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

Texas State University-San Marcos (TxState) Texas Stream Team Program
The Meadows Center for Water and the Environment, Texas State University-San Marcos
601 University Drive
San Marcos, Texas 78666

Funding Source:

Nonpoint Source Protection Program CWA §319(h)
Prepared in cooperation with the Texas Commission on Environmental Quality
and the U.S. Environmental Protection Agency
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Questions concerning this quality assurance project plan should be directed to:

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San Marcos, Texas 78666
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emilyw@txstate.edu
Texas Stream Team QAPP
Revision date: 12/14/12
Page 2

A1 APPROVAL PAGE

Texas Commission on Environmental Quality
Monitoring Division

Sharon Coleman, Manager (Acting)  01/16/2013
Quality Assurance

Kyle Gidley, Lead NPS QA Specialist  1/14/13
Quality Assurance Team

Water Quality Planning Division

Kerry Niemann, Team Leader  1/16/13
Nonpoint Source Program

Anju Chalise, NPS QA Specialist  1/16/2013
Nonpoint Source Program

Arthur Talley, Project Manager  1/16/13
Nonpoint Source Program

Texas State University / Texas Stream Team Program

Emily Warren  12/18/12
TxEstate Texas Stream Team Project Manager

Travis Tidwell  12/18/12
TxEstate Texas Stream Team Quality Assurance Officer

Jessica Snider  12/18/12
TxEstate Texas Stream Team Data Manager

Texas Stream Team will secure written documentation from additional project participants (e.g., subcontractors, laboratories) stating the organization’s awareness of and commitment to requirements contained in this quality assurance project plan and any amendments or revisions of this plan. Texas Stream Team will maintain this documentation as part of the project’s quality assurance records. This documentation will be available for review. 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.
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LIST OF ACRONYMS

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AWRL</td>
<td>Ambient Water Reporting Limit</td>
</tr>
<tr>
<td>BMP</td>
<td>Best Management Practice</td>
</tr>
<tr>
<td>CAP</td>
<td>Corrective Action Plan</td>
</tr>
<tr>
<td>CRWN</td>
<td>Colorado River Watch Network</td>
</tr>
<tr>
<td>CWA</td>
<td>Clean Water Act</td>
</tr>
<tr>
<td>DMP</td>
<td>Data Management Plan</td>
</tr>
<tr>
<td>DQO</td>
<td>Data Quality Objective</td>
</tr>
<tr>
<td>GIS</td>
<td>Geographic Information System</td>
</tr>
<tr>
<td>GPS</td>
<td>Global Positioning System</td>
</tr>
<tr>
<td>LCRA</td>
<td>Lower Colorado River Authority</td>
</tr>
<tr>
<td>LOD</td>
<td>Limit of Detection</td>
</tr>
<tr>
<td>LOQ</td>
<td>Limit of Quantitation</td>
</tr>
<tr>
<td>NPS</td>
<td>Nonpoint Source</td>
</tr>
<tr>
<td>QA/QC</td>
<td>Quality Assurance/Quality Control</td>
</tr>
<tr>
<td>QAO</td>
<td>Quality Assurance Officer</td>
</tr>
<tr>
<td>QAPP</td>
<td>Quality Assurance Project Plan</td>
</tr>
<tr>
<td>QAS</td>
<td>Quality Assurance Specialist</td>
</tr>
<tr>
<td>QMP</td>
<td>Quality Management Plan</td>
</tr>
<tr>
<td>RWA</td>
<td>Receiving Water Assessment</td>
</tr>
<tr>
<td>SOP</td>
<td>Standard Operating Procedure</td>
</tr>
<tr>
<td>SWQM</td>
<td>Surface Water Quality Monitoring</td>
</tr>
<tr>
<td>SWQMIS</td>
<td>Surface Water Quality Monitoring Information System</td>
</tr>
<tr>
<td>TBD</td>
<td>To be determined</td>
</tr>
<tr>
<td>TCEQ</td>
<td>Texas Commission on Environmental Quality</td>
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<tr>
<td>TMDL</td>
<td>Total Maximum Daily Load</td>
</tr>
<tr>
<td>TNTC</td>
<td>Too Numerous To Count</td>
</tr>
<tr>
<td>TxState</td>
<td>Texas State University-San Marcos</td>
</tr>
<tr>
<td>TSWQS</td>
<td>Texas Surface Water Quality Standards</td>
</tr>
<tr>
<td>WMT</td>
<td>Watershed Management Team</td>
</tr>
<tr>
<td>USEPA</td>
<td>United States Environmental Protection Agency</td>
</tr>
</tbody>
</table>
A3 DISTRIBUTION LIST

The Lead NPS QA Specialist will provide original versions of this project plan and any amendments or revisions of this plan to the TCEQ NPS Project Manager and the Texas Stream Team Project Manager. The TCEQ NPS Project Manager will provide copies to the EPA Project Officer within two weeks of approval. The TCEQ NPS Project Manager will document receipt of the plan and maintain this documentation as part of the project’s quality assurance records. This documentation will be available for review.

U.S. Environmental Protection Agency Region 6
Nonpoint Source Program
1445 Ross Avenue
Suite # 1200
Dallas, TX 75202-2733

Leslie Rauhe, Project Officer
(214) 665-2773

The Texas Stream Team 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 Texas Stream Team 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.

(TxState) Texas Stream Team
The Meadows Center for Water and the Environment
Texas State University-San Marcos
601 University Drive
San Marcos, TX 78666

Emily Warren, Project Manager
(512) 245-4476

Travis Tidwell, Quality Assurance Officer
(512) 245-9148

Jessica Snider, Data Manager
(512) 245-3461

Texas Stream Team Partners
For a complete list of partners, visit the Partners List on the Texas Stream Team’s website at http://txstreamteam.meadowscenter.txstate.edu/partners/partner-list.html.
A4 PROJECT/TASK ORGANIZATION

TCEQ

Monitoring Division

Kyle Girten
Lead NPS QA Specialist
Assists the TCEQ Project Manager in QA related issues. Serves on planning team for NPS projects. Participates in the planning, development, approval, implementation, and maintenance of the QAPP. Determines conformance with program quality system requirements. Coordinates or performs audits, as deemed necessary and using a wide variety of assessment guidelines and tools. Concurs with proposed corrective actions and verifications. Monitors corrective action. Provides technical expertise and/or consultation on quality services. Provides a point of contact at the TCEQ to resolve QA issues. Recommends to TCEQ management that work be stopped in order to safeguard project and programmatic objectives, worker safety, public health, or environmental protection.

Water Quality Planning Division

Kerry Niemann, Team Leader
NPS Program
Responsible for management and oversight of the TCEQ NPS Program. Oversees the development of QA guidance for the NPS program to be sure it is within pertinent frameworks of the TCEQ. Monitors the effectiveness of the program quality system. Reviews and approves all NPS projects, internal QA audits, corrective actions, reports, work plans, and contracts. Enforces corrective action, as required. Ensures NPS personnel are fully trained and adequately staffed.

Arthur Talley
TCEQ NPS 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 Texas Stream Team, the TCEQ, and the EPA. 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 NPS projects. Participates in the development, approval, implementation, and maintenance of the QAPP. Assists the TCEQ QAS in technical review of the QAPP. Responsible for verifying that the QAPP is followed by Texas Stream Team. Notifies the TCEQ QAS of particular circumstances which may adversely affect the quality of data derived from the collection and analysis of samples. Enforces corrective action.
Anju Chalise
NPS QA Specialist
Assists Lead QAS with NPS QA management. Serves as liaison between NPS management and Agency QA management. Responsible for NPS guidance development related to program quality assurance. Serves on planning team for NPS projects. Participates in the development, approval, implementation, and maintenance of the QAPP.

TxState Texas Stream Team Program

Emily Warren
TxState Texas Stream Team Project Manager

Responsible for implementing the TxState Texas Stream Team requirements in the contract and in the QAPP. Implements the quality system as defined by the contract and in the QAPP. Assesses the quality subcontractor/participant work as defined in the work plan. Identifies, receives, and maintains project quality assurance records. Submits accurate and timely deliverables to the TCEQ Texas Stream Team Project Manager. Coordinates attendance at conference calls, training events, meetings, and related project activities with the TCEQ.

Travis Tidwell
TxState Texas Stream Team Quality Assurance Officer

Responsible for writing and maintaining Texas Stream Team QAPP and ensuring the quality of data submitted to the TCEQ. Responsible for compiling and submitting the annual QA report. Responsible for coordinating with the NPS QAS to resolve QA related issues. Responsible for coordinating and conducting quality control activities. Responsible for maintaining written records of sub-tier commitments specified in this QAPP. Responsible for maintaining records of QAPP distribution, including appendices and amendments. Responsible for transferring data to the TCEQ in the acceptable format. Provides the point of contact for the TCEQ Data Manager to resolve issues related to the data.

Jessica Snider
TxState Texas Stream Team Data Manager

Ensures that the procedures described within the data validation checklist are adhered to, documented properly, and submitted with the data. Runs automated data validation checks that “flag” data not meeting the requirements of the checklist.
A5  PROBLEM DEFINITION/BACKGROUND

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

1) Texas has a large number of 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 citizens about NPS pollution and their role in reducing and preventing it.
5) Many citizens are becoming increasingly concerned about potentially harmful bacteria in waterways, swimming areas, and drinking water. Biennial TCEQ 305(b) reports assess as much as sixty-five percent of Texas’ surface waters (TCEQ 2003 or 2004 NPS REPORT). Up to thirty-three percent of assessed surface waters have been identified as impaired by TCEQ and may not be achieving designated use 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. Texas Stream Team provides, at an affordable cost, an expanded capacity to collect 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 direct professional monitors to water quality degradation that is happening at a more advanced rate. More uses of volunteer monitoring data are explained below.

The purpose of the QAPP is to clearly delineate Texas Stream Team QA policy, management structure, and policies that will be used to implement the QA requirements necessary to document the reliability and validity of environmental data. The QAPP is reviewed by the TCEQ to ensure that data generated for the purposes described above are appropriate for its intended uses. This process will ensure that all data submitted to Texas Stream Team database 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 (BMP) effectiveness, problem identification, and other uses deemed appropriate by resource managers and the TCEQ. Data collected within this plan are not intended for use in enforcement proceedings. Volunteers interested in collecting data, which is used in enforcement proceedings, will be directed to the applicable TCEQ protocols.

Texas Stream Team is implemented through a partnership between TxState, TCEQ, and the USEPA to support volunteer monitors in the collection of valid, quality assured water quality data. The project is funded through an inter-local Contract between TCEQ and TxState. The source of funds is Federal Clean Water Act Section 319, Nonpoint Source Pollution Program.

Texas Stream Team QAPP is an umbrella document covering all participating volunteer monitoring programs. This QAPP will support all VOLUNTEER WATER QUALITY MONITOR (VWQM) groups and individuals who have completed the approved certification process.

Texas Stream Team will utilize the established network of volunteer monitors and partners to contribute to education, research, screening and problem identification, and coordinated planning processes through the Clean Rivers Program Coordinated Monitoring and Watershed Planning process. TxState Texas Stream Team will coordinate these activities with local partners who will ensure monitoring, QC, equipment, and data management conform to Texas Stream Team QAPP. TxState Texas Stream Team will recruit volunteers and partner organizations, and initiate trainings statewide as resources permit.
The LCRA Colorado River Watch Network (CRWN) is a partner program of Texas Stream Team. CRWN has their own set of procedures and quality system for their citizen monitoring program. The CRWN procedures have been incorporated in this QAPP as Appendix K. As an independent entity which does not receive funding from the TCEQ or Texas State University, CRWN manages volunteers, conducts trainings, manages data, and supplies equipment for volunteers within the Colorado River Watershed. However, TxState Texas Stream Team has chosen to include CRWN information in this QAPP based on the following points: CRWN is considered as part of the Texas Stream Team volunteer monitoring network, CRWN data is included in the Texas Stream Team database and CRWN volunteers and state-funded staff are counted as match for the Texas Stream Team 319 grant project. Other ways in which TxState Texas Stream Team partners exclusively with CRWN is through the 1) sharing of water quality data and 2) planning events.

A6 PROJECT/TASK DESCRIPTION AND SCHEDULE

Through this project, Texas Stream Team will conduct volunteer water quality monitoring statewide according to approved certification and data collection protocols. Monitors in the CRWN program will follow CRWN protocols provided in Appendix K.

Monitoring sites information, within Texas Stream Team Database, is reviewed and updated in the beginning of the project year based on current monitoring activities. This review will take place in conjunction with annual QAPP revisions. VWQMs are instructed to sample monthly, or as defined in their Monitoring Plan. All sites data are tracked, stored, and maintained within Texas Stream Team Database.

See Appendix A for the project related work plan tasks and schedule of deliverables for a description of work defined in this QAPP. Volunteer data collection and public education/outreach efforts are focused into six targeted watersheds specifically where there are currently TMDL or watershed protection projects underway, as directed by TCEQ. The projects supported are the: Oso Creek/Oso Bay TMDL, Gilleland Creek TMDL, Upper Guadalupe River TMDL, Arroyo Colorado WPP, Upper Cibolo Creek WPP, and Plum Creek WPP.

Revisions to the QAPP

Until the work described is completed, this QAPP shall be reissued annually on the anniversary date, or revised and reissued prior to any significant changes being made in activities, whichever is sooner. Reissuances and annual updates must be submitted to the TCEQ for approval at least 90 days before the last approved version has expired. If the QAPP expires, the QAPP is no longer in effect and the work covered by the QAPP must be halted. If the entire QAPP is current, valid, and accurately reflects the project goals and the organization’s policy, the annual re-issuance may be done by a certification that the plan is current. This can be accomplished by submitting a cover letter stating the status of the QAPP and a copy of new, signed approval pages for the QAPP. If the QAPP needs to be updated to incorporate amendments made earlier in the year or to incorporate new changes, a full annual update is required. This is accomplished by submitting a cover letter, a document detailing changes made, and a full copy of the updated QAPP (including signature pages).
Amendments to the QAPP

Revisions to the QAPP may be necessary to reflect changes in project organization, tasks, schedules, objectives, and methods; to improve operational efficiency; and to accommodate unique or unanticipated circumstances. Requests for amendments are directed from the TxState Texas Stream Team Project Manager to the TCEQ Texas Stream Team Project Manager in writing. They are effective immediately upon review and approval by the TCEQ Texas Stream Team Project Manager, QA staff, and other TCEQ staff as appropriate. They will be distributed by the TxState Texas Stream Team Project Manager and incorporated into the QAPP by way of attachment and distributed to personnel on the distribution list.

Personnel and Equipment Requirements

Texas Stream Team staff and partners will train and certify citizen volunteers to collect water quality field data. The field sampling equipment selected for this project is both affordable and easy to use with accuracy and precision comparable to results produced by professional monitors. See Section A8 and B6.

Assessment Techniques

See section C1 for a listing of project assessments.

Quality Assurance Records

See Section A9 for a listing of project quality assurance documents and records.

A7 QUALITY OBJECTIVES AND CRITERIA FOR MEASUREMENT

This project will collect surface water quality data. LCRA CRWN procedures and protocols are provided in Appendix K.

The measurement performance criteria to support the project objectives are specified in Table A7.1.

Table A7.1 - Measurement Quality Objectives

<table>
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<tr>
<th>PARAMETER</th>
<th>UNITS</th>
<th>MATRIX</th>
<th>METHOD</th>
<th>PARAMETER CODE</th>
<th>LWRL</th>
<th>Limit of Quantitation (LOQ)</th>
<th>RECOVERY AT LOQs (%)</th>
<th>PRECISION (RPF of LCS/LCS)</th>
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<th>Complete ness (%)</th>
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<td>B C</td>
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<td>EPA 170.1 and TCEQ SOP V1</td>
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<td>NA</td>
<td>NA</td>
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<td>PARAMETER</td>
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<td>METHOD</td>
<td>PARAMETER CODE</td>
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<td>RECOVERY AT LOQs (%)</td>
<td>PRECISION (RPD of LCS/LCS)</td>
<td>BIAS (% Rec. of LCS)</td>
<td>COMPLETENESS (%)</td>
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<td>su</td>
<td>water</td>
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<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
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<td>Secchi Depth</td>
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<td>NA</td>
<td>NA</td>
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<td>NA</td>
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<td>Salinity</td>
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<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>90</td>
</tr>
<tr>
<td>Algae Cover</td>
<td>1-absent 2-rare 3-common 4-abundant 5-dominant</td>
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<td>Texas Stream Team SOP</td>
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<td>NA*</td>
<td>NA</td>
<td>NA</td>
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<td>NA</td>
<td>90</td>
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<td>Water Color</td>
<td>1-no color 2-light green 3-dark green 4-tan 5-red 6-green/brown 7-black</td>
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<td>Texas Stream Team SOP</td>
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<td>NA*</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>90</td>
</tr>
<tr>
<td>Water Clarity</td>
<td>1-clear 2-cloudy 3-turbid</td>
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<td>NA</td>
<td>90</td>
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<tr>
<td>Water Surface</td>
<td>1-clear 2-scum 3-froth 4-debris 5-skein</td>
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<td>NA</td>
<td>NA</td>
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</tr>
<tr>
<td>Water Conditions</td>
<td>1-calm 2-ripples 3-waves 4-white cap</td>
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<tr>
<td>Water Odor</td>
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<td>Texas Stream Team SOP</td>
<td>NA</td>
<td>NA*</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>90</td>
</tr>
<tr>
<td>PARAMETER</td>
<td>UNITS</td>
<td>MATRIX</td>
<td>METHOD</td>
<td>PARAMETER CODE</td>
<td>AWRL Limit of Quantification (LOQ)</td>
<td>RECOVERY AT LOQs (%)</td>
<td>PRECISION (RPD of LCS/LCS)</td>
<td>BIAS (%Rec. of LCS)</td>
<td>Complete ness (%)</td>
<td></td>
</tr>
<tr>
<td>-----------------------------------</td>
<td>-----------------------------</td>
<td>--------</td>
<td>-----------------------------</td>
<td>----------------</td>
<td>-----------------------------------</td>
<td>----------------------</td>
<td>---------------------------</td>
<td>----------------------</td>
<td>-------------------</td>
<td></td>
</tr>
<tr>
<td>Present Weather</td>
<td>1-clear 2-cloudy 3-overcast 4-rain</td>
<td>air</td>
<td>Texas Stream Team SOP</td>
<td>89966</td>
<td>NA*</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>90</td>
</tr>
<tr>
<td>Days since last significant rainfall</td>
<td>days</td>
<td>NA</td>
<td>TCEQ SOP V1</td>
<td>72033</td>
<td>NA*</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>90</td>
</tr>
<tr>
<td>Rainfall Accumulation (last 3 days)</td>
<td>inches</td>
<td>NA</td>
<td>Texas Stream Team SOP</td>
<td>NA</td>
<td>NA*</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>90</td>
</tr>
<tr>
<td>Tidal Stage</td>
<td>1-low 2-filling 3-slaek 4-chasing 5-high</td>
<td>water</td>
<td>Texas Stream Team SOP</td>
<td>89972</td>
<td>NA*</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>90</td>
</tr>
<tr>
<td>E.coli</td>
<td>Colony forming units (cfu) per 100 mL</td>
<td>water</td>
<td>Texas Stream Team SOP</td>
<td>NA</td>
<td>1 cfu per 100 mL</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>90</td>
</tr>
<tr>
<td>Transparency Tube</td>
<td>Meters</td>
<td>water</td>
<td>Texas Stream Team SOP</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>90</td>
</tr>
<tr>
<td>Nitrate Nitrogen</td>
<td>Mg/L</td>
<td>water</td>
<td>Texas Stream Team SOP</td>
<td>00618</td>
<td>0.1 mg/L</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>90</td>
</tr>
<tr>
<td>Orthophosphate Phosphorus</td>
<td>Mg/L</td>
<td>water</td>
<td>Texas Stream Team SOP</td>
<td>00671</td>
<td>0.02 - 50 mg/L</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>90</td>
</tr>
<tr>
<td>Chemical Turbidity</td>
<td>Jackson Turbidity Units (JTUs)</td>
<td>water</td>
<td>Texas Stream Team SOP</td>
<td>00070</td>
<td>5 JTU's</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>90</td>
</tr>
<tr>
<td>Stream Flow estimate</td>
<td>Cubic feet per second (cfs)</td>
<td>water</td>
<td>Texas Stream Team SOP</td>
<td>00061</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>90</td>
</tr>
</tbody>
</table>

* Reporting to be consistent with Texas Stream Team or SWQM guidance and based on measurement capability.

**References for Table A7.1:**


TCEQ SOP V2 - TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Community and Habitat.

Data, 2005 (RG-416)
Texas Stream Team SOP - Texas Stream Team Environmental Monitoring Manual, 2002
American Society for Testing and Materials (ASTM) Annual Book of Standards, Vol. 11.02
Representativeness

Data collected under this program will be considered representative of ambient water quality conditions. The representativeness of the data is dependent on the sampling locations and the sampling procedures to adequately represent the true conditions at the sample sites. Site selection criteria (See Appendix B) and use of only EPA-approved analytical methods at the sampling site will assure that the measurement data represents the conditions at the site. Representativeness also depends on the number of samples taken to accurately reflect the water quality at a given site.

Comparability

The comparability of the data produced is predetermined by the commitment of the monitor to use only approved procedures as described in this QAPP. Comparability is also guaranteed by reporting data in standard units, by using accepted rules for rounding figures, and by reporting data in a standard format as specified in the Data Management Plan (Appendix E).

Completeness

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

A8 SPECIAL TRAINING REQUIREMENTS/CERTIFICATION

TxState Texas Stream Team and Partners provide training on field techniques, quality assurance, data management, etc. The training procedures and requirements for certification of Texas Stream Team Volunteer Monitors are described in the Texas Stream Team Water Quality Monitoring Manual. Although the three phase format is the same, the LCRA CRWN monitor training differs from the Texas Stream Team training because the monitoring procedures are slightly different. These differences involve one less step in the DO titration and a different waiting period for air temperature measurement. Procedures and requirements for Texas Stream Team Trainers are outlined in the Texas Stream Team Trainer’s Manual. Finally, procedures for certification as a Texas Stream Team Quality Assurance Officer are described in Texas Stream Team Quality Assurance Officer’s Manual.
A9 DOCUMENTS AND RECORDS

The documents that describe, specify, report, or certify activities are listed. Electronic records are backed up every 24 hours, and are kept on multiple computers, as well as two virtual servers provided by Texas State University.

<table>
<thead>
<tr>
<th>Document/Record</th>
<th>Location</th>
<th>Retention(yrs)</th>
<th>Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>Complete original data sets (physical submission)</td>
<td>TxState Texas Stream Team</td>
<td>7</td>
<td>Paper</td>
</tr>
<tr>
<td>Complete original data sets (electronic submission</td>
<td>TxState Texas Stream Team</td>
<td>7</td>
<td>Electronic</td>
</tr>
<tr>
<td>LCRA CRWN data sets</td>
<td>TxState Texas Stream Team</td>
<td>7</td>
<td>Electronic</td>
</tr>
<tr>
<td>Corrective Action Documentation</td>
<td>TxState Texas Stream Team</td>
<td>7</td>
<td>Electronic</td>
</tr>
<tr>
<td>Field equipment calibration (Included on the field</td>
<td>TxState Texas Stream Team</td>
<td>7</td>
<td>Electronic</td>
</tr>
<tr>
<td>Field SOPs</td>
<td>TxState Texas Stream Team</td>
<td>7</td>
<td>Electronic</td>
</tr>
<tr>
<td>QAPP, amendments, appendices</td>
<td>TCEQ/TxState Texas Stream Team</td>
<td>7</td>
<td>Electronic</td>
</tr>
<tr>
<td>QAPP distribution documentation</td>
<td>TxState Texas Stream Team</td>
<td>7</td>
<td>Electronic</td>
</tr>
</tbody>
</table>
B1 SAMPLING PROCESS DESIGN

See Appendix B for sampling process design information and monitoring tables associated with data collected under this QAPP. See Appendix K for such information pertaining to LCRA CRWN.

B2 SAMPLING METHODS

Field Sampling Procedures

The field sampling procedures are documented in Texas Stream Team Water Quality Monitoring Manual and its appendices, or the TCEQ Surface Water Quality Monitoring Procedures Manual, Volume 1 (October 2008). LCRA CRWN procedures and protocols are provided in Appendix K.

Table B2.1 Sample Storage, Preservation and Handling Requirements

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Matrix</th>
<th>Container</th>
<th>Sample Volume</th>
<th>Preservation</th>
<th>Holding Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>E. coli</td>
<td>water</td>
<td>SPS</td>
<td>100</td>
<td>Refrigerate @ 4^oC*</td>
<td>6 Hours</td>
</tr>
<tr>
<td>Nitrate Nitrogen</td>
<td>water</td>
<td>Plastic Test Tube</td>
<td>10 mL</td>
<td>Refrigerate @ 4^oC*</td>
<td>48 Hours</td>
</tr>
<tr>
<td>Orthophosphate</td>
<td>water</td>
<td>Glass Mixing Bottle</td>
<td>25 mL</td>
<td>Refrigerate @ 4^oC*</td>
<td>48 Hours</td>
</tr>
<tr>
<td>Phosphorous</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chemical Turbidity</td>
<td>water</td>
<td>Plastic Turbidity Column</td>
<td>50 mL</td>
<td>Refrigerate @ 4^oC*</td>
<td>48 Hours</td>
</tr>
</tbody>
</table>

* Preservation performed immediately upon collection (within 15 minutes)

Container Key: SPS = Sterile Polystyrene

Sample Containers

All sample containers will meet the requirements as outlined in Table B2.1. Sterile Polystyrene (100ml) or are used for bacteriological samples and are disposable.

Processes to Prevent Contamination

Procedures documented in Texas Stream Team Water Quality Monitoring Manual and its appendices, or the TCEQ Surface Water Quality Monitoring Procedures Manual, Volume 1 (October 2008) outline the necessary steps to prevent contamination of samples. These include: direct collection into sample containers, when possible. Field QC samples (identified in Appendix G) are collected to verify that contamination has not occurred.
Documentation of Field Sampling Activities

Field sampling activities are documented on the field data sheet as presented in Appendix C. For all field sampling events, station ID, location, sampling time, date, and depth, sample collector’s name/signature, group identification number, conductivity meter calibration information, and reagent expiration dates are checked and recorded if expired. For all *E. coli* sampling events, station ID, location, sampling time, date, and depth, sample collector’s name/signature, group identification number, incubation temperature, incubation duration, *E. coli* colony counts, dilution aliquot, field blanks, and media expiration dates are checked and recorded if expired. Values for all measured parameters are recorded. If reagents or media are expired, it is noted and communicated to Texas Stream Team. Sampling is still encouraged with expired reagents and bacteria media; however, the corresponding values will be flagged in the database (explained thoroughly in 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. Submission via the Texas Stream Team iPhone application.
3. Submission via the Texas Stream Team online data entry system.

Failures in Sampling Methods Requirements and/or Deviations from Sample Design and Corrective Action

Examples of failures in sampling methods and/or deviations from sample design requirements include but are not limited to such things as equipment problems, sample site considerations, etc. Failures or deviations from the QAPP are documented on the field data sheet. The TxState Texas Stream Team Data Manager in consultation with Texas Stream Team 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 document.

B3 SAMPLING HANDLING AND CUSTODY

The field sampling procedures are documented in Texas Stream Team Water Quality Monitoring Manual and its addendums. Core variables are collected as field measurements except for *E. coli* bacteria. Water samples which are collected for analysis of nitrate-nitrogen, orthophosphate, and turbidity (chemical
method) 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. LCRA CRWN procedures and protocols are provided in Appendix K.

B4 ANALYTICAL METHODS

The analytical methods are listed in Table A7.1 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. Data reporting analytical methods are displayed in Appendix E. LCRA CRWN procedures and protocols are provided in Appendix K.

Standards Traceability

All conductivity standards are produced or purchased by Texas Stream Team, Partners, or VWQM groups as needed. All conductivity standards purchased are traceable to certified reference materials. If conductivity standards are produced by Texas Stream Team, Partners, or VWQM groups, 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.

Failures or Deviations in Analytical Method Requirements and Corrective Actions

Failures in field measurement systems involve, but are not limited to such things as, instrument malfunctions and failures in calibration. In many cases, the VWQM or QAO will be able to correct the problem. If the problem is resolvable by the VWQM 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 VWQM or QAO, the parties will consult with the local partner or Texas Stream Team to determine a solution.

B5 QUALITY CONTROL

Sampling Quality Control Requirements and Acceptability Criteria

The minimum Field QC Requirements are outlined in Texas Stream Team Water Quality Monitoring Manual and its appendices. See Appendix D. LCRA CRWN procedures and protocols are provided in Appendix K.
Failures in Field Quality Control and Corrective Action

Best professional judgments will be relied upon in evaluating results. Field values falling outside the acceptability criteria may invalidate the sample. Notations of field duplicate excursions are noted on the data sheet for inclusion in the comments section of Texas Stream Team database. For a comprehensive understanding of TST’s data validation checks, look to section D2 of this QAPP document.

B6 INSTRUMENT/EQUIPMENT TESTING, INSPECTION AND MAINTENANCE

All sampling equipment testing and maintenance requirements are detailed in Texas Stream Team Water Quality Monitoring Manual. Equipment records are kept on all field equipment and TxState Texas Stream Team, the VWQM, or Partner maintains a supply of critical spare parts.

All equipment testing and maintenance requirements are contained within Texas Stream Team Water Quality Monitoring Manual and its addendums. LCRA CRWN procedures and protocols are provided in Appendix K.

B7 INSTRUMENT CALIBRATION AND FREQUENCY

Field equipment calibration requirements are contained in Texas Stream Team Water Quality Monitoring Manual. Post calibration error limits and the disposition resulting from error are adhered to. Data not meeting post-error limit requirements will be “flagged” in Texas Stream Team database for further review by Texas Stream Team staff. LCRA CRWN procedures and protocols are provided in Appendix K.

B8 INSPECTION/ACCEPTANCE REQUIREMENT FOR SUPPLIES AND CONSUMABLES

Sec B4 for standards requirements. Sampling reagents are used until they surpass the expiration dates prescribed by the manufacturer. At each sampling event, monitors 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 or loss.
B9 NON-DIRECT MEASUREMENTS

The Texas Stream Team online data viewer utilizes map overlays from Google Maps Version 3 as well as data layers from the following sources. Maps published by the Texas Stream Team also utilize data layers from the following sources.

Table B9.1 – Data Sources

<table>
<thead>
<tr>
<th>Data</th>
<th>Source</th>
<th>Link</th>
</tr>
</thead>
<tbody>
<tr>
<td>TCEQ 2010 Stream Segments</td>
<td>Texas Commission on Environmental Quality</td>
<td><a href="http://www.tceq.texas.gov/gis/hydro.html">http://www.tceq.texas.gov/gis/hydro.html</a></td>
</tr>
<tr>
<td>Permitted Wastewater Outfalls</td>
<td>Texas Commission on Environmental Quality</td>
<td><a href="http://www.tceq.texas.gov/gis/sites.html">http://www.tceq.texas.gov/gis/sites.html</a></td>
</tr>
<tr>
<td>Surface Water Quality Monitoring Stations</td>
<td>Texas Commission on Environmental Quality</td>
<td><a href="http://www.tceq.texas.gov/gis/sites.html">http://www.tceq.texas.gov/gis/sites.html</a></td>
</tr>
<tr>
<td>StratMap Boundaries</td>
<td>Texas Natural Resource Information System</td>
<td><a href="http://www.tnriss.org/get-data">http://www.tnriss.org/get-data</a></td>
</tr>
<tr>
<td>TxDOT Roadways</td>
<td>Texas Natural Resource Information System</td>
<td><a href="http://www.tnriss.org/get-data">http://www.tnriss.org/get-data</a></td>
</tr>
<tr>
<td>StratMap Transportation</td>
<td>Texas Natural Resource Information System</td>
<td><a href="http://www.tnriss.org/get-data">http://www.tnriss.org/get-data</a></td>
</tr>
<tr>
<td>Hydrologic Unit Code (HUC)</td>
<td>Texas Natural Resource Information System</td>
<td><a href="http://www.tnriss.org/get-data">http://www.tnriss.org/get-data</a></td>
</tr>
</tbody>
</table>

B10 DATA MANAGEMENT

See Appendix E for the Data Review Checklist and Summary. LCRA CRWN procedures and protocols are provided in Appendix K. Data from LCRA CRWN is provided via MS Excel spreadsheets on a quarterly basis and is subsequently added into the TxState Texas Stream Team Database.
## 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 K.

**Table C1.1 – Assessments and Response Requirements**

<table>
<thead>
<tr>
<th>Assessment Activity</th>
<th>Approximate Schedule</th>
<th>Responsible Party</th>
<th>Scope</th>
<th>Response Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status Monitoring Oversight, etc.</td>
<td>Annual</td>
<td>TxState Texas Stream Team</td>
<td>Monitoring of the project status and records to ensure requirements are being fulfilled</td>
<td>Report to TCEQ Project Manager</td>
</tr>
<tr>
<td>Monitoring / Quality Assurance</td>
<td>As needed</td>
<td>TxState Texas Stream Team</td>
<td>Random site visits may be conducted and would include audits of field sampling, handling and measurement and related quality assurance oversight; or facility review, data management, and related quality assurance oversight. However, the primary form of quality assurance is for monitors to utilize quality assurance modules. These modules include instructional videos that review common mistakes and instruct monitors on proper quality assurance procedures. Monitors view the videos and complete quizzes to assess their knowledge. The results are communicated to Texas Stream Team staff, and partner organizations for review and follow up where quality assurance issues are present.</td>
<td>Feedback of evaluation provided to VWQM or Partner</td>
</tr>
<tr>
<td>Systems Audit</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Training Systems Audit</td>
<td>In conjunction with training sessions</td>
<td>Texas Stream Team Trainer</td>
<td>Texas Stream Team Volunteer Monitor and Trainer certification</td>
<td>Training records submitted to TxState Texas Stream Team or Partner</td>
</tr>
<tr>
<td>Quality Control</td>
<td>Monthly</td>
<td>VWQM</td>
<td>Field sampling, handling and measurement, recording data, and equipment and reagent check</td>
<td>Submit completed Monitoring Forms with completed QC information</td>
</tr>
</tbody>
</table>
Corrective Action

Records of audit findings and corrective actions are maintained by TxState Texas Stream Team or Partner as necessary. Audit findings, corrective action, and other activities addressing audit findings will be documented.

C2 REPORTS TO MANAGEMENT

Reports to TCEQ Management

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

Corrective Action Report – Summarizes Texas Stream Team’s non-conformance to the QAPP and lists the ensuing corrective action taken by Texas Stream Team

Data Management Report (Draft and Final) - Details activities conducted under Task 6, Data Management, for the entire contract period.

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

Final Report (Draft and Final) – Summarizes Texas Stream Team activities over the grant contract period; tends to consolidate information provided throughout the contract in the Task Reports.

Partner Coordination and Development Report (Draft and Final) - Details activities conducted under Task 3, Partner Coordination and Development, for the entire contract period.

Project Planning Report (Draft and Final) - Details activities conducted under Task 4, Project Planning, for the entire contract period.

Publications Report (Draft and Final) – Details activities conducted under Task 2, Publications, for the entire contract period.

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 a comprehensive tracking of deliverable status under each task.

Statewide Citizen Environmental Monitoring Support and Activities Report (Draft and Final) - Details activities conducted under Task 7, Statewide Citizen Environmental Monitoring Support and Activities, for the entire contract period.

Statewide Citizen Monitoring and NPS Education Events (Draft and Final) - Details activities conducted under Task 9, Statewide Citizen Monitoring and NPS Education Events, for the entire contract period.
Statewide Education Activities Report (Draft and Final) - Details activities conducted under Task 8, Statewide Education Activities, for the entire contract period.

Targeted Watershed Monitoring and Outreach Projects Report (Draft and Final) - Details activities conducted under Task 10, Targeted Watershed Monitoring and Outreach Projects, for the entire contract period.

Reports to the Texas Stream Team

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

Reports by TCEQ Project Management

Contractor Evaluation - TxState Texas Stream Team participates in a Contractor Evaluation by the TCEQ annually for compliance with administrative and programmatic standards.

D1 DATA REVIEW, VERIFICATION, AND VALIDATION

All 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 data are described in Section D2, below. The TxState Texas Stream Team Data Manager is responsible for ensuring field data are properly reviewed, verified, and submitted in the required format to the database. The TxState Texas Stream Team QAO is responsible for validating that all data collected meet the data quality objectives of the project.

D2 VERIFICATION AND VALIDATION METHODS

All data will be reviewed to ensure they are representative of the samples analyzed and locations where measurements were made, and that the data and associated quality control data conform to specified monitoring procedures and project specifications. The respective field, data management, and QAO data verification responsibilities are listed by task in Table D.1.
Data review and verification will be performed using data management checklist and self-assessments, as appropriate to the project task, 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 and 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 VWQM 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 review checklist (Appendices F and G), the corresponding data is flagged in the database.

LCRA CRWN procedures and protocols are provided in Appendix K.

Table D2.1 – Data Verification Table

<table>
<thead>
<tr>
<th>Data to be Verified</th>
<th>Field Task</th>
<th>Database Task</th>
<th>QAO Task</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collection and analysis techniques consistent with SOPs and QAPP</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sample documentation complete</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>QC samples within acceptance limits</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sample preservation and handling</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Holding times</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Instrument calibration data</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Measurement results</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Calculations</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Data entered in required format</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Absence of transcription error</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Reasonableness of data</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Electronic submittal errors</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>10% verification check of proper data verification procedures being followed</td>
<td></td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>
D3 RECONCILIATION WITH USER REQUIREMENTS

Data produced during this project will adhere to procedures outlined in Section D2 and Table D.1. TxState Texas Stream Team will employ these procedures to ensure that all data included in Texas Stream Team database 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 this water quality data and use it for the above mentioned purposes as well as a general understanding of where Texas Stream Team monitors are currently monitoring and have been in the past. Texas Stream Team may choose to communicate data findings at targeted watershed stakeholder forums (one per watershed per year) as well as at Clean Rivers Program annual basin-wide steering committee meetings. Reference section A5 for more extensive information on data uses. Data which do not meet requirements will not be included in Texas Stream Team database and will not be considered appropriate for the uses noted above.

The following data, presented in section B9, are used to create maps and supplement Stream Team monitoring data for comprehensive reports.

- TCEQ 2010 Stream Segments
- Permitted Wastewater Outfalls
- Surface Water Quality Monitoring Stations
- StratMap Boundaries
- TxDOT Roadways
- StratMap Transportation
- Hydrologic Unit Code (HUC)
- 12 Digit Watershed Boundary Dataset

In addition to the data shown above, the Texas Stream Team online data viewer utilizes

- Google Maps Version 3
Appendix A
SCOPE OF WORK

Updates to the Texas Stream Team Scope of Work are approved by TCEQ on a different schedule than updates to this QAPP.

The most current Texas Stream Team Scope of Work is available at:
http://txstreamteam.rivers.txstate.edu/publications/program-publications.html.
Appendix B
Sample Design Rationale

The sample design follows the intent of the EPA, TCEQ Texas Stream Team Project Manager, and Texas Stream Team to use the data collected within the QAPP for education, local decision-making, research, baseline data, screening, BMP effectiveness, and problem identification. Texas Stream Team actively promotes water quality and NPS pollution education and awareness through volunteer water quality monitoring activities. Additionally, data collected within the 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 problems are known or suspected. Texas Stream Team, its VWQMs, and Partners collect data to educate Texans about water quality, land use, and associated nonpoint source impacts; and the role people play in contributing to these impacts. Information collected can also identify water quality trends to characterize water quality conditions and can assist in resource allocation or the planning processes within the basin management schedule.

Site Selection Criteria

Some general guidelines are followed when selecting sampling sites, as identified below.

1. Fixed station and systematic monitoring sites are chosen based on safety and accessibility.

2. Fixed station and systematic monitoring sites are located preferentially according to local interests and concerns and are selected in conjunction with guidelines provided in Texas Stream Team Volunteer Environmental Monitoring Manual (section 2.0) and in coordination with Texas Stream Team Partner where applicable. Texas Stream Team will attempt to identify sites that maximize stream or basin coverage.

3. Perennial streams are preferred to intermittent streams.

4. A site map or latitude and longitude coordinates will be utilized to determine the site location.

5. Upon receipt of data, a site number will be assigned to the referenced location and the data will be entered into Texas Stream Team Database.

Monitoring Sites

Monitoring sites information submitted to Texas Stream Team is kept in Texas Stream Team Database. This information is reviewed and updated in the beginning of the project year based on current monitoring activities. This review will take place in conjunction with annual QAPP revisions. All sites data are tracked and maintained within Texas Stream Team Database and are available for review on the Texas Stream Team Data Viewer. Texas Stream Team Data Viewer is accessible on the Internet at http://txstreamteam.rivers.txstate.edu/Data/Data-Viewer.html.
Critical vs. non-critical measurements

All data collected in this project and entered into Texas Stream Team database and are considered critical to achievement of the objectives of the QAPP.
Appendix C
Texas Stream Team Field Data Sheet

Texas Stream Team
ENVIRONMENTAL MONITORING FORM
PLEASE PRINT (Black Ink or Red Pencil)

Group ID # ________ Monitor's Name ____________________________
Station ID # ________ Site Description ____________________________
Sample Date _______ _______ _______ _______ Sample Time (military) _______ _______ _______ Sample Depth (meters) _______ _______
Meter Calibration: (Within 24 hours of sampling.) Store and calibrate standard at room temperature.

<table>
<thead>
<tr>
<th>Conductivity</th>
<th>Date</th>
<th>Time</th>
<th>Standard Value</th>
<th>Standard Temp (°C)</th>
<th>Initial Meter Reading</th>
<th>Meter Adjusted To</th>
<th>Post Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH (7.0)</td>
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<td></td>
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<td></td>
</tr>
</tbody>
</table>

Core Tests and Measurements:

- CONDUCTIVITY (µS/cm)
- TDS Tester 3 (Low)
- TDS Tester 4 (High)
- Other
- AIR TEMPERATURE (°C)
- WATER TEMPERATURE (°C)
- DISSOLVED OXYGEN (mg/L)
  Average 1st reading _______ 2nd reading _______
- pH (standard units)
- SECCH DISK TRANSPARENCY (meters)
- TOTAL DEPTH (meters)
  Average 1st reading _______ 2nd reading _______
- TRANSPARENCY TUBE (meters)

Reagents/Media: Are any reagents (or media) expired? ☐Yes ☐No
List any expired:

Bacteria Test:

- E. COLI (colonies/100 mL)
  Average Sample 1 _______ Sample 2 _______
  INCUBATION: Period (hrs) _______ (28-31 hrs)
  Temp. (°C) _______ (33+3°C)
  SAMPLE 1: Sample size _______ mL
  Dilution factor (100/sample size) _______
  Colonies counted _______ x dilution factor _______ = _______ colonies/100 mL
  SAMPLE 2: Sample size _______ mL
  Dilution factor (100/sample size) _______
  Colonies counted _______ x dilution factor _______ = _______ colonies/100 mL
  FIELD BLANK: E. coli colony growth (circle one) YES / NO
  DATA QUALITY REVIEW: Cheddar completed (circle one) YES / NO

Additional Tests Conducted (nutrients, etc.):

- TYPE: ____________________________
- FECAL COLIFORM (colonies/100 mL)
  Source of readings: ☐ Certified Lab ☐ Monitor

Coastal Area Salinity Tests and Observations:

- SALINITY (ppt) _______
- TIDE STAGE: 1-low 2-falling 3-stack 4-rising 5-high
  SAMPLE TEMP (°C) _______

Measurement Comments and Field Observations:

- FLOW SEVERITY: 1-no flow 2-low 3-normal 4-flood 5-high 6-dry
- ALGAE COVER: 1-absent 2-rare (<25%) 3-common (25-50%) 4-abundant (51-75%) 5-dominant (>75%)
- WATER COLOR: 1-no color 2-light green 3-dark green 4-tan 5-red 6-green/brown 7-black
- WATER CLARITY: 1-clear 2-cloudy 3-turbid
- WATER SURFACE: 1-clear 2-scum 3-float 4-debris 5-sheets
- WATER CONDITIONS: 1-calm 2-flows 3-waves 4-wake caps
- WATER ODOR: 1-none 2-dull 3-acid (putrid) 4-sewage 5-rotten egg 6-fishy 7-musty
- PRESENT WEATHER: 1-clear 2-cloudy 3-overcast 4-rain
- DAYS SINCE LAST SIGNIFICANT PRECIPITATION (runoff) _______
- RAINFALL ACCUMULATION (inches, last 3 days) _______

- minutes TOTAL TIME SPENT SAMPLING AND TRAVELING _______ miles TOTAL ROUNDTRIP DISTANCE TRAVELED _______

I CERTIFY THAT ALL PROCEDURES HAVE BEEN FOLLOWED AND THIS INFORMATION IS ACCURATE TO THE BEST OF MY ABILITY.

CERTIFIED MONITOR'S SIGNATURE ____________________________ DATE __________
Yellow - Texas Stream Team White - Volunteer Data Manager or Texas Stream Team Partner
Blue - Volunteer Monitor
Rev. 09/2010
Appendix D
Texas Stream Team Water Quality Monitoring Manual

Updates to the Texas Stream Team Water Quality Monitoring Manual are initiated by Texas Stream Team and reviewed by TCEQ on a different schedule than updates to this QAPP. This manual is revised and printed yearly, or as needed. Manual updates are reviewed and approved by TCEQ as needed.

Appendix E
Texas Stream Team Data Management Plan
Personnel

Emily Warren, TxState Texas Stream Team 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.

Jessica Snider, TxState Texas Stream Team Data Manager - Receives and reviews data sheets. Validates information using the data validation checklist. Maintains and updates Texas Stream Team database to eliminate duplication, data entry errors, and information gaps. Submits recommendations to improve the Texas Stream Team database. Communicates with Texas Stream Team QA Officer and the Program Manager regarding the status of database problems and progress in completing data entry.

Travis Tidwell, TxState Texas Stream Team Quality Assurance Officer - Reviews data validation checklist and error log to ensure data are properly validated and that errors have been corrected or flagged in the database.

Volunteer Monitors - Documents field data on approved data sheet or approved electronic channel. Enters data into online entry form for submission to Texas Stream Team database or sends physical datasheet to Texas Stream Team or Partner/Group for online entry into Texas Stream Team database.

Systems Design
Hosting database and data-viewer – Minimum Requirements
- Web server to host database and data-viewer
- Remote SQL Server back end database
- Google Maps

Texas Stream Team local access database & data-viewer – Minimum Requirements
- MS Access to run local queries on SQL Server data
- Database Visualizer to edit and run advanced queries on SQL Server
- MS Excel to accept batch submission of partner/group data
- Web browser with internet connection
- Email client

Texas Stream Team GIS applications – Minimum Requirements
- ESRI ArcView IMS
- MS Access

Partner/Group access to database & data-viewer – Minimum Requirements
- Web browser with internet connection to validate monitor submissions
- Web browser with internet connection to enter monitor submissions
**Data Dictionary** - Terminology and field descriptions associated with Texas Stream Team data base are included in Texas Stream Team Data Dictionary located at the TxState Texas Stream Team offices.

**Data Management Plan Implementation**
Texas Stream Team data management system receives electronic and physical data from Partners and VWQMs. Physical data is entered into the database Texas Stream Team staff or Partner/Group data-managers and is then validated by a Group Leader, Partner or Texas Stream Team staff member. Electronic data is entered by the monitor or group leader and then is validated by a Group Leader, Partner or Texas Stream Team staff member. Texas Stream Team will make validated data available to the public through internet based Texas Stream Team data viewer.

**Data Validation and Entry**
Texas Stream Team certified Data Managers (Texas Stream Team staff and certified volunteers) enter Phase III Certification Trainings once a monitor account has been created. Data managers validate data entered by volunteers into electronic database. If volunteers cannot enter data into the online system, data managers enter monitoring data from their copy of the physical datasheet.

**Procedures for processing field data**
The volunteer monitor collects field data and reports the measurement results on Texas Stream Team approved physical or electronic datasheet. The physical data sheet includes three color copies, white, yellow, and pink. The volunteer submits the white copy to Texas Stream Team. The yellow copy is submitted to their local partner if applicable and the monitor retains the pink copy. The electronic datasheet is accessible in the online dataviewer.

When Texas Stream Team Quality Assurance Officer receives the physical data sheets, they are date stamped and validated using the data validation checklist (attached). Any errors are noted in an error log and the errors are flagged in Texas Stream Team database. All information is entered into Texas Stream Team database within 45 business days of receipt. All physical data sheets are stored in a hard copy filing system at the TxState Texas Stream Team offices or Partner facility for seven years.

When a monitor enters data electronically, the system will automatically flag data outside of the data limits and the monitor will be prompted to correct the mistake or the error will be logged in the database records. The certified Data Manager will further review any flagged errors before selecting to validate the data. Only after validation will the data formally enter the database and can be accessible through the online dataviewer.

Errors, which may compromise the program's ability to fulfill the completeness criteria prescribed in the QAPP, will be reported to the Texas Stream Team Program Manager. If repeated errors occur, the monitor and/or the group leader will be notified via e-mail or telephone.

**Procedures for processing certification training records**
Monitor Certification is documented on a certification training packet which includes training date, time, location, and test water quality values. Upon successfully completing the training, the training packet is returned
to the Texas Stream Team for review and entry into the database. The data validation checklist includes verification that the monitor is certified.

Document Control System
All data sheets and other documents associated with this data collection and quality control system are stored electronically on two separate hard drives at TxState Texas Stream Team offices in San Marcos, TX for a period of time identified in Section A9 of this QAPP. All physically submitted datasheets are at the TxState Texas Stream Team offices in San Marcos, TX for a period of time identified in Section A9 of this QAPP.

Data Reporting
Data are analyzed with Microsoft Excel, Minitab, SPSS, and SYSTAT and are presented in data summary reports, which cover data for monitoring sites, water bodies, watersheds, or regions. These reports include tables showing the number of sampling events, percentage complete, minimum, mean, maximum, and standard deviation. Data are compared to the Texas Surface Water Quality Standards, and the number and percentage of exceeded values are displayed. Data are displayed on graphs created in Microsoft Excel on which water quality standards are displayed as a reference. The resulting reports are reviewed by the Texas Commission on Environmental Quality and the relevant TCEQ Clean Rivers Program Partner prior to being posted on the TxState Texas Stream Team website and distributed to the public via e-mail.

Quality Assurance/Control - See Section D of this QAPP.

Migration/Transfer/Conversion
The TxState Texas Stream Team Data Manager will receive all data transfers. All electronic data received for submission to Texas Stream Team database will conform to the format describe above (see Data Dictionary).

Backup/Disaster Recovery
The Texas Stream Team database will be hosted by the Texas State University’s SQL cluster and is backed up nightly. Monthly backups are retained for one year.

In the event of a catastrophic system failure, which renders the electronic database unusable, Texas Stream Team will utilize other campus computers to access the database and keep data entry and QC records updated. All electronic files beyond the database will be stored on a Texas Stream Team shared drive located in the center of Texas State Campus and backed up on external hard drives located at the Texas Stream Team Office.

Archives/Data Retention - Complete original data sets (physically and electronically submitted) are archived on by the TxState Texas Stream Team for a period of time identified in Section A9 of this QAPP.

Information Dissemination - Data viewer users will be able to access the information by accessing the data viewer through Texas Stream Team web site or a direct link. The user selects either the site identification number or the county in which the site is located. The data viewer presents the user with a Google map showing the selected site or the county in which the sampling sites are located. To access the data, the user selects the icon indicating the location of the site on the Google map. The data viewer presents the water quality data in tabular format, providing options to view numeric or graphed data summaries. Data summaries can be printed or downloaded by the user.
Appendix F
Field Data Management Checklist

Field Data Validation (DV) Checklist

The following information should be documented on each data sheet and must be correct and legible:

- Site Description
- Volunteer Group number
- VWQM name
- Sample Date
- Sample Time
- Sample Depth

Quality Assurance Officer ensures the following Data Validation procedures:

1. VWQM follows procedures as instructed in monitoring manual
2. VWQM completes a minimum of nine sampling events per year
3. VWQM confirms all reagents and calibration standards are within the expiration date
4. Calibration log reflects that Data Quality Objectives (DQO) are followed
   a. Calibration within 24 hours of monitoring event
   b. Meter adjusted to standard value
   c. Post calibration within specified DQO’s
5. Conductivity meter (EC Testr Low or EC Testr High) is identified
6. Air Temperature and Water Temperature recorded in centigrade readings
7. Secchi Disk and Total Depth recorded in meters
8. Dissolved oxygen titrations are within .5 mg/L of each other
9. VWQM signature is present

If any of the following requirements are not confirmed, the variable affected will be entered into Texas Stream Team database comments section and flagged. Each flagged data point will reference a notation that indicates the associated problem.
Appendix G
E.coli Data Management Checklist

E.coli Data Validation (DV) Checklist

The following information should be documented on each data sheet and must be correct and legible:
  Site Description
  Volunteer Group number
  VWQM name
  Sample Date
  Sample Time
  Sample Depth

Quality Assurance Officer ensures the following Data Validation procedures:

1. VWQM follows procedures as instructed in monitoring manual and appendices
2. Monitor is certified
3. VWQM confirms all media are within the expiration date
4. Sample is refrigerated at 4° C for no more than 6 hours
5. Incubation temperature is 33° C (+/- 3 ° C)
6. Incubation time is 28 -31 hours (with 28 hours being optimum)
7. Optimal colony number is achieved (<200)
8. Dilution aliquot and number of colonies per 100mL calculation is correct
9. No E.coli colony growth on field blanks
10. Data form is complete
11. VWQM signature is present

If any of the following requirements are not confirmed, the variable affected will be entered into Texas Stream Team database comments section and flagged. Each flagged data point will reference a notation that indicates the associated problem.
Appendix II
Corrective Action Status Table

<table>
<thead>
<tr>
<th>Corrective Action #</th>
<th>Date Issued</th>
<th>Description of Deficiency</th>
<th>Action Taken</th>
<th>Date Closed</th>
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</thead>
<tbody>
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Appendix I
Corrective Action Plan Form

**Corrective Action Plan**

<table>
<thead>
<tr>
<th>Issued by:</th>
<th>Date Issued</th>
<th>Report No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description of deficiency</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Root Cause of deficiency</td>
<td></td>
<td></td>
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<tr>
<td>Programmatic Impact of deficiency</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Does the seriousness of the deficiency require immediate reporting to the TCEQ? If so, when was it?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corrective Action to address the deficiency and prevent its recurrence</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proposed Completion Date for Each Action</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Individual(s) Responsible for Each Action</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Method of Verification</td>
<td></td>
<td></td>
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<tr>
<td>Date Corrective Action Plan Closed?</td>
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</tbody>
</table>
Appendix J

Texas Stream Team *E. coli* Bacteria Data Sheet

<table>
<thead>
<tr>
<th>Monitor Name(s)</th>
<th>Monitoring Date <strong>/</strong>/__</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site Name</td>
<td>Site Number</td>
</tr>
<tr>
<td>Watershed</td>
<td>Waterbody</td>
</tr>
</tbody>
</table>

- [ ] Adequate Depth  - [ ] Dry or Inadequate Depth  - [ ] Other ________
- [ ] Tidally Influenced Sites:  - [ ] Rising Tide  - [ ] Falling Tide  - [ ] Uncertain ________

- Time Sample Collected ________  - Sample Media Expiration Date ________
- Last Rain Date __/__/__  - Rainfall in Last 3 Days (inches) ________
- Incubation Start Time ________  - Incubation temperature (33 °C; +/- 3 °C) ________ °C
- Incubation Period ________ (28 – 31 hours from time sample prepared)

Utilize sterile pipettes and two samples from one well-shaken container. The pipettes are discarded after use.

- Sample # 1  Sample size ___ mL  - Dilution factor (100/sample size) ______
- Colonies counted (dark blue/purple) ___ X dilution factor ___ = ______ colonies / 100 mL

- Sample #2  Sample size ___ mL  - Dilution factor (100/sample size) ______
- Colonies counted (dark blue/purple) ___ X dilution factor ___ = ______ colonies / 100 mL

FIELD BLANK *E. coli* Colony Growth (circle one)  YES / NO

Comments, Land Use and Nonpoint Source Pollution Observations, Supply Needs:

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

Please transfer these results to your Texas Stream Team data sheet, circle “*E. coli* Bacteria,” and include this *E. coli* Reporting Form with your regular data sheet submission.

**NOTE:** This form is no longer distributed by Texas Stream Team. The Environmental Monitoring Form should be used for all data submittal, including *E. coli* data. However, the Texas Stream Team will continue to accept this form while notifying monitors to utilize the latest data submittal form.
Appendix K

Lower Colorado River Authority Colorado River Watch Network Standard Operating Procedures

This Appendix will be updated with Annual Updates only.