordinator. Data are verified and validated at various/multiple levels using information provided on the quality control checklist provided on the second page of the monitoring forms. The data are verified and validated prior to submitting the data by the volunteer, Data Coordinator, and/or TST staff depending on the pathway of data entry. Data are collectively uploaded to the TST WaterWays Dataviewer and Datamap monthly, and the EPA Water Quality Exchange (WQX) biannually by the TST Data Manager.

If issues are identified, the volunteer will be contacted to resolve any data quality issues. If not resolvable, the data will be entered into the database and flagged as not meeting the QC checklist protocol. All data deliverables are documented in quarterly progress reports and submitted to TCEQ NPS Project Manager for review and approval.

Record-keeping and Data Storage

Record-keeping and document control procedures are contained in the TST manuals and field guides referenced in Appendix F and this QAPP. Following data verification and validation, the

original forms and data are stored as digital scans of hard copy paper forms, on the Survey123 ESRI cloud for electronic monitoring forms, on the Salesforce contractor cloud-based server for WaterWays Dataviewer data, and the TXST TST cloud-based in accordance with the record-retention schedule in Section A9. Two copies of the database are backed up monthly on cloud-based servers. If necessary, disaster recovery will be accomplished by information resources staff using the backup databases and/or archived hardcopy paper/electronic forms.

Archives/Data Retention
Complete original data sets are archived on separate cloud-based servers and retained by the TST staff and external Salesforce contractor for a retention period specified in Section A9.

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

Forms and Checklists
See Appendix C for the TST Field Data Monitoring Forms and Quality Control Checklists.
See Appendix F for the TST manuals and field guides that contain information about the Data Entry Checklist (See Section 3.2 Data Entry Checklist in the Core Water Quality Citizen Scientist Manual).

Data Dictionary
Terminology and field descriptions are included in the manuals (See Appendix F TST manuals Glossary of Terms).

Data Handling
Data are processed using the Microsoft Excel. Data integrity is maintained by the implementation of password protections which control access to the database and by limiting update rights to a select user group. The database administrator is responsible for assigning user rights and assuring database integrity.

Hardware and Software Requirements
Hardware and software procurements are sufficient to run Microsoft Excel under the Windows operating system in a networked environment. Information Resources staff are responsible for assuring hardware configurations meet the requirements for running current and future data management/database software as well as providing technical support.

Information Resource Management Requirements
Parameters monitored and corresponding reporting units follow the guidelines provided in the TCEQ Data Management Reference Guide. In addition, contract requirements include a 60-day turnaround time for data collected and submitted by volunteers to be made publicly available on the Datamap from the WaterWays Dataviewer. The TST Data Manager uploads data monthly to

ensure requirements are met. These requirements are documented in quarterly progress reports to TCEQ NPS Project Manager.

Quality Assurance/Control
See Section D of this QAPP

C1 ASSESSMENTS AND RESPONSE ACTIONS

The following table presents the types of assessments and response action for data collection activities applicable to the QAPP. LCRA CRWN procedures and protocols are provided in Appendix G.

Table C1.1 Assessments and Response Requirements

Assessment Activity	Approximate Schedule	Responsible Party	Scope	Response Requirements
Status Monitoring Oversight, etc.	Continuous	TST Project Manager	Monitoring of the project status and records to ensure QAPP requirements are being fulfilled	Report to TCEQ Project Manager
Monitoring Systems Audit/Field Audit Session	Every two years	TST Quality Assurance Officer/Certified Trainer	Site visits may be conducted to audit field sampling technique, data management, and related quality assurance oversight. Documentation will take place on the Field Audit Session form provided on the back of the monitoring form.	Feedback by TST staff/trainer following field audit session (see Field Audit Session documentation on monitoring forms)
Training Systems Audit	In conjunction with training sessions	TST staff/trainer	TST Volunteer Monitor and Trainer certification	Training records submitted to TST and/or Partner
Field Sampling Readiness Reviews	Training Phase III	TST staff/trainer	Field sampling, handling and measurement, recording data, and equipment and reagent check	TST staff/trainer submits completed Training Sign-in Sheet for certification
Monitoring Systems Audit	Dates to be determined by TCEQ	TCEQ QAS	The assessment will be tailored in accordance with objectives needed to assure compliance with the QAPP.	30 days to respond in writing to the TCEQ to provide corrective actions addressing audit findings
Site Visit	Dates to be determined by TCEQ	TCEQ PM	Status of activities. Overall compliance with work plan and QAPP	As needed

Corrective Action Process for Deficiencies and Nonconformances

Deficiencies are any unauthorized deviations from the approved QAPP and procedures referenced in the QAPP. Deficiencies may invalidate resulting data. All deficiencies from the QAPP require documentation of the nonconformance and corrective action. Deficiencies must be documented in a corrective action plan and corrected in a timely manner. Corrective action may include samples be discarded and re-collected. Deficiencies are documented in logbooks, field data sheets, etc. by field or laboratory staff. It is the responsibility of the TST Project Manager, in consultation with the TST QAO, to ensure that the actions and resolutions to the problems are documented and that records are maintained in accordance with this QAPP.

Nonconformances must be communicated to the TCEQ NPS Project Manager immediately via email. A Corrective Action Plan (CAP) Form (See Appendix E for the form and an example) must be submitted to the TCEQ NPS Project Manager within 14 days of the deficiency occurring. Once it is approved, the TCEQ NPS PM will send the CAP to the QA Coordinator who will then email the CAP to the Lead NPS QAS within 30 days of the initial notice of deficiency per TCEQ QMP and after it is reviewed by the TCEQ NPS Project Manager. The deficiency must also be communicated to the TCEQ NPS Project Manager through the Corrective Action Status Table (see Appendix D for the table and an example) to be included with the quarterly progress report.

The TST Project Manager is responsible for implementing and tracking corrective actions. All Corrective Action Plans will be documented on the Corrective Action Status Table, which will be submitted to the TCEQ NPS Project Manager with the quarterly progress report for review and approval. Records of TCEQ audit findings and corrective actions are maintained by both the TCEQ and the TST QAO. Documentation of corrective action to address audit findings will be submitted to the TCEQ within 30 days of receipt of audit report.

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

Corrective Action Plans

Corrective Action Plans are designed to prevent recurrence of a deficiency and should specifically:

- Identify and describe the deficiency, problem, nonconformity, or undesirable situation
- Identify the underlying cause(s) of the problem
- Identify programmatic impact of the deficiency
- Identify whether the problem is likely to recur, or occur in other areas
- Identify immediate remedial actions if possible
- Include a description of the need for Corrective Action
- Include a description of cause(s), determine solution, and propose an action plan
- Establish timelines and provide a schedule

- Identify personnel responsible for action
- Document the corrective action

C2 REPORTS TO MANAGEMENT

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 and the contract schedule of deliverables.

Quarterly Progress Reports - Quarterly Progress Reports contain a level of detail sufficient to document the activities that occurred under each task during the quarter and contain comprehensive tracking of deliverable status under each task.

Corrective Action Report - Summarizes TST's non-conformance to the QAPP and lists the ensuing corrective action taken by TST.

Monitoring System Audit Response - The TST will respond in writing to the TCEQ within 30 days upon receipt of a monitoring system audit report to address findings as needed.

Data Activity Reports - Summarizes volunteer data submitted, number of trained volunteer scientists, number of volunteer scientists conducting monitoring, and number of monitoring events.

Data Summary Reports - Summarize data for a monitoring site, water body, watershed, or region.

Watershed Services Report (Draft and Final) - Summarizes all activities, findings, and deliverables under Task 5.

Final Report (Draft and Final) - Summarizes all project activities, findings, and the contents of all deliverables.

Contractor Evaluation - The TST 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.

Reports to the TST

Partner Activity Reports - TST partner agencies submit quarterly reports documenting number of trainings conducted, distance traveled, and time spent conducting program. Information included in these reports is used for in kind contribution reporting.

D1 DATA REVIEW, VERIFICATION, AND VALIDATION

For the purposes of this document, data verification is a systematic process for evaluating performance and compliance of a set of data to ascertain its completeness, correctness, and consistency using the methods and criteria defined in the QAPP. Validation means those processes taken independently of the data-generation processes to evaluate the technical usability of the verified data with respect to the planned objectives or intention of the project. Additionally, validation can provide a level of overall confidence in the reporting of the data based on the methods used.

All water quality and non-water quality data obtained from field measurements will be reviewed for integrity and continuity, reasonableness, and conformance to project requirements, and then validated against the data quality objectives that are listed in Section A7. The procedures for verification and validation of environmental data are described in Section D2, below. The TST Data Manager is responsible for ensuring field data are properly reviewed, verified, and submitted in the required format to the database. The TST QAO is responsible for validating that all data collected meet the data quality objectives of the project. Only those data which are supported by appropriate quality control data and meet the measurement performance specification defined in this QAPP will be considered acceptable and submitted to the TST WaterWays Dataviewer.

D2 VERIFICATION AND VALIDATION METHODS

All water quality and non-water quality data will be reviewed upon submission by TST staff or their designee, the group training coordinator or partner to ensure the data is representative of the samples analyzed and locations where measurements were made. Data must also conform to specified monitoring procedures, quality control protocols, and project specifications. The respective field, data management, and QAO data verification responsibilities and acceptability criteria are listed by task in Table D2.l.

Data review and verification will be performed using a Data Entry Checklist (See 3.2 Data Entry Checklist of the TST Core Water Quality Citizen Scientist Manual in Appendix F) followed by automated database functions that will validate data as the information is entered into the database. The data to be verified and evaluated against project specifications are checked for errors, especially errors in transcription, calculations, and data input. Potential errors are identified by examination of documentation and by manual and computer assisted examination of corollary or unreasonable data. If a question arises or a potential error or anomaly is identified, the volunteer or partner of the monitor responsible for generating the data is contacted to resolve the issue. Issues that can be corrected are corrected and documented. If there are errors in the calibration log, expired reagents used to generate the sampling data, or any other deviations from the field or *E. coli* data, the corresponding data are flagged in the database.

When one or more data entry does not meet the data verification procedures (Table D2.1), the data are flagged for review. TST staff evaluate the flagged data submissions by first looking for typos, mis-recordings, or data boxes that were left blank. If during the review process a question about the validity or the level of detail about the data submitted is detected by TST staff, the volunteer who submitted the data will be contacted for further clarification. If the issue is not resolved, the data will continue to be flagged for not meeting quality assurance protocols.

Table D2.1 Data Verification Procedures

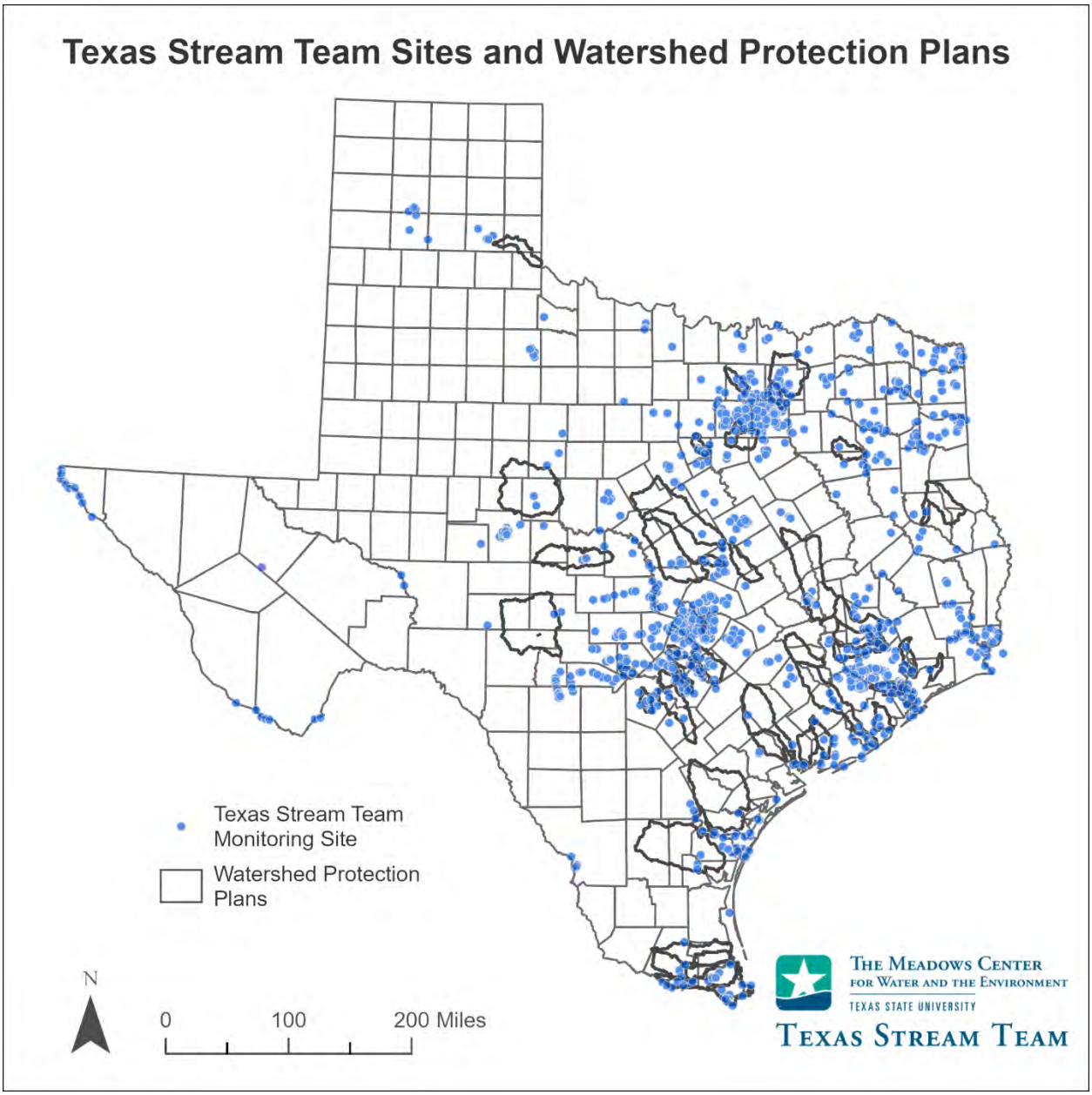
Acceptability Criteria	Field Task	Database Task	QAO Task
Collection and analysis techniques consistent with SOPs and QAPP	X		
Sample documentation complete on Monitoring Form	X	X	X
QC samples within acceptance limits	X		
Sample preservation and handling	X		X
Holding times	X		
Instrument calibration data	X	X	X
Measurement results	X	X	X
Calculations	X	X	X
Data entered in required format	X	X	X
Absence of transcription error	X	X	X
Reasonableness of data	X	X	X
Electronic submittal errors		X	X
l0% verification check of proper data verification procedures being followed			X

D3 RECONCILIATION WITH USER REQUIREMENTS

Data produced for this project will adhere to procedures outlined in Section D2 and Table D2.1. TST will employ these procedures to ensure that all data included in TST databases can be used for educational purposes, local decision-making, research, screening, BMP effectiveness, problem identification, and other uses deemed appropriate by the end users. The online data viewer allows anyone to access TST data and use it for the above-mentioned purposes as well as a general understanding of where TST volunteers are currently monitoring and have been in the past. TST may choose to communicate data findings at targeted watershed stakeholder forums as well as at Clean Rivers Program annual basin-wide steering committee meetings, websites, newsletters, and data summary reports. Data which do not meet requirements described in this QAPP will be flagged in the TST database and may not be considered appropriate for the uses noted above. The purpose of flagged data is to note inconsistencies or what may be data

determined to have excessive variability. The Dataviewer was built to recognize and flag data that does not meet the quality control checklist associated with each monitoring type (see back side of Monitoring Forms).

APPENDIX A. PROJECT LOCATION MAP


Texas Stream Team Sites and Watershed Protection Plans
Texas Stream Team Monitoring Site
Watershed Protection Plans
N
0
100
200 Miles
The Meadows Center for Water and the Environment
Texas State University
Texas Stream Team

APPENDIX B. CONTRACT SCOPE OF WORK AND SCHEDULE OF DELIVERABLES

Scope of Work

This project will support the Performing Party's statewide water quality monitoring program by providing supplies and training for volunteer citizen monitors. Watershed services and nonpoint source pollution education focused on impaired waters will also be provided in watersheds where Watershed Protection Plans (WPPs) are being developed or implemented.

Task 1: Project Administration

Objective: To effectively administer, coordinate, and monitor all work performed under this project including technical and financial supervision and preparation of status reports.

Subtask 1.1: Project Oversight — The Performing Party will provide technical and fiscal oversight of the staff and/or subgrantee(s)/subcontractor(s) to ensure Tasks and Deliverables are acceptable and completed as scheduled and within budget. With the TCEQ Project Manager's authorization, the Performing Party may secure the services of subgrantees(s)/subcontractors(s). Project oversight status will be provided to the TCEQ Project Manager with the quarterly Progress Reports (PRs).

Subtask 1.2: Progress Reports (PRs) — The Performing Party will submit PRs to the TCEQ Project Manager by the 15th of the month following each state fiscal quarter (Sept – Nov, Dec – Feb, March – May, June – August). PRs will include reporting on the status of Deliverables and proposed revisions to due dates, narrative description of progress by Task, and status of nonconformances/corrective actions. The TCEQ Project Manager will provide a template for the PR to the Performing Party.

Subtask 1.3: Reimbursement Forms (Financial Status Reports) — The Performing Party will submit Reimbursement Forms in accordance with the Special Terms and Conditions.

Subtask 1.4: Contract Communication — The Performing Party will participate in a call/meeting with TCEQ to discuss project scope and contract requirements within 30 days of Contract execution. The Performing Party will maintain regular telephone and/or e-mail communication with the TCEQ Project Manager regarding the status and progress of the project and any matters that require attention between PRs. Communications will include a quarterly conference call to discuss items such as project Tasks, financial status, Quality Assurance Project Plans (QAPPs), corrective actions, and any other matters that require attention. The TCEQ Project Manager may request additional information from the Performing Party prior to the call or meeting. The Performing Party will provide meeting notes, identifying action items, for the telephone calls within five days of the call.

The first conference call held each fiscal year of the project will cover, as applicable, any staff changes, the previous year's performance, budget estimates, invoicing issues, quality assurance issues, and overall project progress.

Matters that will be communicated to the TCEQ Project Manager include, but are not limited to:

- Notification a minimum of 14 days before the Performing Party has scheduled public meetings or events, initiation of construction, or other major Task activities.
- Notification within 48 hours following events or circumstances that may require changes to the Budget, Scope of Work, or Schedule of Deliverables.
- Requests for prior approval of activities or expenditures for which the Contract requires advance approval or that are not specifically included in the Scope of Work

Subtask 1.5: Contractor Evaluation — The Performing Party will participate in an annual Contractor Evaluation at the end of each state fiscal year.

Subtask 1.6: Coordination Call with EPA — Upon request by TCEQ and EPA, the Performing Party will participate in a call with EPA to share progress on goals, measures of success, challenges, and draft documents.

Subtask 1.7: Project Article — The Performing Party, upon request by TCEQ, will provide a project article. The article will state the project's purpose, describe the activities of the past fiscal year, and include photographs of the project.

Subtask 1.8: Contract Budget Updates — The Performing Party will discuss annual fiscal year budgets with the TCEQ Project Manager on a quarterly basis at a minimum. Starting in the second year of the project, the Performing Party will provide an Annual Budget Update that details state fiscal year spending projections associated with planned project activities. These updates will be revised when fiscal year spending projections change by ten percent or more, or upon request by the TCEQ Project Manager. The update in the final year of the project will include a budget for all remaining project activities. The TCEQ Project Manager will provide a template for the Annual Budget Update.

Deliverables:

1.2 PRs (by the 15th of the month following each state fiscal quarter)
1.3 Reimbursement forms (see Special Terms and Conditions)
1.4 Conference calls with meeting notes and action items (quarterly, notes within five days of meeting)
1.5 Contractor Evaluation (annually, upon request by TCEQ)
1.6 EPA coordination call (upon request by TCEQ)
1.7 Project article and photographs (upon request by TCEQ)
1.8 Contract Budget updates (by the 15th of the month following the end of each state fiscal quarter, in PRs)
1.8 Annual Budget Updates (within 2 weeks following TCEQ request)

Task 2: Quality Assurance

Objective: To refine, document, and implement data quality objectives (DQOs) and quality assurance/quality control (QA/QC) activities that ensure data of known and acceptable quality are generated by this project.

Subtask 2.1: QAPP Planning Meetings — The Performing Party will schedule a QAPP planning meeting with the TCEQ Project Manager, QA staff, technical staff, and contractors within 30 days of Contract execution, to implement a systematic planning process based on the elementsin the applicable QAPP Shell. A QAPP shell/examples will be provided by the TCEQ Project Manager. The information developed during this meeting will be incorporated into a QAPP by the Performing Party. The Performing Party may conduct additional meetings to determine whether changes to an existing QAPP are needed.

Subtask 2.2: Monitoring QAPP — The Performing Party will develop and submit to TCEQ a QAPP with project-specific DQOs and other components consistent with the following documents:

- TCEQ NPS QAPP Shell(s)
- EPA Requirements for QAPPs (QA/R5)
- EPA Guidance for Geospatial Data QAPPs (QA/G-5G)
- EPA QAPP Requirements for Secondary Data Research Projects
- TCEQ Surface Water Quality Monitoring (SWQM) Procedures

The Performing Party will develop the QAPP in consultation with the TCEQ Project Manager, QA staff, and contractors. The Performing Party will address comments and submit a final QAPP for review. The QAPP must be signed/fully approved by TCEQ and, if necessary, EPA, before any environmental data operations begin.

Subtask 2.3: QAPP Annual Reviews, Revisions, and Updates — The Performing Party will submit documentation certifying its annual review or supporting the revision or reissuance of the QAPP at least 90 days prior to the QAPP anniversary or expiration date. Amendments approved since the initial QAPP approval or a subsequent certified annual review (if applicable) or revision must be submitted along with the certification. For multi-year QAPPs, if extensive changes are necessary, a full revision/update is required. No work described in a QAPP will be conducted outside the effective period for the QAPP.

Subtask 2.4: QAPP Amendments — The Performing Party will submit Draft QAPP Amendments for TCEQ review when changes to the QAPP are necessary. Draft QAPP Amendments should be submitted at least 90 days prior to the scheduled initiation of changes and must be accompanied by a justification, summary of changes, and detail of changes. The Performing Party will submit Final QAPP Amendments within 30 days of receipt of any comments provided by TCEQ. Final QAPP Amendments will be submitted to TCEQ with the Performing Party's signatures and responses to comments and circulated for appropriate TCEQ signatures. The QAPP Amendments must be signed/fully approved by TCEQ and, if necessary, EPA, before any changes conveyed within Amendments are implemented.

Subtask 2.5: Corrective Action Reports — The Performing Party will provide corrective actionreports (CARs), as needed, to document deviations from sampling method requirements

or sample design, failures associated with chain-of-custody procedures or in field and laboratory measurement systems. The Performing Party will submit CARs with PRs.

Deliverables:

2.1 QAPP Planning Meeting notes (within 30 days of Contract execution)

2.2 Draft QAPP (120 days prior to the scheduled initiation of environmental data operations)

2.2 Final QAPP (30 days prior to the scheduled initiation of environmental data operations)

2.3 QAPP Annual Reviews and Revisions (at least 90 days prior to the QAPP approval anniversary)

2.4 Draft QAPP Amendments (at least 90 days prior to the scheduled initiation of changes or additions to activities listed in the current QAPP)

2.4 Final QAPP Amendments (within 30 days of receipt of TCEQ comments)

2.5 CARs (as needed, with PRs, until the issue is resolved)

Task 3: Water Quality Data Reporting and Dataviewer Management

Objective: To maintain and update the Database and Dataviewer, and to generate reports. All submitted data collected under the QAPP are entered into the Performing Party's online Dataviewer.

Subtask 3.1: Data Submittals — The Performing Party will enter all data collected under the QAPP into the Dataviewer within 60 days of data submission by citizen scientists. The Performing Party will submit quarterly Data Activity Reports that will communicate the number of citizen scientists trained, number of citizen scientists monitoring, and number of monitoring events. The Performing Party will also submit data to EPA Water Quality Exchange (WQX) semi-annually. The Performing Party will e-mail the TCEQ Project Manager a confirmation of each data submittal to WQX.

Subtask 3.2: Data Summary Reports — The Performing Party will compile and distribute selected citizen science Data Summary Reports. The reports will use the data collected under the QAPP for sites/segments/basins agreed upon by the Performing Party, TCEQ, citizen scientist stakeholders, partners, and Clean Rivers Planning agencies. The Data Summary Reports will also contain maps that illustrate the citizen scientist water quality data collectedfor each respective watershed. The Performing Party will submit Draft Data Summary Reports and presentations to the TCEQ Project Manager for review and approval at least two weeks prior to the scheduled public release.

Subtask 3.3: Water Quality Online Database and Mapping Technique Study — The Performing Party will conduct a study to evaluate online database options currently on the market for efficiency and cost effectiveness and survey other successful citizen science programs across the United States. The Performing Party will submit a report summarizing the results of the water quality online database and mapping technique study.

Deliverables:

3.1 Data Activity Reports (quarterly, with PRs)

3.1 Data Submittals to EPA (twice per year, in PRs and proof of submission emailed to TCEQ Project Manager)

3.2 Draft Data Summary Reports with watershed maps (quarterly, with PRs)

3.2 Final Data Summary Reports and watershed maps with response to TCEQ comments (at least two weeks prior to the scheduled public release)

3.3 Draft Water Quality Online Database Technique Study Report (quarter 8, month 1)

3.3 Final Water Quality Online Database Technique Study Report (within 30 days after receipt of TCEQ comments)

Task 4: Citizen Science Activities

Objective: To engage, manage, expand, and strengthen a minimum of 400 statewide water quality citizen scientists and associated partner networks annually in activities related to water quality. The Performing Party will provide water quality monitoring training to support existing and new groups performing volunteer monitoring.

Subtask 4.1: Support Existing and New Citizen Scientists — The Performing Party will maintain a stock of water quality monitoring kits and supplies for use by the Performing Party staff for special monitoring events, trainings, and quality control sessions. The Performing Party will engage a minimum of 400 citizen scientists annually in activities related to water quality. The Performing Party will maintain a limited supply of kits and replacement reagents to equip citizen scientists who do not currently have partner support or where partner funding is unavailable.

Subtask 4.2: Establish New Partnerships and Groups — The Performing Party will create at least three new partnerships and three new citizen science groups per year to recruit citizen scientists in geographic areas approved by the TCEQ Project Manager.

Subtask 4.3: Annual Trainer Meeting — The Performing Party will hold one Statewide Trainer Meeting per year with the primary objective of gathering input and feedback toward the Performing Party's advancement of program objectives, QAPP/protocol updates, and improvement of volunteer and support efforts. The Performing Party will submit the agenda to the TCEQ Project Manager for review and approval at least two weeks prior to the meeting.

Subtask 4.4: Core Citizen Scientist Water Quality Monitoring Trainings — The Performing Party will support water quality monitoring trainings which cover core parameters (dissolved oxygen, pH, conductivity, salinity, Secchi disk, transparency tube, field observations/comments) and methods addressed in the latest TCEQ-approved QAPP. Training will emphasize watershed awareness through discussion and demonstration of the relationship between monitoring tests and field observations to corresponding nonpoint source pollution issues. The Performing Party's staff or certified trainers will conduct at least seven Core Trainings per year.

Subtask 4.5: Advanced and *E. coli* Bacteria Citizen Scientist Water Quality Monitoring Trainings — The Performing Party will support water quality monitoring trainings which cover

the nonpoint source pollution suite (*E. coli* Bacteria and/or nitrates, orthophosphates, flow, turbidity) parameters and methods addressed in the latest TCEQ-approved QAPP. Training will emphasize watershed awareness through discussion and demonstration of the relationship between monitoring tests and field observations to corresponding nonpoint source pollution issues. The Performing Party's staff or certified trainers will conduct at least three Advanced or *E. coli* Bacteria Trainings per year.

Subtask 4.6: Certify Citizen Scientists as a Trainer — The Performing Party will train and certify citizen scientists to provide Texas Stream Team (TST) trainings, including watershed and nonpoint source pollution education. The Performing Party's staff or certified trainers will train at least three certified citizen scientists per year to become TST trainers.

Subtask 4.7: Bioassessment and Riparian Evaluation Program — The Performing Party will develop and support new citizen scientists and groups/partners in the adoption of Bioassessment and Riparian Evaluation activities. The Performing Party staff or certified trainers will conduct at least four Bioassessment or Riparian Evaluation trainings per year.

Subtask 4.8: Regional Citizen Scientists/Stakeholder Outreach Meetings — The Performing Party will participate in at least two regional citizen scientists/stakeholder meetings per year. These events will directly support citizen scientists, partners, and WPP collaborators and will enhance attendees' water quality knowledge and ability to better understand watershed functions. Topics for the meetings will include priority issues for the WPP areas. Networking and other open sessions will generate discussion between WPP projects.

Subtask 4.9: Citizen Science Tasks Report — The Performing Party will produce a Draft and Final Citizen Scientist Tasks Report that describes project activities completed under this task. The report will identify and discuss the extent to which goals and purposes have been achieved.

The report will emphasize successes, failures, and lessons learned. The Draft Citizen Scientist Tasks Report will be submitted to the TCEQ Project Manager for review. The Final Citizen Scientist Tasks Report will address TCEQ comments.

Deliverables:

4.1 Documentation of progress toward the goal of engaging 400 citizen scientists per year (quarterly, in PRs)

4.2 Documentation of new citizen scientist groups and new partnerships established (quarterly, with PRs, minimum of 3 new groups and 3 new partnerships per year)

4.3 Draft agenda (at least two weeks prior to Trainer Meeting)

4.3 Documentation of Annual Statewide Trainer Meeting (by the end of quarters 4 and 8, minimum of 2)

4.4 Documentation of core citizen scientist water quality monitoring trainings (quarterly, in PRs, minimum of 7 per year)

4.5 Documentation of advanced or *E. coli* bacteria citizen scientist water quality monitoring trainings (quarterly, in PRs, minimum of 3 per year)

4.6 Documentation of trainer certifications (by the end of quarters 3 and 7, with PRs, minimum of 3 per year)

4.7 Documentation of trainings for Bioassessment/Riparian program (quarterly, in PRs, minimum of 4 per year)

4.8 Documentation of regional citizen scientists/stakeholder outreach meetings (quarters 4and 8, with PRs, minimum of 2 per year)

4.9 Draft Citizen Science Tasks Report (quarter 8, month 1)

4.9 Final Citizen Science Tasks Report (within 30 days after receipt of TCEQ comments)

Task 5: Watershed Services

Objective: To offer and provide services that contribute to the successful implementation of accepted WPPs across Texas. The Performing Party will achieve this by working with Watershed Coordinators to engage stakeholders in watersheds approved by the TCEQ Project Manager and assess the alignment of watershed/WPP needs with capabilities of the Performing Party.

Subtask 5.1: Outreach to Watershed Coordinators — The Performing Party will correspond with a minimum of eight Watershed Coordinators or project leads per year and offer services to support implementation of WPPs. Services may include:

- Providing information regarding matching/in-kind funds.
- Assisting with water quality and data collection.
- Assisting with analyses of monitoring data.
- Developing citizen science programming and curricula.

Subtask 5.2: Watershed Services Report — The Performing Party will provide a Draft and Final Watershed Services Report summarizing all activities covered by this task. The Draft WatershedServices Report will be submitted to the TCEQ Project Manager for review. The Final Watershed Services Report will address TCEQ comments.

Deliverables:

5.1 Documentation of correspondence with Watershed Coordinators or project leads (quarterly, in PRs, minimum of 8 per year)

5.2 Draft Watershed Services Report (quarter 8, month 1)

5.2 Final Watershed Services Report (within 30 days after receipt of TCEQ comments)

Task 6: Water Resource Education and Outreach

Objective: To provide watershed education to 2,500 people annually on nonpoint source pollution and activities that support water conservation and management.

Subtask 6.1: TST Curriculum, Spring Lake Education Program — The Performing Party will incorporate TST activities into the Meadows Center's existing Spring Lake Education program toreach a targeted portion of the 125,000 annual visitors.

The Performing Party will use the Spring Lake program to:

- Promote/hold one teacher workshop per year.
- Conduct four Enviroscape watershed model demonstrations per year.
- Provide four water quality monitoring certifications for all grade levels per year.

Subtask 6.2: TST Resources and Website — The Performing Party will maintain and update their website quarterly. The website includes watershed planning information and resources such as water quality monitoring information, data, maps, metrics, volunteer monitoring activities, WPP development/implementation activities, educational events, and lessons learned.

Subtask 6.3: Newsletters — The Performing Party will produce and distribute four online newsletters to citizen scientists, partners, and other interested parties per year. Information inthe newsletters will be targeted toward potential new partners and users of the Performing Party's data and services. Draft Newsletters will be submitted to the TCEQ Project Manager forreview and approval at least two weeks prior to distribution or release. The Final Newsletters will address TCEQ comments.

Subtask 6.4: Education — The Performing Party will incorporate educational activities and/or nonpoint source pollution water quality curriculum into one partner program per year. Examples include water resource-focused school assemblies, water quality monitoring, adoption of interpretive and educational materials/signage, use of the Enviroscape watershed model, watershed demonstrations, nonpoint source pollution reduction/water quality protection activities, games, career days, or learning modules.

Subtask 6.5: Watershed Education and Outreach Task Report — The Performing Party will produce a Draft and Final Watershed Education and Outreach Task Report that describes project activities under this task and identifies and discusses the extent to which goals and purposes have been achieved. The report will emphasize successes, failures, and lessons learned. The Draft Watershed Education and Outreach Task Report will be submitted to the TCEQ Project Manager for review. The Final Watershed Education and Outreach Task Report will address TCEQ comments.

Subtask 6.6: Peer-Reviewed Journal Article — The Performing Party will produce a journal article to evaluate the effectiveness of water resource citizen science and present the findings at one conference.

Deliverables:

6.1 Documentation of teacher workshops, including agenda, sign-in sheets, and presentation materials (quarterly, with PRs, minimum of 1 per year)

6.1 Documentation of Enviroscape watershed model demonstrations (quarters 4 and 8, with PRs, minimum of 4 per year)

6.1 Documentation of providing water quality monitoring certifications (by the end of quarters 4 and 8, minimum of 4 per year)

6.2 Documentation of website maintenance and updates (quarterly, with PRs)

6.3 Draft online Newsletters (at least two weeks prior to distribution or release)

6.3 Final online Newsletters (quarterly, in PRs, minimum of 4 per year)

6.4 Documentation of incorporation of program activities/curriculum into partner education programs (by the end of quarters 4 and 8, minimum of 1 existing partner program per year)

6.5 Draft Watershed Education and Outreach Task Report (quarter 8, month 1)

6.5 Final Watershed Education and Outreach Task Report (within 30 days after receipt of TCEQ comments)

6.6 Peer-Reviewed Journal Article (quarter 8, month 1)

6.6 Documentation of research presentation at one conference (quarter 8, month 1)

Task 7: Final Report

Objective: To produce a Final Report that summarizes all activities completed and conclusions reached during the project period. The Final Report will discuss the extent to which project goals and purposes have been achieved. The Final Report should emphasize successes, failures, lessons learned, and should include analyses estimating the project's water quality improvements and/or load reductions, if applicable. The Final Report will summarize all the Task Reports either in the text or as appendices.

Subtask 7.1: Draft Final Report — At least 30 days prior to submitting the Final Report, the Performing Party will provide a Draft Final Report. The comprehensive report should document all Deliverables under this Scope of Work. The Draft Final Report should be structured per the following outline:

- Title and Contract Number;
- Table of Contents;
- Project Significance and Background;
- Study Area (maps);
- Summary of all Task Reports and final approved PR;
- Amount of project funding and amount spent;
- Discussion: include deliverables not completed, lessons learned, recommendations for future work; and
- Appendices (if needed).

Subtask 7.2: Final Report — The Performing Party will revise the Draft Final Report to address comments provided by the TCEQ Project Manager. At least two weeks before the expiration of the Contract, the Performing Party will submit the Final Report to the TCEQ Project Manager.

Deliverables:

7.1 Draft Final Report (quarter 8, month 1)

7.1 Address TCEQ comments (within 10 days of receipt of comments)

7.2 Final Report (at least two weeks prior to end of contract)

APPENDIX C. FIELD DATA MONITORING FORMS AND QUALITY CONTROL CHECKLISTS

Core environmental monitoring form and field quality control checklist (for Standard Core and Probe core)

Advanced environmental monitoring form and field quality control checklist

TEXAS STREAM TEAM OBSERVATIONS MONITORING FORM

E. coli bacteria environmental monitoring form and field quality control checklist

Riparian environmental monitoring form and field quality control checklist

Macroinvertebrate bioassessment monitoring form (coming soon)

Monofilament monitoring form

APPENDIX D. CORRECTIVE ACTION STATUS TABLE

Corrective Action Status Table

The Corrective Action Status Table is included as a tab in the quarterly progress report template provided by the TCEQ NONPOINT SOURCE Project Manager.

Corrective Action #	Date Issued	Description of Deficiency	Action Taken	Date Closed

Corrective Action Status Table Example

Corrective Action #	Date Issued	Description of Deficiency	Action Taken	Date Closed
1	7/25/2014	Runoff measured at pavement was greater than total area runoff.	The area is being surveyed to ensure the catchment area size is correct. The monitoring station location is being modified to ensure runoff flows through properly.	
2	8/1/2014	Sample residual insufficient for analysis of TSS.	Data estimated but questionable, not will not be submitted to TCEQ.	8/8/2014

APPENDIX E. CORRECTIVE ACTION PLAN FORM

Nonconformance Report and Corrective Action Plan
QAPP Title:_____ **QAPP Contractor: _____** **Issued by:_____ Date of Occurrence:_____ Date Identified: _____** **Report No.:_____ Date Issued:_____**
Description of deficiency
Root Cause of deficiency
Programmatic Impact of deficiency
Does the seriousness of the deficiency require immediate reporting to the TCEQ? If so, when was it reported?
Corrective Action to address the deficiency and prevent its recurrence
Proposed Completion Date for Each Action
Individual(s) Responsible for Each Action
Method of Verification
Date Corrective Action Plan Closed? NONPOINT SOURCE Project Manager Initial When Closed _____ *Please forward CAP to Lead NONPOINT SOURCE QAS once it is closed.*

Example Corrective Action Plan Form

Nonconformance Report and Corrective Action Plan

QAPP Title: Watershed Protection Plan Implementation – LID BMP Monitoring QAPP
QAPP Contractor: River Authority
Issued by: Jane Doe **Date of Occurrence:** 7/15/2014 **Date Identified:** 7/20/2014
Report No.: 1 **Date Issued:** 7/25/2014

Description of deficiency
The pavement monitoring station at the university is measuring a larger runoff volume than is possible according to estimates. Runoff measured is higher than the total precipitation volume calculated by multiplying the catchment area by the precipitation measured at the site.

Root Cause of deficiency
(1) The drainage area was not measured accurately; it is larger than originally measured.
(2) The outfall of the monitoring station does not adequately allow runoff to flow through causing pooling around the flow-measuring point. The accumulation of non-flowing water is likely confounding the flow meter since its physical principal of measurement is hydrostatic pressure caused by water depth.

Programmatic Impact of deficiency
The illogical results of the pavement runoff measurement indicate that further calibration of the equipment is necessary. Data collected at this event will not be used in analysis or results.

Does the seriousness of the deficiency require immediate reporting to the TCEQ? If so, when was it?
Yes, it was reported to the TCEQ NONPOINT SOURCE Project Manager via email on 7/18/2014.

Corrective Action to address the deficiency and prevent its recurrence
A survey will be conducted by the Contractor Project Manager on the site to determine the ridge of the catchment area. The pavement runoff measurement equipment will undergo further calibration to ensure accurate measurements.
A wider and deeper channel will be dug out at the monitoring point outfall to ensure all the flow drains away from the measuring point to prevent both pooling around the flow-measuring point and confounding measurements produced by the flow meter. Storm event runoff will not be measured at this site until this work has been completed.

Proposed Completion Date for Each Action
8/15/2014

Individual(s) Responsible for Each Action David Lopez, Contractor Project Manager
Method of Verification Results of the catchment area survey along with any measurements and calculations conducted will be emailed to the TCEQ NONPOINT SOURCE Project Manager for verification. Photos of the modified measurement site will be emailed to the TCEQ NONPOINT SOURCE Project Manager and the QAPP will be amended to reflect any/all revisions.
Date Corrective Action Plan Closed? *The TCEQ NONPOINT SOURCE Project Manager will provide a closed date once the corrective action has been verified.* NONPOINT SOURCE Project Manager Initial When Closed *Please forward CAP to Lead NONPOINT SOURCE QAS once it is closed.* _____

APPENDIX F. TEXAS STREAM TEAM MANUALS, FIELD GUIDES, TRAINER ENROLLMENT FORM, AND MAINTENANCE GUIDES

Manuals
2020 Texas Stream Team Core Water Quality Citizen Scientist Manual (August 2020)
E. coli Bacteria Water Quality Citizen Scientist Manual (coming soon)
Texas Stream Advanced Water Quality Citizen Scientist Manual (April 2019)
Texas Stream Team Riparian Evaluation Citizen Scientist Manual (January 2022)
Texas Stream Team Macroinvertebrate Bioassessment Citizen Scientist Manual (coming soon)

Field Guides
Standard Core Field Guide
Standard Core Salinity Field Guide
Probe Core Field Guide
E. coli Bacteria Field Guide
Advanced Field Guide – Streamflow & Turbidity
Advanced Field Guide – Nitrate-Nitrogen & Phosphate
Macroinvertebrate Bioassessment Filed Guide (coming soon)

Trainer Enrollment Form

Maintenance Guides
Standard Core Equipment Maintenance Guide
Probe Kit Maintenance Guide

APPENDIX G. LOWER COLORADO RIVER AUTHORITY, COLORADO RIVER WATCH NETWORK WATER QUALITY MONITORING MANUAL

Lower Colorado River Authority
Colorado River Watch Network Water Quality Monitoring Manual Ninth Edition:
https://www.lcra.org/wp-content/uploads/2020/01/CRWN-Manual_2012final.pdf