TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

May 6, 2019

Emily Monroe
TWRI Extension Specialist
578 John Kimbrough Blvd.
2260 TAMU
College Station, Texas 77843

Subject: Lavaca River Watershed Protection Plan (WPP) - Coordination of Implementation and Routine Water Quality Monitoring Quality Assurance Project Plan

Approved May 6, 2019 (Expires May 6, 2022)

Dear Ms. Monroe:

The above named QAPP has been approved. The approved QAPP and signature pages are enclosed as documentation of approval.

In accordance with the terms of the QAPP, **please ensure that copies of this QAPP and subsequent amendments are distributed to each sub-tier participant as noted in Section A3 of the QAPP.** This approval letter must be available for review during a monitoring systems audit.

Should you have questions, please contact me at (512) 239-1702.

Sincerely,

Sandra S. Arismendez, Ph.D.
Nonpoint Source Program Lead Quality Assurance Specialist

enclosure

cc: Tim Cawthon, NPS Project Manager, MC 203

Lavaca River Watershed Protection Plan (WPP) – Coordination of Implementation and Routine Water Quality
Monitoring Quality Assurance Project Plan
(QAPP)

Texas A&M AgriLife Extension Service
Texas Water Resources Institute (TWRI)
College Station, TX 77843

Funding Source:

Nonpoint Source (NPS) Program CWA §319(h)
Prepared in cooperation with the Texas Commission on Environmental Quality
and the U.S. Environmental Protection Agency
Federal ID #99614623
QTRAK#_____

Effective Period: Three years from date of final approval

Questions concerning this QAPP should be directed to:

Emily Monroe
TWRI Extension Specialist
578 John Kimbrough Blvd.
2260 TAMU
College Station, Texas 77843
(979) 458-3154
emily.monroe@ag.tamu.edu

A1 APPROVAL PAGE

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

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Monitoring Division
Laboratory and Quality Assurance Section

Sharon R. Coleman, TCEQ Quality Assurance (QA) Manager — Date 5/6/2019

Sandra Arismendez — Date 5/6/2019
Lead NPS QA Specialist
Quality Assurance Team

Water Quality Planning Division

Faith Hambleton, Team Leader — Date 5/1/19
NPS Program

Cathy Anderson, Team Leader — Date 5/3/2019
Data Management and Analysis

Jessica Uramkin, NPS QA Coordinator — Date 4/29/19

Tim Cawthon, TCEQ NPS, Project Manager — Date 4/29/19
NPS Program

Texas Water Resources Institute

4/19/19

Emily Monroe, Project Manager Date

4/15/19

Lucas Gregory, QA Officer Date

Lavaca-Navidad River Authority

Chad Kinsfather 4.22.19

Chad Kinsfather, Project Manager/QAO Date

4-22-19

Brandon Byler, Data Manager/Field Supervisor Date

B-Environmental Laboratory

4-25-19

Kevin Baros, Laboratory Manager and QA Officer Date

TWRI will secure written documentation from additional project participants stating the organization's awareness of and commitment to requirements contained in this QAPP and any amendments or revisions of this plan. TWRI 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. (See sample letter in Attachment 1 of this document.)

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A3 DISTRIBUTION LIST

The Lead NPS QA Specialist will provide approved versions of this QAPP and any amendments or revisions to the TCEQ NPS Project Manager and the TWRI Project Manager. The TCEQ NPS Project Manager will provide approved copies to the TCEQ Data Management and Analysis Team Leader and EPA Project Officer within two weeks of approval. The TCEQ Data Management and Analysis team needs searchable .pdf files of finalized QAPPs that are small enough to upload into SWQMIS. There is a limit on file size of 15 MB. The TCEQ NPS 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.

Cathy Anderson, Team Leader
Data Management and Analysis
MC-234
(512) 239-1805

U.S. Environmental Protection Agency Region 6
Water Quality Protection Division
Assistance Program Branch
1445 Ross Avenue
Suite # 1200
Dallas, TX 75202-2733

Anthony Suttice, Project Officer
(214) 665-8590

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

Tim Cawthon, NPS Project Manager
MC-203
(512) 239-0845

Cathy Anderson, Data Management and Analysis Team
MC-234
(512) 239-6546

Sandra Arismendez, NPS Quality Assurance Specialist
MC-165
(512) 239-1702

TWRI will provide copies of this project plan and any amendments or revisions of this plan to each project participant defined in the list below. TWRI 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 Water Resources Institute
578 John Kimbrough Blvd
2260 TAMU
College Station, Texas 77843-2260

Allen Berthold, Principal Investigator
(979) 458-5916

Emily Monroe, Project Manager
(979) 458-3154

Lucas Gregory, Quality Assurance Officer
(979)-845-7869

Lavaca-Navidad River Authority (LNRA)
PO Box 429
Edna, TX 77957

Chad Kinsfather, Project Manager and Quality Assurance Officer
(361) 782-5229

Brandon Byler, Data Manager and Field Supervisor
(361) 782-5229

B Environmental Laboratory
2713 Houston Hwy
Victoria, TX 77901

Kevin Baros, Laboratory Manager & QA Officer
(361) 572-8244

Nueces River Authority
400 Mann St. Ste 1002
Corpus Christi, TX 78401

Rocky Freund, Data QA and Consultant
(361) 653-2110

A4 PROJECT/TASK ORGANIZATION

TCEQ

Monitoring Division

Sandra Arismendez
Lead NPS QA Specialist
Assists the TCEQ NPS Project Manager in QA 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 deemed 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 safe guard project and programmatic objectives, worker safety, public health, or environmental protection.

Water Quality Planning Division

Faith Hambleton, 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, program corrective actions, work plans, and contracts. Enforces program corrective action, as required. Ensures NPS personnel are fully trained and adequately staffed.

Tim Cawthon
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 the contractor, 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. 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 NPS QA Specialist and the TCEQ NPS Data Manager of particular circumstances which may adversely affect the quality of data derived from the collection and analysis of samples. Monitors and enforces corrective action.

Jessica Uramkin

NPS Quality Assurance Coordinator
Assists Lead NPS QA Specialist with NPS QA management. Serves as liaison between NPS management and Agency QA management. Responsible for NPS guidance development related to program quality assurance. Assists with development and maintenance of data management-related standard operating procedures (SOP) for NPS 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.

Cathy Anderson NPS Data Manager
Responsible for coordination and tracking of NPS data sets from initial submittal through the TCEQ NPS Project Manager for review and approval. Ensures that data is reported following instructions in the SWQM Data Management Reference Guide (DMRG) (December 2016, or most current version). Runs automated data validation checks in SWQMIS and coordinates data verification and error correction with TCEQ NPS Project Managers' data review. Generates SWQMIS summary reports to assist TCEQ NPS Project Managers' data reviews. Provides training and guidance to NPS and Planning Agencies on technical data issues. Reviews QAPPs for valid stream monitoring stations. Checks validity of parameter codes, submitting entity code(s), collecting entity code(s), and monitoring type code(s). Develops and maintains data management-related standard operating procedures (SOP) for NPS data management. Serves on planning team for NPS projects. Coordinates SWQMIS user access and privileges for TCEQ NPS Project Managers and Contract staff. Reviews data deliverables and SWQMIS validator reports per information provided in the QAPP.

TWRI

Emily Monroe
TWRI 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 ensuring the most recent version of the NPS QAPP shell document is acquired from the TCEQ NPS 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 verifying the QAPP is followed and the project is producing data of known and acceptable quality. Complies with corrective action requirements.

Lucas Gregory
TWRI QAO
Responsible for determining that the QAPP meets the requirements for planning, QA and QC. Responsible for coordinating with the TCEQ NPS Manager to resolve QA-related issues.

Notifies the TWRI Project Manager and TCEQ NPS Project Manager and documents particular circumstances which may adversely affect the quality of data. Responsible for validation and verification of all data collected and acquired. Coordinates the research and review of technical QA 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.

LNRA

Chad Kinsfather
LNRA Project Manager/Quality Assurance Officer
Responsible for ensuring tasks and other requirements in the subcontract 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 TWRI. 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.

Responsible for coordinating development and implementation of the QA program. Responsible for contributing to the development of the QAPP. Responsible for identifying, receiving, and maintaining project quality assurance records. Responsible for coordinating with the TWRI Project Manager to resolve QA-related issues. Notifies the TWRI Project Manager and documents particular circumstances which may adversely affect the quality of data. Responsible for validation and verification of all data collected and acquired. Coordinates the research and review of technical QA 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.

Brandon Byler
LNRA Data Manager/Field Supervisor
Responsible for the acquisition, verification, and transfer of data to the TCEQ. Oversees data management for the QAPP. Performs data quality assurances prior to transfer of data to TCEQ. Responsible for transferring data to the TCEQ in the Event/Result file format specified in the DMRG. Ensures data are submitted according to QAPP and work plan specifications. Provides the point of contact for the TCEQ NPS Data Manager to resolve issues related to the data.

Responsible for supervising all aspects of the sampling and measurement of surface waters and other parameters in the field. Responsible for the collection of water samples and field data measurements in a timely manner that meet the quality objectives specified in Section A7, as well as the requirements of Sections B1 through B8. Responsible for field scheduling, staffing, and ensuring that staff is appropriately trained as specified in Section A8. Responsible for adhering to SWQM Procedures and all updates as appropriate.

B Environmental Laboratory

Kevin Baros
B Environmental Laboratory Manager
Responsible for supervision of laboratory personnel involved in generating analytical data for this project. Responsible for ensuring the lab is TCEQ-accredited for the matrix, method, and parameter combinations listed in A7 Quality Objectives and Criteria. Responsible for ensuring that laboratory personnel involved in generating analytical data have adequate training and a thorough knowledge of the analytical requirements in the QAPP and all SOPs specific to the analyses or task performed and/or supervised. Responsible for oversight of all operations, ensuring that all QA/Quality Control (QC) requirements are met, and documentation related to the analysis is completely and accurately reported. Enforces corrective action, as required.

Kevin Baros
B Environmental Laboratory QAO
Monitors the implementation of the Laboratory Quality Assurance Manual (QAM) and the QAPP within the laboratory to ensure complete compliance with QA objectives as defined by the contract and in the QAPP. Conducts internal audits to identify potential problems and ensure compliance with QAPP, lab-accreditation requirements, and written SOPs. Responsible for supervising and verifying all aspects of the QA/QC in the laboratory. Performs validation and verification of data and compliance with A7 Quality Objectives and Criteria before the report is sent to the contractor. Insures that all QA reviews are conducted in a timely manner from real-time review at the bench during analysis to final submittal of data to the LNRA QA officer.

Nueces River Authority (NRA)

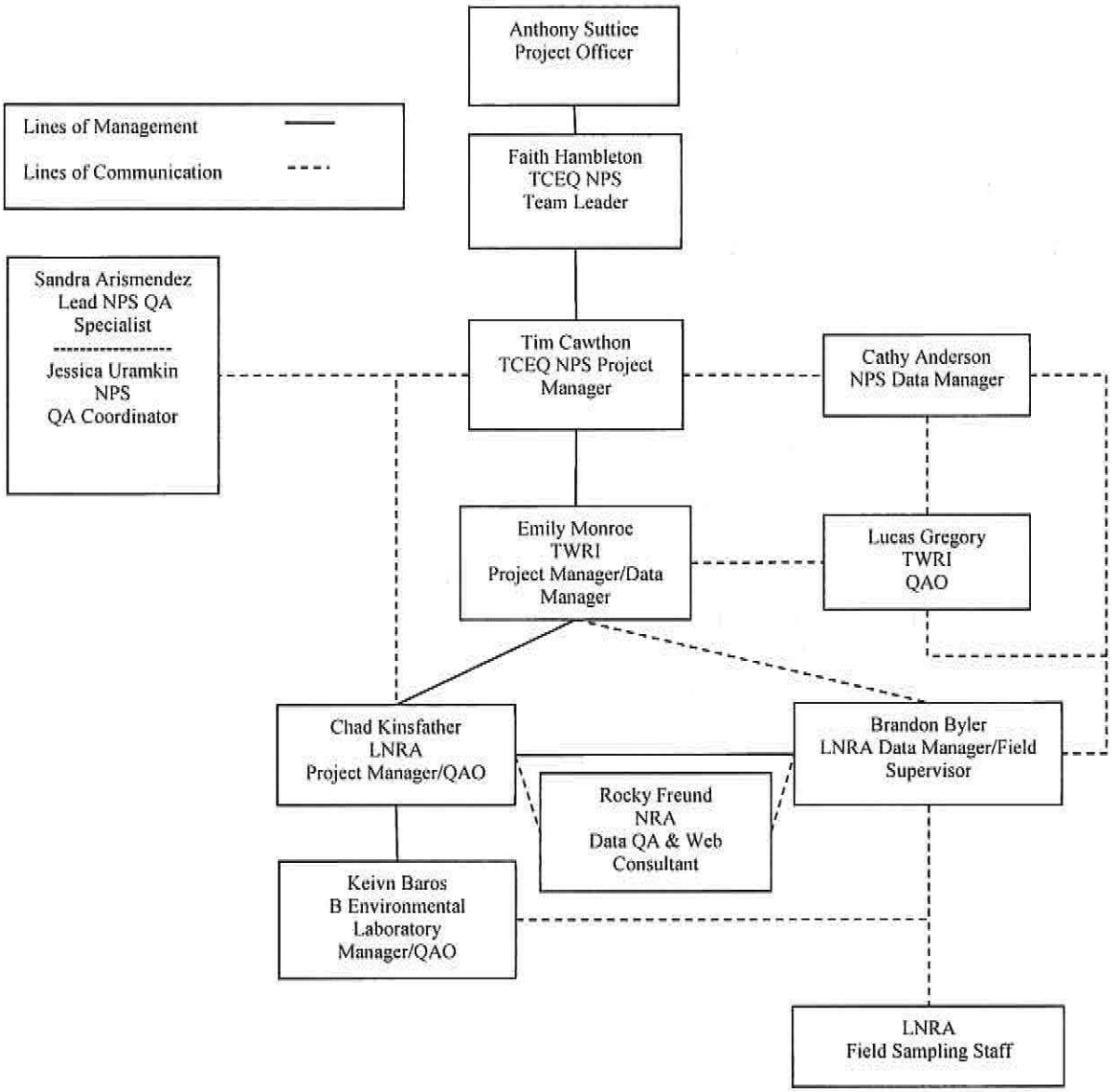
Rocky Freund
Reviews data for exceedances in LOQs, AWRLs, minimum and maximum values, tag redundancies, numerical/clerical errors, and other data quality criteria and sends data back to the LNRA Data Manager with any recommendations or corrections to be made. Maintains remote dedicated server with all water quality data for Lavaca Basin and updates database as data is submitted to and approved by TCEQ.

U.S. EPA Region 6

Anthony Suttice
EPA Project Officer
Responsible for managing the CWA Section 319 funded grant on behalf of EPA. Assists the TCEQ in approving projects that are consistent with the management goals designated under the State's NPS 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 EPA 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

The Lavaca River and its tributary Rocky Creek contain two impaired segments for bacteria. The segments are listed on the TCEQ 2014 303(d) list due to the bacteria levels exceeding the set standard for primary contact recreation. To address the higher than accepted levels of bacteria, a total maximum daily load (TMDL), watershed protection plan (WPP), and TMDL Implementation Plan (I-Plan) were developed. The WPP was accepted by the EPA in 2018. The TMDL and TMDL I-Plan are currently under TCEQ review. The WPP and I-Plan include the impaired river above tidal and a tributary creek and extend downstream to incorporate the whole watershed.

The land use is largely agricultural lands in rural areas supporting hay, pasture, and cropland. Thus, the majority of best management practices will be focused on agricultural practices and agricultural education programs. The education programs will allow for the producers to understand water quality issues and solutions to mitigate their impacts on the water quality. A component of the education programs includes viewing a riparian area firsthand on demonstration field days. Currently there are no official education programs within the watershed but the project will build upon previous education programs from TSSWCB and TCEQ.

Through this project TWRI will work with key stakeholders and partner agencies to facilitate implementation of key management measures identified in the WPP. TWRI will assist governmental and nongovernmental agencies with identification and acquisition of resources to enable implementation. TWRI will bring extension and education programs to the watershed and develop and deliver educational materials.

Finally, TWRI will work with the Lavaca-Navidad River Authority to increase routine surface water quality monitoring frequency at four sites within the watershed to complement ongoing Clean Rivers Program monitoring efforts. Data collected will be used to update and inform stakeholders of water quality progress, evaluate implementation progress, and estimate instream loads. Field parameters to be collected include streamflow, flow severity, pH, temperature, conductivity, and dissolved oxygen. Conventional parameters to be collected include total suspended solids, nitrate-nitrogen, and ammonia nitrogen. The bacteria parameter is *E. coli*.

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 SWQMIS have been collected and analyzed in a way that guarantees their reliability and can be used by programs deemed appropriate by the TCEQ.

Milestone Load Reductions

TWRI will track progress towards achieving milestones outlined in Tables 25 (see table 25 below) and 26 of the WPP. TWRI will annually contact multiple organizations within the watershed that have information on implementation efforts to include in the milestone table such as Texas AgriLife Extension Coastal Zone Team (for OSSFs), Texas State Soil and Water

Conservation Board (for livestock BMPs such as feet of exclusionary fencing installed, etc.), cities (for pet waste stations), etc. TWRI will develop a tracking spreadsheet based on the milestones table for annually tracking this information. The milestone numbers will be plugged into the load reduction formulas documented in Appendix A of the WPP. The calculated load reductions will be included in the tracking spreadsheet.

Management Measure	Responsible Party	Unit Cost	Implementation Goals (years after implementation begins)†										Total Cost
			1	2	3	4	5	6	7	8	9	10	
Livestock													
Hire WQMP field technician.	TSSWCB, SWCDs	$75,000/yr	1										
Develop 100 WQMPs/conservations plans.	TSSWCB, SWCDs, NRCS	$15,000	20		40		60		80		100		$1,500,000
Feral Hogs													
Install feral hog enclosures.	Landowners	$200	As many as possible										N/A
Feral hog removal	Landowners	N/A	15% reduction or > 2,439 hogs/yr										N/A
Develop and implement Wildlife Management Plans and Practices.	Landowners, TPWD, TSSWCB, NRCS	N/A	As many as possible										N/A
OSSFs													
Develop OSSF repair/replacement program.	Watershed Coordinator, counties, AgriLife Extension	N/A	1										N/A
Repair/replace faulty OSSFs.	Homeowner	$8,000			10		20		30		40		$320,000
Pet Waste													
Install and maintain pet waste stations.	Cities	$500 for stations plus $100/yr/station			2		3		4		5		$4,400
Develop educational and outreach materials.	Cities, AgriLife Extension, Watershed Coordinator	N/A	Develop and deliver annually										N/A
Urban Stormwater													

Identify and install potential stormwater BMP projects.	Cities	$4,000 to $45,000/acre treated	As many as possible	N/A
SSOs and Unauthorized Discharges				
Develop program to repair private connections contributing to I&I.	Cities, AgriLife Extension, property owners	N/A	1	N/A
Smoke testing and repair of faulty pipes and connections	Cities, contractors	$2,000-$2,500/ mile; $3,000-$20,000/repair	As funding allows	N/A
Develop and deliver educational materials.	Cities, AgriLife Extension, TWRI	N/A	Develop and deliver annually	N/A

Management Measure	Responsible Party	Unit Cost	Implementation Goals (years after implementation begins)†										Total Cost
			1	2	3	4	5	6	7	8	9	10	
Illicit Dumping													
Develop educational and outreach materials.	Counties, AgriLife Extension, Water-shed Coordinator	N/A	Develop and deliver annually										N/A
General Watershed Management													
Hire Watershed Coordinator.	TWRI	$75,000/yr	1										
Semi-annual meetings	TWRI, Watershed Coordinator	$300/meeting	Semi-annually										$6,000

† number of measures are cumulative

A6 PROJECT/TASK DESCRIPTION

Supplemental NPS ambient water quality data will be collected to provide increased temporal scale to the existing CRP monitoring regime. Monitoring will not commence until the QAPP is approved. Four sites in the Lavaca River Above Tidal and Rocky Creek have been selected. Planned quarterly CRP monitoring will continue at all sites and supplemental NPS monitoring associated with the current 319-funded monitoring project will be coordinated such that selected sites are monitored on a monthly basis for one year. This approach will provide additional data to supplement the existing CRP monitoring regime. Collecting additional water quality and flow data will improve estimates for loading reductions needed to achieve applicable water quality standards.

Data analysis will be conducted to improve knowledge regarding existing instream water quality conditions and hydrological influences on overall pollutant loading. Load duration curves (LDCs) are widely accepted for depicting existing pollutant loading in relation to flow regime and enable current pollutant loads and needed pollutant loading reduction estimates to be made. LDCs will be developed at each sampling station in the watershed with sufficient paired water quality and stream flow data (≥20 points) and will demonstrate the general drivers of pollution. Other water quality data assessments will also be conducted using proven statistical methods to determine the presence of other trends or correlations in water quality and/or watershed characteristics.

This project started in September 2018 and is estimated to be completed in August 2021. All task, deliverable, and monitoring dates are estimates.

See Appendix A for a project location map.

See Appendix B for the contract scope of work and schedule of deliverables for a description of work defined in this QAPP.

See Section B1 for monitoring to be conducted under this QAPP.

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 TWRI 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, TCEQ NPS Data 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 TWRI 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 and Revisions

This QAPP shall be reviewed in its entirety and certified annually by the TWRI 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 stop work order. Amendments approved since QAPP approval should 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. This is accomplished by submitting a cover letter, a document detailing changes made if any, and three copies of the fully updated QAPP (including three sets of signature pages).

A7 QUALITY OBJECTIVES AND CRITERIA

Only data collected that have a valid TCEQ SWQM parameter code in Table A7.1 will be stored in SWQMIS. The project objective is to collect water quality data that complies with TCEQ's Guidance for Assessing and Reporting Surface Water Quality in Texas (May 2012), as well as SWQM Procedures Volume 1: Physical and Chemical Monitoring Methods (2012). These water quality data will be used to assess the progress of the Lavaca River Watershed Protection Plan.

Table A7.1 Measurement Performance Specifications for Routine Instream Monitoring

Parameter	Units	Matrix	Method	Parameter Code	AWRL*	Limit of Quantitation (LOQ)	Recovery at LOQ (%)	PRECISION (RPD of LCS/LCSD)	BIAS %Rec. of LCS	Labs
pH (standard units), Field determined	s.u.	water	EPA 150.1 and TCEQ SOP, V1	00400	NA	NA	NA	NA	NA	Field
Oxygen, dissolved (mg/L) (Field determined, actual reading from instrument)	mg/L	water	SM4500 O-G and TCEQ SOP, V1	00300	NA	NA	NA	NA	NA	Field
Specific conductance, Field (us/cm @ 25C)	uS/cm	water	EPA 120.1 and TCEQ SOP, V1	00094	NA	NA	NA	NA	NA	Field
Temperature, Water Field determined, (Degrees Centigrade)	degC	water	SM2550B and TCEQ SOP V1	00010	NA	NA	NA	NA	NA	Field
Nitrogen, Ammonia, Total (mg/L as N)	Mg/L	Water	SM 4500-NH3 D	00610	0.1	0.1	70-130	20	80-120	B Environmental
Nitrate Nitrogen, Total (mg/L as N)	Mg/L	Water	EPA 300.0	00620	0.05	0.05	70-130	20	80-120	B Environmental
Residue, total nonfiltrable (mg/l)	mg/L	water	SM 2540 D	00530	5	1	NA	NA	NA	B Environmental
Flow stream, Instantaneous (cubic feet per sec)	cfs	water	TCEQ SOP V1	00061	NA	NA	NA	NA	NA	Field
Flow Severity: 1=No Flow, 2-Low, 3=Normal, 4=Flood, 5=High, 6=Dry	NU	Water	TCEQ SOP V1	01351	NA	NA	NA	NA	NA	Field
Flow Mth 1=Gage, 2=Elec, 3=Mech, 4=Weir/Flu, 5= Doppler	NU	Other	TCEQ SOP V1	89835	NA	NA	NA	NA	NA	Field
E.coli, Colilert, IDEXX Method, MPN/100ml	mpn / 100ml	water	IDEXX Laboratories Colilert-18	31699	1	1	NA	0.5**	NA	B Environmental
E.coli, Colilert, IDEXX , Holding time,	hours	water	NA	31704	NA	NA	NA	NA	NA	Field

*The most up-to-date list of AWRLs is located at http://www.tceq.texas.gov/assets/public/waterquality/crp/QA/awrlmaster.pdf

** *Based on a range statistic as described in Standard Methods, 20th Edition, Section 9020-B, Quality Assurance/Quality Control - Intralaboratory Quality Control Guidelines. This criterion applies to bacteriological duplicates with concentrations >10 MPN/100mL or >10 organisms/100mL.*

Table A7.1 References:

- *US EPA Methods for Chemical Analysis of Water and Wastewater*, Manual #EPA-600/4-79-020.
- American Public Health Association, American Water Works Association and Water Environment Federation, *Standard Methods for the Examination of Water and Waste Water*, 20th Ed.,
- TCEQ SOP: Texas Commission on Environmental Quality *Surface Water Quality Monitoring Procedures*, Volume 1: RG-415, August 2012.

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.

A field split is a single sample subdivided by field staff immediately following collection according to procedures specified in the SWQM Procedures Manual and submitted to the laboratory as two separately identified samples. Split samples are preserved, handled, shipped, and analyzed identically and are used to assess variability in all of these processes. Field split samples are not required as part of the routine SWQM Program, but if needed, may be inserted into the sample regime. The frequency is determined by the needs of the project.

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 bacterial analysis. Precision results are compared against measurement performance specifications and used during evaluation of analytical performance. Program-defined measurement performance specifications for precision are defined in Table A7.1.

Bias

Bias is a statistical measurement of correctness and includes multiple components of systematic error. A measurement is considered unbiased when the value reported does not differ from the true value. Bias is determined through the analysis of laboratory control samples and LOQ Check Samples prepared with verified and known amounts of all target analytes in the sample matrix (e.g. deionized water, sand, commercially available tissue) and by calculating percent recovery. Results are compared against measurement performance specifications and used during evaluation of analytical performance. Program-defined measurement performance specifications for bias are specified in Table A7.1.

Representativeness

Site selection, the appropriate sampling regime, the sampling of all pertinent media according to TCEQ SWQM Procedures Vol. 1, and use of only approved analytical methods 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 to be 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 and contracted laboratories 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.

Limit of Quantitation

AWRLs (Table A7.1) are used in this project as the *limit of quantitation specification*, so data collected under this QAPP can be compared against the Texas Surface Water Quality Standards. Laboratory *limits of quantitation* (Table A7.1) must be at or below the AWRL for each applicable parameter.

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

Analytical Quantitation

To demonstrate the ability to recover at the limit of quantitation, the laboratory will analyze an LOQ check standard for each analytical batch of samples run.

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

A8 SPECIAL TRAINING/CERTIFICATION

Work conducted for this project is covered under a documented quality management system. Personnel conducting work associated with this project are deemed qualified to perform their work through educational credentials, specific job/task training, required demonstrations of competency, and internal and external assessments. Laboratories are NELAP-accredited as required. Records of educational credentials, training, demonstrations of competency, assessments, and corrective actions are retained by project management and are available for review.

LNRA field personnel will receive training in proper sampling and field analysis. Before actual sampling or field analysis occurs, LNRA field personnel they will demonstrate to the LNRA Field Supervisor their ability to properly calibrate field equipment and perform field sampling and analysis procedures. Training will be documented and retained by the LNRA QA Officer (or designee) and be available during an audit.

B Environmental Laboratory will be responsible for analyzing laboratory samples under this QAPP and meets the requirements contained in TNI Volume 1 Module 2, Section 4.4 (2009) (concerning Review of Requests, Tenders, and Contracts).

A9 DOCUMENTS AND RECORDS

Table A9.1 Project Documents and Records

Document/Record	Location	Retention	Form
QAPP, amendments, and appendices	TWRI	5 years	Electronic
QAPP distribution documentation	TWRI	5 years	Electronic
Field notebooks or data sheets	LNRA	7 years	Paper
Field equipment calibration/maintenance logs	LNRA	7 years	Paper
Chain of custody records	LNRA	7 years	Paper
Field SOPs	LNRA	7 years	Paper/electronic
Laboratory QA Manuals	B Environmental	5-years	Paper/electronic
Laboratory SOPs	B Environmental	5-years	Paper/electronic
Instrument raw data files	B Environmental	5-years	Paper/electronic
Laboratory equipment maintenance logs	B Environmental	5-years	Paper/electronic
Laboratory calibration records	B Environmental	5-years	Paper/electronic
Laboratory corrective action documentation	B Environmental	5-years	Paper/electronic
Corrective action documentation	TWRI, LNRA	5 years	Paper/electronic

Laboratory Test Reports

Test/data reports from the laboratory must document the test results clearly and accurately. Routine data reports should be consistent with *TNI Volume 1 Module 2 Section 5.10* and include the information necessary for the interpretation and validation of data.

- Sampling Location
- Station ID
- Date/Time Collected
- Name of Sample Collector
- Date/Time Received
- Name of Sample Receiver
- Analysis Performed
- Units of measurement

- Sample Volume Processed
- Name of Person Processing Sample and Recording Results
- Sample Analysis Results
- Narrative of any QA/QC deviations or failures that may affect sample quality
- Certification of TNI compliance

Electronic Data

Data will be submitted to the TCEQ NPS Project Manager in the event/result format specified in the TCEQ DMRG for upload to SWQMIS. The Data Review Checklist and Summary as contained in Appendix C of this document will be submitted with the data. Contractors must upload the data deliverables into the Test environment of SWQMIS and provide the exported SWQMIS Validator Report in .pdf format as part of the data deliverable. The SWQMIS Test Environment Validator Report si produced to ensure that the data flat files have no loader errors which could result in a delay of data delivery and approval.

All reported data resulting from monitoring events will have a unique TagID (see DMRG). A Tag Prefix must be requested from the TCEQ in accordance with the DMRG where the Submitting Entity does not already have one. TagIDs used in this project will be seven-character alphanumerics with the structure of the two-letter Tag prefix followed by a four digit number and ending with the character "N": for example - KI1234N, KI1235N, etc.

Submitting Entity, Collecting Entity, and 2- or 4-character Monitoring Type codes will reflect the project organization and monitoring type in accordance with the DMRG. The proper coding of Monitoring Type is essential to accurately capture any bias toward certain environmental condition (for example, high flow events) as well as the purpose of the project. The TCEQ NPS Project Manager and the NPS Data Manager should be consulted to assure proper use of the Monitoring Type code.

Sample Description	Tag Prefix	Submitting Entity	Collecting Entity	Monitoring Type Code
Routine monitoring	*LN*	*LN*	*LN*	*RT*

B1 SAMPLING PROCESS DESIGN (EXPERIMENTAL DESIGN)

The purpose for the water quality monitoring aspect of the study is to provide enhanced temporal resolution for assessing trends in water quality over the course of the study period and meet monitoring goals established in the Lavaca River Watershed Protection Plan. The sample design consists of routine scheduled monitoring at four sites conducted three times per quarter (offset from ongoing planned CRP monitoring). These data will be collected monthly at designated locations regardless of flow conditions and submitted to TCEQ's SWQMIS database. Only personnel safety will result in a deviation from the scheduled sampling event schedule. Should this situation arise, the missed sampling event will be completed as soon as safe conditions return and personnel logistics allow.

The water quality parameters to be collected are: pH, dissolved oxygen, specific conductance, temperature, nitrogen-ammonia, nitrate-nitrogen, total suspended solids, streamflow, flow severity, and *E. coli*.

Site Descriptions
Four stations will be monitored during this study (locations are depicted in Appendix A).

Station 12524 is located in the impaired assessment unit 1602_03. The site is located in Jackson County on the Lavaca River at the upstream US 59 bridge southwest of Edna.

Station 12525 is located in the unimpaired assessment unit 1602_02. The site is located in Lavaca County on the Lavaca River at SH 111, 60M downstream for SH 111 SE of Yoakum.

Station 12527 is located in the unimpaired assessment unit 1602_02. The site is located at the US Alt 90/US 77 bridge in Hallettsville.

Station 18190 is located in the impaired 1602B_01 assessment unit. The site is located on Rocky Creek upstream of Lavaca CR 387, approximately 5.3 miles south of Hallettsville on US 77 and 0.92 miles west on CR 387.

Table B1.1 Descriptive Monitoring Site Information and Sampling Plan

Station ID	Short Description	Latitude, Longitude	Start Date	End Date	Parameters	Monitoring Frequency (per year)
12524	Lavaca River at US59	28.960285, -96.686855	Upon QAPP approval	36 months from the start date	pH, dissolved oxygen, specific conductance, temperature, nitrogen-ammonia, nitrate-nitrogen, total suspended solids, streamflow, flow severity, and *E. coli*	8

12525	Lavaca River at SH 111	29.156658, -96.874801	Upon QAPP approval	36 months from the start date	pH, dissolved oxygen, specific conductance, temperature, nitrogen-ammonia, nitrate-nitrogen, total suspended solids, streamflow, flow severity, and *E. coli*	8
12527	Lavaca River at US 77	29.44338, -96.944936	Upon QAPP approval	36 month from the start date	pH, dissolved oxygen, specific conductance, temperature, nitrogen-ammonia, nitrate-nitrogen, total suspended solids, streamflow, flow severity, and *E. coli*	8
18190	Rocky Creek at Lavaca CR 387	29.360889, -96.97428	Upon QAPP approval	36 month from the start date	pH, dissolved oxygen, specific conductance, temperature, nitrogen-ammonia, nitrate-nitrogen, total suspended solids, streamflow, flow severity, and *E. coli*	8

B2 SAMPLING METHODS

Field Sampling Procedures

Routine sample collection and field analysis will be conducted in accordance with the TCEQ SWQM Procedures Volume 1: Physical and Chemical Monitoring Methods for Water, Sediment and Tissue (August 2012, or most recent version).

Table B2.1 Sample Storage, Preservation, and Handling Requirements

Parameter	Matrix	Container	Preservation***	Sample Volume	Holding Time
Ammonia-N	water	1 L plastic	Cool to 4°C H_2SO_4 to pH <2	150 mL[3]	28 days**
Nitrate-N	water	1 L plastic	Cool, 0-6°C	150 mL	48 hours
TSS	water	2 L plastic	Cool, 0-6°C	400 mL	7 days
E. coli IDEXX	water	100 mL plastic; duplicate samples will be in 290 mL	Cool, 0-6°C	100 mL; duplicate samples will be 120 mL.	6 + 2 hours

+*E.coli* samples analyzed by SM 9223-B should always be processed as soon as possible and within 8 hours. When transport conditions necessitate delays in delivery longer than 6 hours, the holding time may be extended and samples must be processed as soon as possible and within 24 hours.

**Nutrient samples will be preserved within 15 minutes of the last collection

Sample Containers

Certificates from sample container manufacturers are maintained by B Environmental Laboratory for the bottles that LNRA obtains from B Environmental (IDEXX *E. coli*) and by LNRA for the other bottles which LNRA purchases directly. Sample bottles needing to be acidified are either pre-treated before taking to the field or treated soon after they are gathered.

- 1- and 2-L sample containers are purchased by LNRA pre-cleaned for conventional parameters.
- 100-mL pre-cleaned and sterilized bacterial bottles are obtained from the B Environmental laboratory for IDEXX Colilert *E. coli* samples. These bacterial bottles are certified and documentation is maintained by B Environmental. Bottles are not pre-treated with sodium thiosulfate since sites are not contaminated with chlorine (i.e. not directly downstream of wastewater plants).

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

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

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

B3 SAMPLE HANDLING AND CUSTODY

Sample Labeling

Samples from the field are labeled 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. Sampling entity (LNRA)

Sample Handling

The principle of sample custody is being able to account for the sample's integrity from the moment the water sample is placed in a sample container until all analytical tests have been completed and any remaining sample is discarded. This means that proper sample custody is a joint effort between the sampling crew, the sample transporter, and the laboratory staff.

The chain of custody (COC) record (Appendix E) documents the sequence of sample possession and requires that the sample container have the same station number inked onto the sample container as is written on the data sheet. The chain of custody record is signed by the sample collector, and name is printed on COC. These records have provisions for adding the information discussed in comments 1 through 5 below.

1. Site and location and point of collection establish where the particular sample became official.
2. Time and date of collection establishes the start of the holding time clock. The date of shipment adds to this information.
3. The collection signature establishes the first person with responsibility for the sample's custody.
4. The presence or absence of added preservatives establishes that the sample will not be significantly altered before arrival at the laboratory due to microbial or chemical or physical actions.
5. Analyses requested are listed on the COC.

The sheet has special places for signatures and printed names and times to document changes in sample possession. This is the actual documentation of chain-of-custody. It begins with the sample collector and ends with the laboratory's designated sample custodian.

Sample integrity must also be protected by preventing sample contamination, whether intentional or accidental, after the sample is placed in a container. The containers used by the LNRA are purchased pre-cleaned.

Chain-of-custody documents accompany each sample for transfer of pertinent information. LNRA transports the samples with COC documents to the B Environmental laboratory. Samples are transported by LNRA staff who are cognizant of holding time considerations, and samples are continuously within LNRA's custody until they are received by the laboratory. The B Environmental laboratory has a designated sample custodian who examines arriving samples for proper documentation, and proper preservation. The custodian accepts delivery by signing the final portion of the official chain-of-custody, and a copy of the COC is given to LNRA. The sample custodian attaches a special laboratory sample number to the sheet and the same number to the sample container and enters the receipt of the sample into a laboratory sample inventory logbook. This book notes the date of receipt, the date of completion, and the corresponding sheet number. Any possible information which could identify the source of the sample is now traceable using the inventory logbook which is maintained solely by the sample custodian. B Environmental maintains the records of sample handling according to their quality assurance SOPs.

Sample Tracking

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

A sample is in custody if it is in actual physical possession or in a secured area that is restricted to authorized personnel. The COC form is used to document sample handling during transfer from the field to the laboratory and among contractors. The following information concerning the sample is recorded on the COC form (See Appendix E).

1. Date and time of sample collection
2. Site identification or Station ID
3. Sample matrix
4. Number of containers
5. Preservative used
6. Was the sample filtered?
7. Analyses required
8. Name of collector
9. Custody transfer signatures and dates and time of transfer
10. Bill of lading (*if applicable*)

Sample Tracking Procedure Deficiencies and Corrective Action

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

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

B4 ANALYTICAL METHODS

The analytical methods are listed in Table A7.1 of Section A7. Laboratories collecting data under this QAPP are compliant with the TNI Standards and must be accredited in accordance with

NELAP requirements for the matrix, method, and parameter combinations listed in Table A7.1 of the QAPP on the date the samples are processed for analysis. Procedures for laboratory analysis will be in accordance with the most recently published or online edition of *Standard Methods for the Examination of Water and Wastewater*, the latest version of the TCEQ *Surface Water Quality Monitoring Procedures Volume 1: Physical and Chemical Monitoring Methods, RG-415, August 2012, Austin, TX,* or most recent version, or other reliable procedures acceptable to TCEQ.

Standards Traceability

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

Analytical Method Deficiencies and Corrective Actions

Deficiencies in field and laboratory measurement systems involve, but are not limited to instrument malfunctions, failures in calibration, blank contamination, quality control samples outside QAPP defined limits, etc. In many cases, the field technician or lab analyst will be able to correct the problem. If the problem is resolvable by the field technician or lab analyst, then they will document the problem on the field data sheet or laboratory record and complete the analysis. If the problem is not resolvable, then it is conveyed to the B Environmental Laboratory Supervisor, who will make the determination and notify the LNRA QAO. If the analytical system failure may compromise the sample results, the resulting data will not be reported to the TCEQ. The nature and disposition of the problem is reported on the data report which is sent to the LNRA Project Manager. The LNRA Project Manager will include this information in the Corrective Action Plan and submit it to the TWRI Project Manager for inclusion in the project quarterly progress report which is sent to the TCEQ NPS Project Manager.

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

The TCEQ has determined that analyses associated with the qualifier codes (e.g. holding time exceedance, sample received unpreserved, estimated value, etc.) may have unacceptable measurement uncertainty associated with them. This will immediately disqualify data resulting from the analyses from being submitted to SWQMIS. Therefore, data with these types of problems should not be reported to the TCEQ. Additionally, any data collected or analyzed by means other than those stated in the QAPP should not be submitted for loading to SWQMIS. If data is later found, after submission to SWQMIS, to have been collected or analyzed by means other than those stated in the QAPP they must have an appropriate data qualifier assigned which can be found in the SWQM DMRG (December 2016, or most recent version). The qualifier

codes are added through the submission of a QAPP amendment and Data Correction Request (per the DMRG).

B5 QUALITY CONTROL

Sampling Quality Control Requirements and Acceptability Criteria

The minimum Field QC Requirements are outlined in the TCEQ Surface Water Quality Monitoring Procedures Vol 1. Specific requirements are outlined below. Field QC samples are reported with the laboratory data report (See Section A9 and C2).

Laboratory Measurement Quality Control Requirements and Acceptability Criteria

Detailed laboratory QC requirements and corrective action procedures are contained within the individual laboratory Quality Management Plans (QMP). The minimum requirements for this project are stated below. Results from laboratory QC samples are submitted with the laboratory data report.

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

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

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

Limit of Quantitation (LOQ) – The laboratory will analyze a calibration standard (if applicable) at the LOQ listed in Table A7.1 once per quarter when samples are analyzed. In addition, an LOQ check sample will be analyzed with each analytical batch. Calibrations including the standard at the LOQ will meet the calibration requirements of the analytical method or corrective action will be implemented.

LOQ Check Sample – An LOQ check sample consists of a sample matrix (e.g., deionized water, sand, commercially available tissue) free from the analytes of interest spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes. It is used to establish intra-laboratory bias to assess the performance of the measurement system at the lower limits of analysis. The LOQ check sample is spiked into the sample matrix at a level less than or near the LOQ listed in Table A7.1 for each analyte for each analytical batch of samples run. If it is determined that samples have exceeded the high range of the calibration curve, samples should be diluted or run on another curve. For samples run on batches with calibration curves that do not include the LOQ published in Table A7.1 a check sample will be run at the low end of the calibration curve.

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

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

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

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

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

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

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

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

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

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

Laboratory Duplicates – A laboratory duplicate is prepared by taking aliquots of a sample from the same container under laboratory conditions and processed and analyzed independently. A laboratory control sample duplicate (LCSD) is prepared in the laboratory by splitting aliquots of an LCS. Both samples are carried through the entire preparation and analytical process. LCSDs are used to assess precision and are performed at a rate of one per preparation batch.

For most parameters except bacteria, precision is evaluated using the relative percent difference (RPD) between duplicate LCS results as defined by 100 times the difference (range) of each duplicate set, divided by the average value (mean) of the set. For duplicate results, X1 and X2, the RPD is calculated from the following equation:

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

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

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

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

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

Matrix spike (MS) – Matrix spikes are prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available. Matrix spikes are used to determine any effects the sample-specific matrix may have on the analytical system's performance.

Matrix spikes indicate the effect of the sample on the precision and accuracy of the results generated using the selected method. The frequency of matrix spikes is specified by the analytical method, or a minimum of one per preparation batch, whichever is greater. To the

extent possible, matrix spikes prepared and analyzed over the course of the project should be performed on samples from different sites.

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

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

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

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

Method blank – A method blank is a sample of matrix similar to the batch of associated samples (when available) that is free from the analytes of interest and is processed simultaneously with and under the same conditions as the samples through all steps of the analytical procedures, and in which no target analytes or interferences are present at concentrations that impact the analytical results for sample analyses. The method blanks are performed at a rate of once per preparation batch. The method blank is used to document contamination from the analytical process. The analysis of method blanks should yield values less than the LOQ. For very high-level analyses, the blank value should be less than 5% of the lowest value of the batch, or corrective action will be implemented. Samples associated with a contaminated blank shall be evaluated as to the best corrective action for the samples (e.g. reprocessing or data qualifying codes). In all cases the corrective action must be documented.

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

Quality Control or Acceptability Requirement Deficiencies and Corrective Actions

Sampling QC excursions are evaluated by the LNRA Project Manager/QAO. Differences in sample results are used to assess the entire sampling process, including environmental variability, the arbitrary rejection of results based on pre-determined limits is not practical. Therefore, the professional judgment of the LNRA Project Manager/QAO will be relied upon in evaluating results. Rejecting sample results based on wide variability is a possibility.

Laboratory measurement quality control failures are evaluated by the laboratory staff. The disposition of such failures and the nature and disposition of the problem is reported to the B Environmental Laboratory QAO. The Laboratory QAO will discuss with the LNRA Project Manager. If applicable, the LNRA Project Manager include this information in the Corrective Action Plan and submit it to the TWRI project manager for inclusion in the project quarterly progress report which is sent to the TCEQ NPS Project Manager.

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 instream sampling equipment testing and maintenance requirements are detailed in the *SWQM Procedures, Volume 1: Physical and Chemical Monitoring Methods, RG-415, August 2012 (or most recent version).* Equipment records and pre- and post-calibration logs are kept on all field equipment and a supply of critical spare parts is maintained by the Contractor Field Supervisor.

All laboratory tools, gauges, instrument, and equipment testing and maintenance requirements are contained within laboratory QAM(s). Testing and maintenance records are maintained and are available for inspection by the TCEQ. Instruments requiring daily or in-use testing may include, but are not limited to, water baths, ovens, autoclaves, incubators, refrigerators, and laboratory pure water. Critical spare parts for essential equipment are maintained to prevent downtime. Maintenance records are available for inspection by the TCEQ.

B7 INSTRUMENT/EQUIPMENT CALIBRATION AND FREQUENCY

Instream field equipment calibration requirements are contained in the *SWQM Procedures, Volume 1: Physical and Chemical Monitoring Methods for Water, Sediment, and Tissue (RG-415) (*August 2012, or most recent version*).*
Post calibration error limits as provided in SWQM Procedures and the disposition resulting from error are adhered to and documented in the calibration and maintenance log. Data not meeting post-error limit requirements invalidates associated data collected subsequent to the pre-calibration and are not submitted to the TCEQ.

Detailed laboratory calibrations are contained within the QAM(s).

B8 INSPECTION/ACCEPTANCE OF SUPPLIES AND CONSUMABLES

New batches of supplies are tested before use to verify that they function properly and are not contaminated. The laboratory QAM provides additional details on acceptance requirements for laboratory supplies and consumables.

B9 NON-DIRECT MEASUREMENTS

Data not collected under this QAPP, but that were collected by the TCEQ and Texas Clean Rivers Program partners that meet the data quality objectives of this QAPP may be useful in satisfying the data and informational needs for this project. The qualification of the TCEQ and data it collects are addressed in the TCEQ SWQM QAPP. The qualification of the Texas CRP program and the data it collects are addressed in the Texas Clean Rivers Program QAPPs. All data used will be clearly identified in the final project report. These data will be used to calculate loadings and assess trends in constituent concentrations and loads.

Table B9.2 Monitoring Data Sources

Data Type	Monitoring Project/Program	Collecting Entity	Dates of Collection	QA Information	Data Use(s)
Bacteria (*E. coli*), Field measurements, Ammonia nitrogen, Nitrate nitrogen, TKN, TP, TSS	LNRA Clean Rivers Program	LNRA	All available at stations: 12524 12525 12527 18190	LNRA-CRP QAPP; SWQMIS database	summary statistics, trend analysis
Monitoring Data (Field measurements: Temperature, dissolved oxygen, pH, etc.)	TCEQ SWQM Program	TCEQ	All available at stations: 12524 12525 12527 18190	TCEQ SWQM QAPP; SWQMIS database	summary statistics, trend analysis
Flow Data	United States Geological Survey (USGS) flow data	USGS	All available at streamgages: 08164000 08163500	USGS QAPP; USGA database	Flow duration curves, Loading calculations
Precipitation Data	National Weather Service (NWS)	NWS	Most up-to-date precipitation data will be downloaded from the NWS website following storm events.	NWS Website	Days since last precipitation

Existing geospatial data available from various local, regional, state, and federal organizations may be used for project cartographic and illustrative purposes. These types may include land use, precipitation, soil type, ecoregion, TCEQ monitoring location, TCEQ permitted outfall, gage location, city/county/state boundary, stream hydrology, reservoir, drought, road, watershed, municipal separate storm sewer system, urbanized area, basin, railroad, recreational area, area landmark, aerial photography, and park information. The above data come from the following reliable sources: USGS, TNRIS, TCEQ, TxDOT, TSSWCB, TCEQ, and US Census Bureau. Geospatial data from these sources are accepted for use in project maps based on the reputability of these data sources and the fact that there are no known comparable sources for these data. Geospatial data will be cited in reports. Table B9.2 includes a listing of geospatial data sources used for more than just illustrative purposes.

Table B9.3 Geospatial Data Sources Used for Analysis*

Geospatial Data	Source	Date(s)	Analysis and/or Processing	Data Use
NHDv2Plus	http://www.horizon-systems.com/NHDPlus/NHDPlusV2_documentation.php	2012	Hydroenforced DEMs in NHDv2Plus will be used to delineate watershed boundaries using the ArcHydro extension or Spatial Analyst tools in ArcGIS	Watershed boundary identification and illustrative purposes.

*Metadata that contains the Federal Geographic Data Committee (FGDC) minimum documentation requirements will be created for any acquired spatial data manipulated through data analysis and/or processing.

Other data that are compiled and published by other entities may also be used in preparing project reports. This may include long-term precipitation, census, ecoregion, land use and land cover, historic water quality and stream flow data. Sources of these data are the USGS, National Weather Service, US Census Bureau, USDA NRCS, TCEQ, and TPWD. Data collected by these entities are assumed to have been verified and validated according to the requirements of the respective programs. Data compilations created for this project will be visually screened for errors. Data will be cited in reports.

As the project progresses, additional data sources and/or data types may be identified as necessary to complete project tasks. Once identified, the TWRI Project Manager will notify the TCEQ NPS Project Manager and request approval prior to use. If data will be analyzed or used for any purposes beyond cartographic, illustrative, or other ancillary purposes, the QAPP must be amended prior to use. All approved data sources will be clearly documented in this QAPP and where such data sources are reported (e.g. technical documents, technical reports, and final reports).

Only data collected directly under this QAPP will be submitted to the TCEQ for storage in SWQMIS. This project will not submit any acquired or non-direct measurement data to SWQMIS that has been or is going to be collected under another QAPP. All data collected under this QAPP and any acquired or non-direct measurements will comply with all requirements/guidance of the project.

B10 DATA MANAGEMENT

Personnel

Section A4 lists responsibilities and lines of communication for data management personnel.

Data Management Process

Samples are collected by field staff and transferred to the laboratory for analyses as described in Sections B1 and B2. The LNRA Project Manager/QAO and Data Manger check B

Environmental data reports for completeness, holding times, minimums, maximums, AWRLs, LOQs, etc. and run numeric (RPD) comparisions of field splits. Data is hand entered in the LNRA water quality Access database and flow data are added to results from the field notebook. Data entry is 100% check by the Data Manager and 10% by the Project Manager. Lab reports are kept in LNRA perment archives and originals are kept in the LNRA water quality department, data is also stored in laserfische on the LNRA network database. The LNRA water quality Access database is backed up onto the LNRA network in a dedicated file.

At least three times annually, data is submitted to TCEQ for inclusion in SWQMIS. The LNRA Data Manager exports period-of-record data from the LNRA Water Quality Access database and properly formats. LNRA QAO/Project Manager checks data file. Data then is e-mailed to Data Management QA consultant at Nueces River Authority. Consultant checks data for minimums, maximums, formatting, redundancies, matching event and results, tag IDs, etc. Data is run through SWQMIS to get a Validator Report and any errors are reported to LNRA.

Consultant sends recommendations to LNRA regarding any errors, and any necessary changes are made to both data submittal file and to the LNRA Water Quality Access database by the LNRA Data Manager and are 100% checked by the LNRA QAO/Project Manager. Data (1 events file, 1 results file), scanned data summary, and validator report are e-mailed to the NPS Project Manager at TCEQ for submission to TCEQ's SWQMIS (as described in the SWQM DMRG December 2016or later version). Once TCEQ approval of the data is obtained, the data are loaded into SWQMIS by TCEQ data manager.

See Appendix F for the Data Management Process Flow Chart

Record-keeping and Data Storage

LNRA record keeping and document control procedures are contained in the water quality sampling and SOPs and this QAPP. Field results data acquired with YSI multi-parameter probes are downloaded from datalogger into EcoWatch software on a PC, and a hard copy is printed out and kept on file. Data is then hand-typed into the Access water quality database, and other data, e.g. Secchi disk depth and flow, are added to the electronic files from field notes. The forms used for field notes and for flow calculations appear in Appendix D. Sample results from the B Environmental laboratory are e-mailed to LNRA and then printed out in a hard-copy report format. LNRA retains copies of laboratory reports following the document retention guidelines found in the most recent version of the LNRA CRP QAPP.. These lab results are also stored in laserfiche in the LNRA network. This data also is hand-typed into the Access water quality database by the Data Manager. Data is retained according to the schedule in Table A9.1

Archives/Data Retention

Complete data set submittals are retained on-site by the LNRA for a retention period specified in Table A9.1 of the current QAPP. Each data set submitted to the TCEQ is also stored on the

LNRA Project Manager/QAO's computer. Data will be managed in accordance with the TCEQ DMRG (December 2016 or most recent version).

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

Forms and Checklists
See Appendix C for the Data Review Checklist and Summary.
See Appendix D for the Field Data Reporting Form.
See Appendix G for the Chain-of-Custody Form

Data Dictionary
Terminology and field descriptions are included in the SWQM DMRG (2016 or most recent version). For the purposes of verifying which entity codes are included in this QAPP, a table outlining the entities that will be used when submitting data under this QAPP (Please see table under Electronic Data section). .

Data Handling
Data are processed by LNRA using the Microsoft Office 2000 (or newer) suite of tools and applications. Both field and conventional laboratory analyses results are entered into an Access water quality database running on Windows 10 platform. The Access water quality database is also backed up onto the LNRA network system. The Access files are exported as pipe-delimited text files for submittal to the TCEQ. ESRI's Arcview and ArcGIS are the software used for the GIS database.
Data are processed by TWRI using the Microsoft Office 2016 or newer suite of tools and applications. 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. No data from external sources are maintained in the database. The database administrator is responsible for assigning user rights and assuring database integrity.

Hardware and Software Requirements
LNRA hardware configurations are sufficient to run Microsoft Access 2000 under the Windows 10 operating system in a networked environment. The computers used by the LNRA CRP staff have internet access in order to facilitate transmission of data and information to and from TCEQ via electronic mail. 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.

TWRI hardware configurations are sufficient to run Microsoft Office 2016 or newer under the Windows 10 operating system in a networked environment. TWRI Information Technology (IT) 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.

Software development and database administration are also the responsibility of the information resources department. Information Resources develops applications based on user requests and assures full system compatibility prior to implementation.

Information Resource Management Requirements

The LNRA Data Manager is responsible for ensuring that information resource management requirements are satisfied. This includes the oversight of the transfer of electronic data files from the LNRA Intranet to TCEQ in their required format as required in the Surface Water Quality Monitoring DMRG. Transfer of water quality data to TCEQ will occur via email attachments.

The TWRI Project Manager/Data Manager is responsible for ensuring that information resource management requirements are satisfied. The various types of data to be downloaded from the Internet are included in Table B9.1. Data produced through this project will also be stored as a digital copy. Copies will be saved to the project directory. Databases on the Internet are stored in a variety of formats. Some data or files required for the project can be downloaded from the Internet into text or Excel files, where they can be manipulated to create text files or other types of data files that can be used directly by models. TCEQ SWQMIS water quality data is downloaded into Excel for ease of manipulation and processing.

Quality Assurance/Control
See Section D of this QAPP

C1 ASSESSMENTS AND RESPONSE ACTIONS

Table C1.1 Assessments and Response Requirements

Assessment Activity	Approximate Schedule	Responsible Party	Scope	Response Requirements
Status Monitoring Oversight, etc.	Continuous	TWRI Project Manager	Monitoring of the project status and records to ensure QAPP requirements are being fulfilled.	Report to TCEQ in Quarterly Report
Review of Field Data Sheets	Within 30 days of the first sampling event	LNRA Project Manager TCEQ NPS Project Manager	The LNRA Project Manager will submit field sheets and instrument calibration sheets from the first sampling event within 30 days of the event. The TCEQ NPS Project Manager will review the data sheets and calibration sheets for conformance with the QAPP.	The LNRA Project Manager has 14 days to respond to TCEQ NPS Project Manager comments. If needed, Corrective Action Plans will be provided within 30 days.
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. Field sampling, handling and measurement; facility review; field instrument calibration logs; and data management as they relate to the NPS Project	30 days to respond in writing to the TCEQ to address corrective actions
Field Sampling Readiness Review	Prior to first sampling event for all monitoring projects	LNRA/TWRI QAO, Project Manager, or Field Supervisor	The LNRA/TWRI QAO (or designee) will review the QAPP in detail with field staff to ensure that the requirements of the QAPP are understood. The scope of this review will include QAPP sampling procedures and the SWQM Procedures Manual (including pre- and post-calibration, sample collection, QA/QC, and other sections as applicable).	The LNRA/TWRI Project Manager will document this review with a brief report describing who attended the review, the topics covered, and signatures from attendees certifying that field staff understand the QAPP requirements.
Monitoring Systems Audit	Based on work plan and/or discretion of TWRI or upon request of the TCEQ NPS Project Manager. For projects collecting routine (RT) data, at least one assessment must be performed	TWRI QAO	The assessment will be tailored in accordance with objectives needed to assure compliance with the QAPP. Field sampling, handling and measurement; facility review; and data management as they relate to the NPS Project	30 days to respond in writing to the TWRI QAO to address corrective actions
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 LNRA Project Manager/ LNRA 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 L for the form and an example) must be submitted to the TCEQ NPS Project Manager within 14 days of the deficiency occurring. The TCEQ NPS QA Coordinator will email the CAP to the Lead NPS QAS (and TCEQ DM&A Data Manager if data quality is affected) within 30 days of the initial notice of deficiency per TCEQ QMP and after it is accepted 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 K for the table and an example) to be included with the quarterly progress report.

The LNRA 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 LNRA 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.

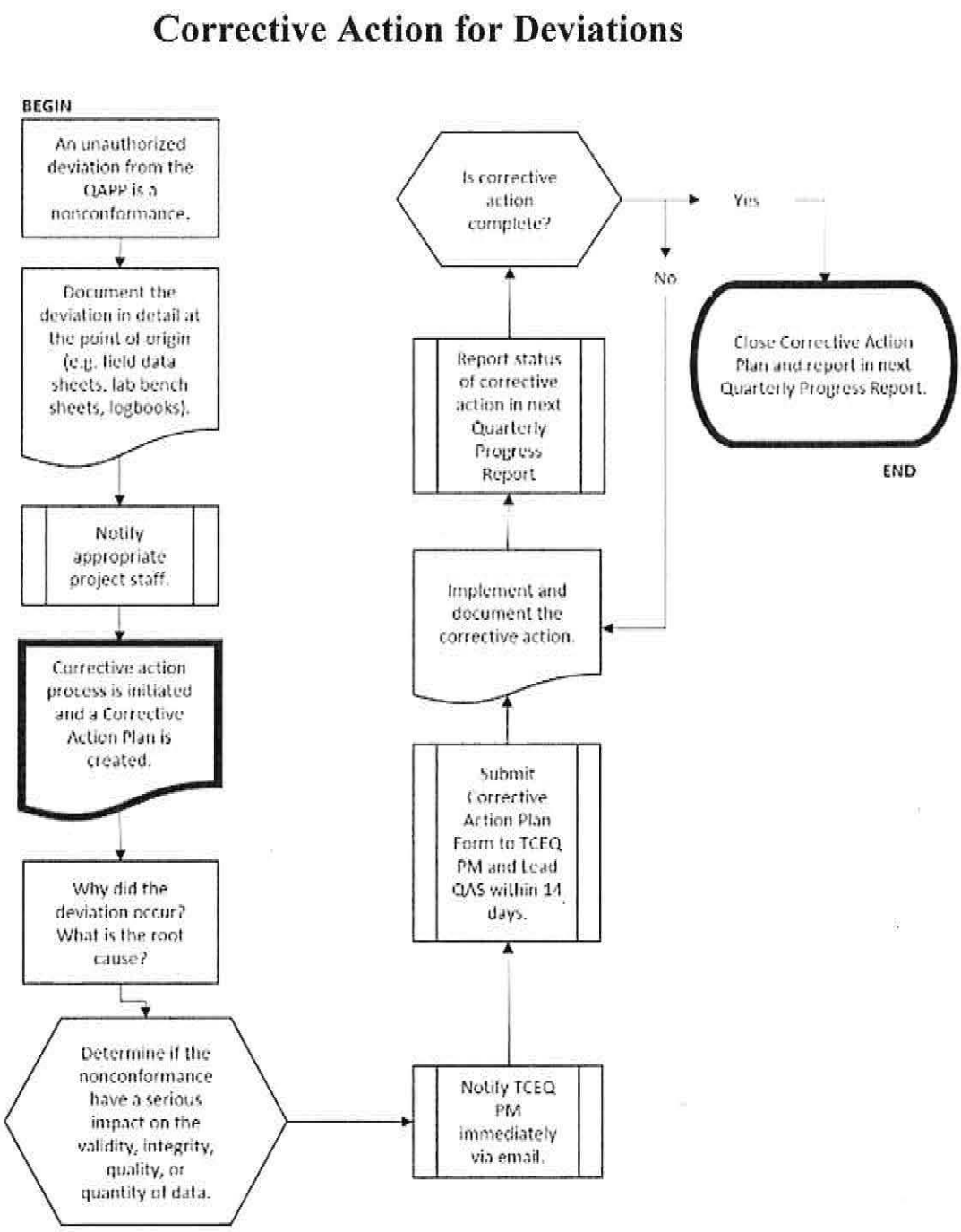
Corrective Action Plans

Corrective Action Plans should:

- 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

To facilitate the process a flow chart has been developed (see figure C1.1: Corrective Action Process for Deviations).

Figure C1.1 Corrective Action Process for Deviations



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 Report - Summarizes TWRI's activities for each task; reports monitoring status, problems, delays, and corrective actions; and outlines the status of each task's deliverables.

Monitoring System Audit Response - The LNRA Project Manager will respond in writing to the TCEQ within 30 days upon receipt of a monitoring system audit report to address corrective actions.

Task Reports - Summarize the activities conducted under individual Tasks for the project period including a description and documentation of major Task activities and the evaluation any results.

Final Project Report - Summarizes TWRI's activities for the entire project period including a description and documentation of major project activities; evaluation of the project results and environmental benefits; and a conclusion.

Corrective Action Documentation – Records of all quality assurance audits and associated corrective actions will be submitted to the TCEQ NPS Project Manager with the progress reports. LNRA may use the NPS Program Corrective Action Reports (CAR) form (Attachment G) or any other format as long as the appropriate information is documented. Any situation which, if not corrected by the LNRA, may have a serious effect on validity or integrity of the data, should be reported to the TCEQ NPS Project Manager immediately verbally and followed up in writing.

Reports to LNRA Project Management

Laboratory data reports contain the results of all specified QC measures listed in section B5, including but not limited to field equipment blanks, trip blanks, field blanks, laboratory duplicates, field splits, laboratory control standards, matrix spikes, AWRL/LOQ verification, laboratory equipment blanks, and method blanks. This information is reviewed by the LNRA QAO and compared to the pre-specified acceptance criteria to determine acceptability of data. This information is available for inspection by the TCEQ.

Reports by TCEQ Project Management

Contractor Evaluation - TWRI participates in a Contractor Evaluation by the TCEQ annually for compliance with administrative and programmatic standards. Results of the evaluation are submitted to the TCEQ Financial Administration Division, Procurement, and Contracts Section.

D1 DATA REVIEW, VERIFICATION, AND VALIDATION

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 data obtained from field and laboratory measurements will be reviewed and verified by the LNRA QAO for conformance to project requirements, and then validated against the data quality objectives which are listed in Section A7. 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 TCEQ for entry into SWQMIS.

The procedures for verification and validation of data are described in Section D2, below. The LNRA Field Supervisor is responsible for ensuring that field data are properly reviewed and verified for integrity. The Laboratory Supervisor is responsible for ensuring that laboratory data are scientifically valid, defensible, of acceptable precision and bias, reviewed for integrity, and meet all QAPP requirements. The LNRA Data Manager will be responsible for ensuring that all non-qualified data are properly reviewed and verified, and submitted in the required format to be loaded into SWQMIS as appropriate. The LNRA QAO is responsible for validating a minimum of 10% of the data produced in each task. Finally, the LNRA Project Manager/QAO is responsible for validating that all data to be reported meet the objectives of the project and are suitable for reporting to TCEQ.

D2 VERIFICATION AND VALIDATION METHODS

All data will be verified 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 project specifications. The staff and management of the respective field, laboratory, and data management tasks are responsible for the integrity, validation, and verification of the data each task generates or handles throughout each process. The field and laboratory tasks ensure the verification of raw data, electronically generated data, and data on chain-of-custody forms and hard copy output from instruments.

Verification, validation, and integrity review of data will be performed using self-assessments and peer review, as appropriate to the project task, followed by technical review by the manager of the task. The data to be verified (listed in Table D2.1) are evaluated against project performance specifications (Section A7) and are checked for errors, especially errors in transcription, calculations, and data input. If a question arises or an error is identified, the manager of the task responsible for generating the data is contacted to resolve the issue. Issues

which can be corrected are corrected and documented electronically or by initialing and dating the associated paperwork. If an issue cannot be corrected, the task manager consults with the higher level project management to establish the appropriate course of action, or the data associated with the issue are rejected and not reported to the TCEQ for storage in SWQMIS. The performance of these tasks is documented by completion of the Data Review Checklist and Summary (Appendix C).

The LNRA Project Manager/QAO are each responsible for validating that the verified data are scientifically valid, defensible, of known precision, bias, and integrity, meet the data quality objectives of the project, and are reportable to TCEQ. One element of the validation process involves evaluating the data again for anomalies. Any suspected errors or anomalous data must be addressed by the manager of the task associated with the data, before data validation can be completed.

A second element of the validation process is consideration of any findings identified during the assessments listed in Table C1.1. Any issues requiring corrective action must be addressed, and the potential impact of these issues on previously collected data will be assessed by the LNRA QAO. The LNRA Project Manager, with the concurrence of the QAO validates that the data meet the data quality objectives of the project and are suitable for reporting to TCEQ.

Table D2.1 Data Verification Procedures

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

10% of data manually reviewed			QAO	Data Manager

D3 RECONCILIATION WITH USER REQUIREMENTS

SWQM

Data produced in this project, and data collected by other organizations will be analyzed and used to assess progress towards meeting water quality goals in the Lavaca River Watershed Protection Plan. Data that do not meet requirements described in this QAPP will not be submitted to SWQMIS nor will it be considered appropriate for any of the uses noted above.

Data produced in this project will be analyzed and reconciled with project data quality requirements. Data meeting project requirements may be used by the TCEQ for the Texas Water Quality Integrated Report in accordance with the most recent approved version of the TCEQ's Guidance for Assessing Texas Surface and Finished Drinking Water Quality Data, and for TMDL development, water quality standards development, and permit decisions as appropriate. Data that do not meet data quality objectives outlined in this document will not be submitted to SWQMIS.

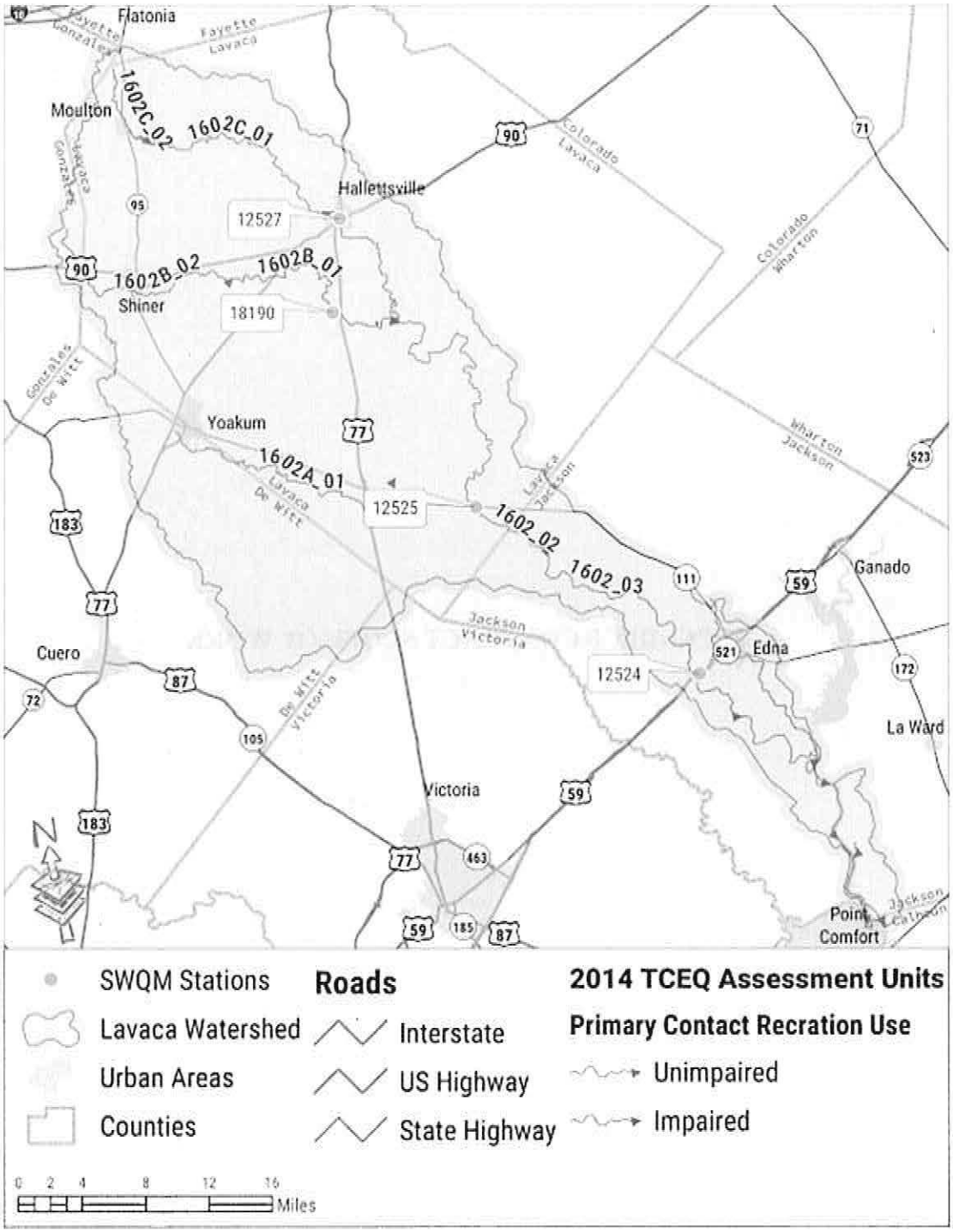
Load Estimation

Bacteria and other constituent loads will be estimated from monitoring data collected in this project and from previously collected water quality data in SWQMIS. Current and historical loads will be estimated using the Load Duration Curve framework, USGS's LOADEST tool, or statistical regression as appropriate. Each approach use historical mean daily flow data and water quality data to estimate allowable and probable instream loads. The load estimation approach used will be described in detail in the final report and used for educational purposes as appropriate and will aid stakeholder in making informed decisions about implementation progress of the watershed protection plan. The limitation of the applied approach will be described in the report and conveyed to audience when discussed.

Trend Analysis

Statistical tests will be used to determine if trends in water quality constituent concentrations and loads are statistically significant. A Mann-Kendall test for trend will be utilized to test the significance of trends in concentration and loads. A Mann-Kendall test for trend will be used on the residuals of the flow-concentration and flow-load regressions to assess trends in flow-normalized concentration and load. Trends will be communicated to stakeholders with scatterplots of the data and regression lines or Thiel-Sen slope plotted through the data to depict directions of the trend.

APPENDIX A AREA LOCATION MAP


Flatonia
Moulton
1602C_02
1602C_01
Hallettsville
12527
1602B_02
1602B_01
Shiner
18190
Yoakum
1602A_01
12525
1602_02
1602_03
Ganado
Cuero
Edna
12524
La Ward
Victoria
Point Comfort
Fayette Gonzales
Fayette Lavaca
Lavaca Gonzales
Colorado Lavaca
Colorado Wharton
Gonzales De Witt
Lavaca De Witt
Lavaca Jackson
Wharton Jackson
Jackson Victoria
De Witt Victoria
Jackson Calhoun
N
SWQM Stations
Lavaca Watershed
Urban Areas
Counties
Roads
Interstate
US Highway
State Highway
2014 TCEQ Assessment Units
Primary Contact Recration Use
Unimpaired
Impaired
0 2 4 8 12 16
Miles

APPENDIX B CONTRACT SCOPE OF WORK

Scope of Work

This project will implement the Lavaca River Watershed Protection Plan (WPP). The Lavaca River watershed contains numerous impaired segments for bacteria. The segments are listed on the TCEQ 2014 303(d) list due to bacteria levels that exceed the water quality standard for primary contact recreation. To address the elevated levels of bacteria, a WPP, Total Maximum Daily Load (TMDL), and TMDL Implementation Plan (I-Plan) were developed.

The Performing Party will continue to work with key stakeholders and partner agencies to facilitate implementation outlined in the WPP. The Performing Party will assist governmental and non-governmental organizations within the watershed with identification and acquisition of resources to enable implementation.

The Performing Party will serve as the primary contact for interaction with landowners, citizens, and entities to facilitate implementation. The Performing Party will coordinate with the stakeholder group to provide updates, seek input and recommendations on needed activities, and continue to support implementation efforts of the plan. The Performing Party will continue to assist stakeholders to implement management measures to improve water quality and acquire resources to enable implementation, as well as, work with state and federal agencies, as appropriate, to bring technical and financial assistance to the watershed.

Coordination of outreach and education efforts by the Performing Party will facilitate and support public participation by private individuals and local officials during implementation. The Performing Party will develop publications, an annual newsletter, factsheets, website content, and other materials to promote and communicate watershed pollution prevention efforts. Additionally, the Performing Party will coordinate and conduct water resources education and outreach efforts across the watershed, organizing educational programs such as the Texas Well Owner Network and various other programs. The Palacios Beautification Committee will work to establish kiosks within the Palacios Pavilion that aim to educate, inspire, and challenge visitors to protect the Texas coastal environment through conservation, species protection, and wise management of resources.

The Performing Party will evaluate ambient water quality at four existing Clean Rivers Program monitoring sites on the Lavaca River and Rocky Creek. Data collected will be used to measure instream loading reductions. Field parameters to be collected include pH, temperature, conductivity, and dissolved oxygen. Conventional parameters to be collected include total suspended solids, turbidity, nitrate-nitrogen, ammonia nitrogen, total kjeldahl nitrogen, total phosphorus, and bacteria.

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 subgrantee(s)/subcontractor(s). Project oversight status will be provided to TCEQ with the Quarterly Progress Reports (QPRs).

Subtask 1.2: QPRs — The Performing Party will submit QPRs to the TCEQ Project Manager by the 15th of the month following each state fiscal quarter for review by the TCEQ Project Manager and incorporation into the United States Environmental Protection Agency's (EPA) Grant Reporting and Tracking System. QPRs will include reporting on status of Deliverables and proposed revisions to due dates, narrative description of progress by Task, and status of nonconformances/corrective actions. A template for the QPR will be provided to the Performing Party by the TCEQ Project Manager.

Subtask 1.3: Reimbursement Forms — See Special Terms and Conditions, 8. Invoice Submittal.

Subtask 1.4: Contract Communication — The Performing Party will participate in a post-award orientation meeting with TCEQ 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 in regard to any matters that require attention between QPRs. This will include a quarterly conference call to discuss Project Tasks, financial status, Quality Assurance Project Plan (QAPP), 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 submit meeting notes (action items at a minimum) to the TCEQ Project Manager within seven days.

The quarterly conference call held the first quarter of each fiscal year of the project will be used to discuss, at a minimum, any staff changes, the previous year's performance, budget estimates, invoicing issues, quality assurance issues, overall project progress, and a plan for the current fiscal year. The Performing Party will submit meeting notes (action items at a minimum) to the TCEQ Project Manager within seven days.

Matters that must 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 two working days regarding events or circumstances that may require changes to the Budget, Scope of Work, or Schedule of Deliverables.

Subtask 1.5: Coordination Meeting with EPA — The Performing Party will attend a project update and coordination meeting with EPA in Dallas upon request by TCEQ and EPA to share progress on goals, measures of success, challenges, and opportunities.

Subtask 1.6: Annual Report Article — The Performing Party will provide an article for the Nonpoint Source (NPS) Annual Report upon request by TCEQ. The article will include a brief summary of the project and describe the activities of the past fiscal year.

Subtask 1.7: Contract Budget Updates — The Performing Party will discuss annual fiscal year budgets with the TCEQ Project Manager on a quarterly basis. Starting in the second year of the project, the Performing Party will provide an Annual Budget Update that details state fiscal year spending projections as associated with planned project activities. These updates will be discussed quarterly at a minimum. They 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 template for the Annual Budget Update will be provided by the TCEQ Project Manager.

Deliverables:
- QPRs
- Reimbursement forms
- Post Award Meeting and notes
- Conference call notes and action items
- Coordination meeting with EPA (upon request)
- Annual Report article and pictures (upon request)
- Contract Budget updates
- Annual Budget updates

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 elements in the TCEQ NPS QAPP Shell. The information developed during this meeting will be incorporated into a QAPP. The storage location of data records, and how data will be coded, will also be determined during these meetings. The Performing Party may conduct additional meetings to determine whether changes to an existing QAPP are needed.

Subtask 2.2: 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 submit the QAPP to TCEQ at least 120 days prior to the scheduled initiation of environmental data operations. The QAPP must be signed/fully approved by TCEQ and, if necessary, EPA, before any environmental data operations begin.

Activities covered under this QAPP:

- Data collection

Tasks covered under this QAPP:

- Tasks 2, 4, and 5

Tasks NOT covered under this QAPP:

- Tasks 1 and 3

Subtask 2.3: QAPP Annual Reviews and Revisions — The Performing Party will submit documentation certifying its annual review of QAPPs no less than 90 days prior to the QAPP anniversary date. Amendments approved since the initial QAPP approval or a subsequent certified annual review (if applicable) must be submitted along with the certification. If extensive changes to a QAPP are necessary, a full revision is required. Once TCEQ certifies the annual review or approves the full revision, the QAPP effective period is extended an additional year. No work described in a QAPP will be conducted outside the effective period of the QAPP.

Subtask 2.4: QAPP Amendments — The Performing Party will submit Draft QAPP Amendments for TCEQ's review when changes to QAPPs are necessary. Draft QAPP Amendments will be submitted no less than 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. The Performing Party will ensure that changes conveyed within Amendments are not implemented until the Amendment is fully approved by TCEQ.

Deliverables:

- QAPP Planning Meeting notes
- Draft and Final QAPP
- QAPP Annual Reviews and Revisions
- Draft and Final QAPP Amendments

Task: 3 Engagement, Support, and Facilitation of WPP Implementation

Objective: To facilitate continued stakeholder engagement in the watershed planning process to ensure successful implementation of the WPP and track implementation.

Subtask 3.1: Identify Technical and Financial Assistance — The Performing Party will assist governmental and non-governmental organizations (i.e., responsible parties in the WPP) in identification and acquisition of resources (financial and technical) to enable WPP implementation. The Performing Party will actively seek and pursue funding opportunities and work with partners to develop grant proposals. The Performing Party will work with state and federal agencies, as appropriate, to bring technical and financial resources to the watershed.

Subtask 3.2: Develop and Distribute Promotional and Educational Material — The Performing Party will facilitate communication with stakeholders to engage the public and affected entities in implementation. The Performing Party will use all appropriate communication mechanisms including direct mail, email, and a project website. The Performing Party will develop and disseminate general project informational materials, including, but not limited to, flyers, letters, factsheets, news releases, and other appropriate promotional publications. The Performing Party will maintain the website on a quarterly basis.

Subtask 3.3: Participate in Public Meetings — The Performing Party will attend and participate in other public meetings, as appropriate, to communicate project goals, activities, and accomplishments to affected parties. Such meetings and events may include, but are not limited to, city councils, county commissioners' courts, Clean River Program Basin Steering Committee and Coordinated Monitoring, any field days, demonstrations, site tours, or education events sponsored by Texas A&M AgriLife Extension Service, United States Department of Agriculture-Natural Resources Conservation Service, and/or Soil and Water Conservation Districts in the watershed and other appropriate events of critical watershed stakeholder groups.

Subtask 3.4: Water Quality Assessment — The Performing Party will 1) evaluate and track progress toward achieving milestones established in the WPP; and 2) assess water quality data collected through the Clean Rivers Program and other data collection efforts (such as Task 4) in relation to achieving load reductions. The Performing Party will develop and maintain a database for tracking implementation progress.

Subtask 3.5: Develop and Facilitate Watershed Coordination Committee and Workgroups — The Performing Party will facilitate public participation and stakeholder involvement in the watershed, specifically by facilitating meetings of a Watershed Coordination Committee (once per year) and work groups (as needed) to provide regular updates on progress to implement the WPP, status of monitoring efforts, progress in identifying implementation funding, and movement towards sustaining and improving water quality. Input and recommendations on needed activities will be sought. The Performing Party will coordinate meetings, secure locations, and prepare and disseminate meeting notices and agendas. Meeting summaries will be prepared and posted to the project website. The Performing Party

will provide all interested and responsible parties with updates on implementation progress.

Subtask 3.6: Annual Newsletter — The Performing Party will develop, publish, and distribute an annual newsletter designed to keep landowners and entities informed of ongoing implementation activities including progress towards achieving milestones in the WPP. The newsletter will be distributed as most appropriate to individual landowners and entities in the watershed.

Subtask 3.7: Stakeholder List Maintenance — The Performing Party will maintain a database of watershed stakeholders and affected parties for use in engaging the public in the implementation process. The database created and used during the WPP development process will be updated as needed. The database will represent a cross section of watershed landowners, citizens, local and regional governmental entities and elected officials, state and federal agencies, and environmental and special interest groups.

Subtask 3.8: Coordinate Water Education Program Delivery — The Performing Party will coordinate and conduct water resources and environmental outreach/education efforts related to NPS across the watershed, as identified in the WPP. The Performing Party will work with collaborating entities to organize at least two educational/training programs annually, including, but not limited to:

- Lone Star Healthy Streams (Feral Hog component) workshop
- Lone Star Healthy Streams (Grazing Cattle component) workshop
- Intro to Septic Systems for Homeowners
- Aerobic system operation and maintenance workshops for homeowners
- Riparian Management Workshops for landowners and land managers
- Texas Watershed Steward Program
- Texas Well Owner Network training and well screening
- Feral Hog Management Workshop

The Performing Party will work with the entities that administer/fund these programs to try to direct delivery of these programs to the watershed, depending on priorities of those entities and programs.

Deliverables:

- Documentation of resource opportunities identified, applied for, and resources obtained to support plan implementation
- Educational and promotional materials, as developed and disseminated
- Website maintenance, including educational materials, workshop information, meeting information, and annual newsletters
- Communication materials, as developed and disseminated, including flyers, letters, news releases, etc.
- Notices, agendas, meeting materials, attendance lists, and summaries from public meetings
- List of other meetings attended, including dates with a brief summary of topics discussed and action needed
- Draft and Final Water Quality Assessment
- Database for tracking implementation progress

- Draft and final annual newsletter developed and distributed to stakeholders
- Stakeholder contact list, updated as needed
- Notices, agendas, meeting materials, attendance lists, and summaries from workshops, field tours, demonstrations, site tours, or educational events attended

Task 4: Routine Surface Water Quality Monitoring (SWQM)

Objective: To collect water quality data for the assessment of the effectiveness of implementing the Lavaca River WPP and TMDL I-Plan by enhancing current routine ambient monitoring efforts.

Subtask 4.1: Water Quality Monitoring Assessment Requirements — The Performing Party will perform the following water quality monitoring assessments described in their monitoring QAPP:

- Perform a desk readiness review with field staff of field sampling procedures and requirements as outlined in the QAPP and the SWQM Procedures Manual. The Performing Party will submit a brief report documenting topics discussed and attendance at this review.
- Submit field notes and instrument calibration sheets from first sampling event within 30 days of first event.
- For routine monitoring, the Performing Party will schedule and perform an internal monitoring systems audit. The Performing Party will provide a scheduled date for the audit within the first quarter of the project.

Subtask 4.2: Routine Monitoring — The Performing Party will conduct monthly near-surface grab samples at four stream stations.

The sampling period extends over 36 months. The total number of samples scheduled to be collected is 24. Currently, routine ambient monitoring is conducted quarterly at four stations through the Clean Rivers Program. Sampling through this Subtask will complement existing routine ambient monitoring regimes.

Field parameters are pH, temperature, conductivity, and dissolved oxygen. Conventional parameters are total suspended solids, nitrate nitrogen, ammonia nitrogen, total kjeldahl nitrogen, total phosphorous and bacteria (*E. coli*). Streamflow will be measured in association with routine monitoring through direct field measurements or through gauging station data.

Monitoring plans, QAPPs, and other plans needed to support data and information collection activities will be developed and submitted for approval to the TCEQ Project Manager. All analyses will be conducted in the Performing Party's National Environmental Laboratory Accreditation Program (NELAP) accredited lab, per the approved QAPP.

Subtask 4.3: Data Maintenance and Submittal — The Performing Party will maintain a master database of collected data. The Performing Party will upload data into the Surface Water Quality Monitoring Information System (SWQMIS) Test Environment, and submit successful data set(s) to the TCEQ Project Manager quarterly. Data will be

submitted electronically to the TCEQ Project Manager in the event/result file format described in the most current version of the Data Management Reference Guide (DMRG), which can be found at:
https://www.tceq.texas.gov/waterquality/data-management/dmrg_index.html
A completed Data Review Checklist and Data Summary will be submitted with each data submittal.

Subtask 4.4: Water Quality Data Collection Report — The Performing Party will summarize activities and results completed under this Task.

Deliverables:
- Documentation of field monitoring desk readiness review before first sampling event
- Field notes and instrument calibration sheets from first sampling event within 30 days of event
- Scheduled date of internal monitoring systems audit
- Results of internal monitoring systems audit
- Documentation of sampling events
- Data submissions (data summary and checklist, event and result files, and validator report) after successful upload into SWQMIS test environment
- Draft Water Quality Data Collection Report
- Final Water Quality Data Collection Report

Task 5: Final Report

Objective: The Performing Party will produce a Final Report that summarizes all activities completed and conclusions reached during the project. The Final Report must describe project activities, and identify and discuss the extent to which project goals and purposes have been achieved, and the amount of funds spent on the project. The Final Report will emphasize successes, failures, lessons learned, and will include analyses estimating the projects' water quality improvements and/or load reductions, if applicable. The Final Report must summarize all the Task Reports in either the text or as appendices.

Subtask 5.1: Draft Final Report — At least 30 days prior to submitting the Final Report, the Performing Party will provide a Draft Final Report summarizing all project activities, findings, and the contents of all previous Deliverables, referencing and/or attaching them as web links or appendices. This comprehensive report will document all Deliverables under this Scope of Work. The Draft Final Report will be structured per the following outline:
- Title
- Table of Contents
- Project Significance and Background
- Study Area
- Summary of all Task Reports and final approved QPR
- Amount of project funding and amount spent
- Discussion; include deliverables not completed, lessons learned, recommendations
- Water quality results achieved/estimated load reductions (if applicable to project)
- Appendices (if needed)

Subtask 5.2: Final Report — The Performing Party will revise the Draft Final Report to address comments provided by the TCEQ Project Manager and EPA. At least two weeks before the expiration of the Contract, the Performing Party will submit the Final Report to the TCEQ Project Manager, who will subsequently submit it to EPA.

Deliverables:
- Draft Final Report
- Address TCEQ/EPA comments
- Final Report

Schedule of Deliverables

Task No.	Task Deliverable	Due Date
1 Project Administration		
1.2	QPRs	The 15th of the month following each state fiscal quarter
1.3	Reimbursement forms	See Special Terms and Conditions, 8. Invoice Submittal
1.4	Post-Award orientation meeting and notes	Meeting within 30 days of Contract execution, meeting notes within two days of meeting
1.4	Conference call notes and action items	Quarterly, notes within seven days of meeting
1.5	EPA coordination meeting	Upon request
1.6	Annual Report Article	Upon request
1.7	Contract Budget updates	Discussed quarterly and updated as needed
1.7	Annual Budget updates	Quarters 5 and 9
2 Quality Assurance		
2.1	QAPP Planning Meetings notes	Meeting within 30 days of Contract execution
2.2	Draft QAPP	At least 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	No less than 90 days prior to the QAPP anniversary date
2.4	Draft QAPP Amendments	No less than 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

3 Engagement, Support, and Facilitation of WPP Implementation		
3.1	Documentation of resource opportunities identified, applied for, and resources obtain to support plan implementation	Quarter 2, Month 1; Quarter 4 Month 1; Quarter 6 Month 1; Quarter 8 Month 1; Quarter 10 Month 1; Quarter 12 Month 1
3.2	Distribute promotional and educational materials, including flyers, letters, news releases, etc.	Quarter 2, Month 1; Quarter 4 Month 1; Quarter 6 Month 1; Quarter 8 Month 1; Quarter 10 Month 1; Quarter 12 Month 1
3.2	Website maintenance	Quarterly, with QPRs
3.3	Documentation of community meetings attended, including brief summary of topics discussed, materials disseminated, and action needed	Quarter 2, Month 1; Quarter 4 Month 1; Quarter 6 Month 1; Quarter 8 Month 1; Quarter 10 Month 1; Quarter 12 Month 1
3.4	Draft Water Quality Assessment	Final Quarter, Month 1
3.4	Final Water Quality Assessment	Final Quarter, Month 2
3.5	Documentation of project meetings, including meeting notices, materials, agendas, attendance lists, and summaries	Quarter 2, Month 1; Quarter 4 Month 1; Quarter 6 Month 1; Quarter 8 Month 1; Quarter 10 Month 1; Quarter 12 Month 1
3.6	Draft annual newsletter	Quarters 3, 7 and 11, Month 3
3.6	Final annual newsletter	Quarters 4, 8 and 12, Month 1
3.7	Stakeholder list maintenance, updated as needed, document activity	in QPRs
3.8	Documentation of workshops, including press releases, agendas, and attendance lists	Quarter 2, Month 1; Quarter 4 Month 1; Quarter 6 Month 1; Quarter 8 Month 1; Quarter 10 Month 1; Quarter 12 Month 1
4 Routine Surface Water Quality Monitoring		
4.1	Documentation of field monitoring desk readiness review	Before first sampling event
4.1	All field data sheets and instrument calibration sheets from first sampling event	Within 30 days of first sampling event

4.1	Scheduled date of internal monitoring systems audit	Quarter 1
4.1	Results of internal monitoring systems audit	Within 30 days of audit completion
4.2	Documentation of sampling events	Quarterly, following sampling initiation, in QPRs
4.3	Data submissions (data summary and checklist, event and result files, and validator report) after successful upload into SWQMIS test environment	Quarterly, following sampling initiation
4.4	Draft Water Quality Data Collection Report	Final Quarter, as part of Final Report
4.4	Final Water Quality Data Collection Report	At least two weeks prior to the end of the Contract, in Final Report
5 Final Report		
5.1	Draft Final Report to TCEQ	Last quarter, Month 1
5.2	Address TCEQ/EPA comments	Within 30 days of TCEQ comments
5.2	Final Report	At least two weeks prior to the end of the Contract

APPENDIX C DATA REVIEW CHECKLIST AND SUMMARY

NPS DATA REVIEW CHECKLIST AND SUMMARY
A completed checklist must accompany all data sets submitted to the TCEQ by the Contractor.

QAPP Title: _____

Effective Date of QAPP: _____

	Data Format and Structure	**Y, N, or N/A**
A.	Are there any duplicate *Tag Id* numbers in the Events file?	
B.	Do the *Tag* prefixes correctly represent the entity providing the data?	
C.	Have any *Tag Id* numbers been used in previous data submissions?	
D.	Are TCEQ station location (SLOC) numbers assigned?	
E.	Are sampling *Dates* in the correct format, MM/DD/YYYY with leading zeroes?	
F.	Are the sampling *Times* based on the 24 hour clock (e.g. 13:04) with leading zeroes?	
G.	Is the *Comment* field filled in where appropriate (e.g. unusual occurrence, sampling problems, unrepresentative of ambient water quality)?	
H.	Are *submitting Entity, Collecting Entity, and Monitoring Type* codes used correctly?	
I.	Are sampling end dates in the *Results* file the same as the one in the *Events* file for each Tag Id?	
J.	Are values represented by a valid parameter code with the correct units?	
K.	Are there any duplicate parameter codes for the same *Tag Id*?	
L.	Are there any invalid symbols in the *Greater Than/Less Than* (*GT/LT*) field?	
M.	Are there any *Tag Ids* in the *Results* file that are not in the *Events* file or vice versa?	

	Data Quality Review	**Y, N, or N/A**
A.	Are all the "less-than" values reported at the LOQ? **If no, explain on next page.**	
B.	Have the outliers been verified and a "1" placed in the *Verify_flg* field?	
C.	Have checks on correctness of analysis or data reasonableness been performed? e.g.: Is ortho-phosphorus less than total phosphorus? Are dissolved metal concentrations less than or equal to total metals?	
D.	Have at least 10% of the data in the data set been reviewed against the field and laboratory data sheets?	
E.	Is the data set complete? e.g. are all parameter codes listed tables A7.1 and/or A7.2 included? Does the data set include results for all parameter codes listed in tables A7.1 and/or A7.2? **If not, explain on next page.**	
F.	Are all stations in the data set listed in the QAPP?	
G.	Has data been checked to ensure all data meets QC requirements?	

	Documentation Review	**Y, N, or N/A**
A.	Are blank results acceptable as specified in the QAPP?	
B.	Were control charts used to determine the acceptability of field duplicates?	
C.	Was documentation of any unusual occurrences that may affect water quality included in the *Event* table's *Comments* field?	
D.	Were there any failures in sampling methods and/or deviations from sample design requirements that resulted in unreportable data? **If yes, explain on next page.**	
E.	Were there any failures in field and/or laboratory measurement systems that were not resolvable and resulted in unreportable data? **If yes, explain on next page.**	
F.	Was the laboratory's NELAP Accreditation current for analysis conducted?	

Data Set Information

Data Source:

Date Submitted:

Tag_ID Range:

Date Range:

Comments:

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

- Inconsistencies with AWRL specifications or LOQs
- Failures in sampling methods and/or laboratory procedures that resulted in data that could not be reported to the TCEQ
- Include completed Corrective Action Reports with the applicable Quarterly Progress Report

_____
_____
_____
_____
_____
_____
_____
_____
_____

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

□ This data set has been reviewed using the Data Review Checklist.

LNRA Data Manager:
Date submitted:

APPENDIX D FIELD DATA REPORTING FORM

Lavaca Navidad River Authority
Surface Water Quality Field Data Sheet
Station ID: _____Sampling Time: _____Sampling Date:_____
TCEQ #_____Collector: _____Weather_____
89978 (# of people recreating) _____ 89979 (evidence) _____(0 or 1)
Location Description: _____Lake elevation_____
Lake % full:_____Last rainfall:_____
Depth: _____DO: _____DO%: _____Flow (cfs)_____
Temp: _____ pH: _____SpCond: _____
Flow Severity: _____Salinity: _____Secchi_____
Other Observational Data:
_____
_____
_____

Station ID: _____Sampling Time: _____Sampling Date:_____
TCEQ #_____Collector: _____Weather_____
89978 (# of people recreating) _____ 89979 (evidence) _____(0 or 1)
Location Description: _____Lake elevation_____
Lake % full:_____Last rainfall:_____
Depth: _____DO: _____DO%: _____Flow (cfs)_____
Temp: _____ pH: _____SpCond: _____
Flow Severity: _____Salinity: _____Secchi_____
Other Observational Data:
_____
_____
_____

Station ID: _____Sampling Time: _____Sampling Date:_____
TCEQ #_____Collector: _____Weather_____
89978 (# of people recreating) _____ 89979 (evidence) _____(0 or 1)
Location Description: _____Lake elevation_____
Lake % full:_____Last rainfall:_____
Depth: _____DO: _____DO%: _____Flow (cfs)_____
Temp: _____ pH: _____SpCond: _____
Flow Severity: _____Salinity: _____Secchi_____
Other Observational Data:
_____
_____

Stream Flow (Discharge) Measurement Form

Stream: ______________________________ Date: __________

Station Description: ______________________________

Time Begin: __________ Time End: __________ Meter Type: ______________

Observers: ______________ Stream Width*: ________ Section Width (W): ________

Observations: ______________________________

Section Midpoint (ft) (m)	Section Depth (ft) (m) (cm) (D)	Observational Depth** (ft)(m)	Velocity (V)		Flow (Q) (m^3/s) (ft^3/s) Q = (W)(D)(V)
			At Point (ft/s)(m/s)	Average (ft/s)(m/s)	

m^3/s x 35.3 = ft^3/s

Total Flow (Discharge)(ΣQ) (ft^3/s)	

APPENDIX E CHAIN-OF-CUSTODY FORM

B Environmental Laboratory, LLC
1606 E Brazos Suite D Victoria, Texas 77901 ph. (361) 572-8224

Chain Of Custody Record

Batch #	TEMP UN-C:	Page___of ___
THERM ID#	TEMP Corr:	

Customer / Report Information	Billing Information ☐ Check box if Billing is the same as Report Information		
Name:	Address:	Phone:	FAX:
Attention:	Attention: PO #	EMAIL:	
Address:	Project: Comments:	Requested Analysis	Completed By laboratory

Sample Information				Matrix	Container													Custody Seals Present Yes ☐ No ☐ Intact Yes ☐ No ☐
Collected By:																		
Client / Field Sample ID	Collected		G = Grab C = Composite	DW - Drinking H2O S - Solid WW - Waste H2O SL - Sludge L - Liquid W - Water	TYPE	NUMBER	Size	Preservative										LAB Sample Number
	Date	Time																
								☐ H2SO4 ☐ HNO3 ☐ H3PO4 ☐ NaOH ☐ ICE ☐ HCL ☐ ______ ☐ Na2SO3										
								☐ H2SO4 ☐ HNO3 ☐ H3PO4 ☐ NaOH ☐ ICE ☐ HCL ☐ ______ ☐ Na2SO3										
								☐ H2SO4 ☐ HNO3 ☐ H3PO4 ☐ NaOH ☐ ICE ☐ HCL ☐ ______ ☐ Na2SO3										
								☐ H2SO4 ☐ HNO3 ☐ H3PO4 ☐ NaOH ☐ ICE ☐ HCL ☐ ______ ☐ Na2SO3										
								☐ H2SO4 ☐ HNO3 ☐ H3PO4 ☐ NaOH ☐ ICE ☐ HCL ☐ ______ ☐ Na2SO3										
								☐ H2SO4 ☐ HNO3 ☐ H3PO4 ☐ NaOH ☐ ICE ☐ HCL ☐ ______ ☐ Na2SO3										
								☐ H2SO4 ☐ HNO3 ☐ H3PO4 ☐ NaOH ☐ ICE ☐ HCL ☐ ______ ☐ Na2SO3										

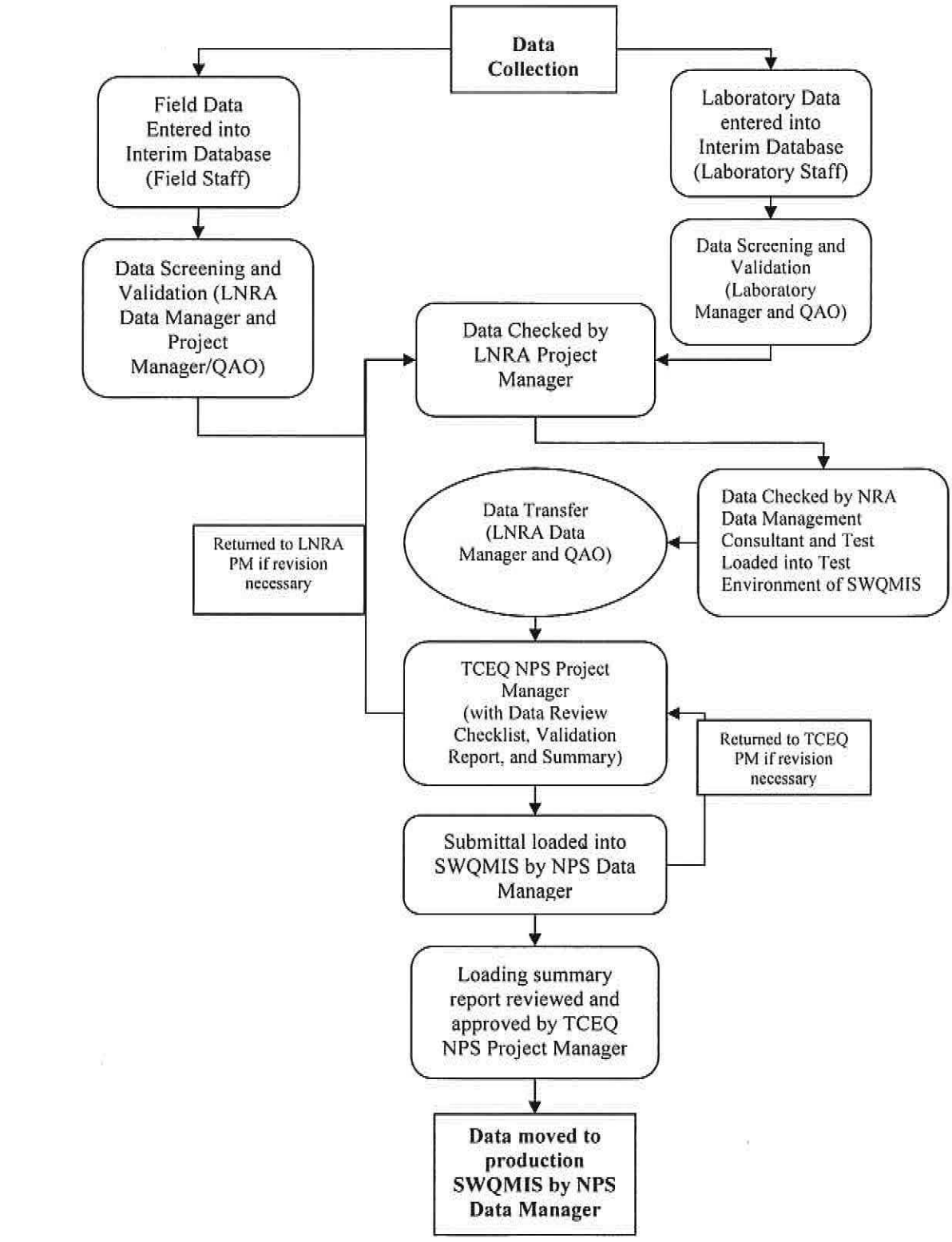
Required Turnaround: ☐ Routine (6-10 Business days) Expedite / Rush: ☐ 1 Business Day ☐ 2 Business Days ☐ 3 Business days ☐ 5 Business days ☐ Other ________ REMARKS:

Surcharge will apply to RUSH TAT Authorized BY: Container Type: P=Plastic, G=Glass, V=Voa, O=Other Carrier ID :

Relinquished By:		Date:		Time:		Received By:		Date:		Time:	
Relinquished By:		Date:		Time:		Received By:		Date:		Time:	
Relinquished By		Date:		Time:		Received By:		Date:		Time:	

APPENDIX F DATA MANAGEMENT PROCESS FLOW CHART

NPS Data Management Process Flow Chart



APPENDIX G CORRECTIVE ACTION STATUS TABLE

Corrective Action Status Table

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 H CORRECTIVE ACTION PLAN FORM

Nonconformance Report and Corrective Action Plan
QAPP Title:_____ **QAPP Contractor:** _____ **Issued by:**_____ **Date of Occurrence:**_____ **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? NPS Project Manager Initial When 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 **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 NPS Project Manager via email on 7/18/2014.
Corrective Action to address the deficiency and prevent its recurrence A survey will be conducted on the site to determine the ridge of the catchment area. 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. 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 will be emailed to the TCEQ NPS Project Manager.
Photos of the modified measurement site will be emailed to the TCEQ NPS Project Manager.

Date Corrective Action Plan Closed?
The TCEQ NPS Project Manager will provide a closed date once the corrective action has been verified.

NPS Project Manager Initial When Closed _____

ATTACHEMENT 1 EXAMPLE LETTER TO DOCUMENT ADHERENCE TO THE QAPP

TO: (name)
(organization)

FROM: (name)
(organization)

RE: TWRI, Lavaca River Watershed Protection Plan (WPP) – Coordination of Implementation and Routine Water Quality Monitoring Quality Assurance Project Plan

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

(address)

I acknowledge receipt of the "Lavaca River Watershed Protection Plan (WPP) – Coordination of Implementation and Routine Water Quality Monitoring Quality Assurance Project Plan, Revision Date". I understand that the document describes quality assurance, quality control, data management and reporting, and other technical activities that must be implemented to ensure the results of work performed will satisfy stated performance criteria.

My signature on this document signifies that I have read and approved the document contents. Furthermore, I will ensure that all staff members participating in activities covered under this QAPP will be required to familiarize themselves with the document contents and adhere to the contents as prescribed.

_____

Signature Date