Water Quality Monitoring for the Upper Cibolo Creek (Segment 1908) Watershed Protection Plan Quality Assurance Project Plan

City of Boerne
402 E. Blanco
Boerne, Texas 78006

Funding Source:

Nonpoint Source Protection Program CWA §319(h)
Prepared in cooperation with the Texas Commission on Environmental Quality and the U.S. Environmental Protection Agency
Federal ID #99614613

Effective Period: One year from date of final approval

Questions concerning this quality assurance project plan should be directed to:

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A1 APPROVAL PAGE

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Field Operations Support Division

Stephen Stubbs, Date
TCEQ QA Manager

Kyle Girten, QA Specialist Date
Quality Assurance Team

Water Quality Planning Division

Monica Harris, Manager Date
Planning and Implementation Section

Kerry Neimann, Team Leader Date
Nonpoint Source Program

Nancy Ragland, Team Lead Date
Data Management and Analysis

Anju Chalise, QA Specialist Date
Nonpoint Source Program

Lauren Bilbe Date
Project Manager, Nonpoint Source Program

City of Boerne

Don Burger, City of Boerne — Date 2/8/11
Deputy Public Works Director

Ryan Bass, QA Officer — Date 2/2/11

San Antonio River Authority Regional Environmental Laboratory

2-6-11

Charles J. Lorea, IV — Date
Laboratory Director

2-8-11

Patricia M. Carvajal — Date
Laboratory QA Officer

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

A2 TABLE OF CONTENTS

A3 DISTRIBUTION LIST

The TCEQ QA Specialist will provide original versions of this project plan and any amendments or revisions of this plan to the TCEQ Project Manager and the City of Boerne Project Manager. The TCEQ Project Manager will provide copies to the TCEQ Data Management and Analysis Team Leader and EPA Project Officer within two weeks of approval. The TCEQ Project Manager will document receipt of the plan and maintain this documentation as part of the project's quality assurance records. This documentation will be available for review.

Nancy Ragland, Team Leader
Data Management & Analysis
MC-234
(512) 239-6546

U.S. Environmental Protection Agency Region 6
State/Tribal Section
1445 Ross Avenue
Suite # 1200
Dallas, TX 75202-2733
Leslie Rauscher, Project Officer
(214) 665-2773

The City of Boerne will provide copies of this project plan and any amendments or revisions of this plan to each project participant defined in the list below. The City of Boerne 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.

City of Boerne
402 E. Blanco
Boerne, Texas 78006

Don Burger, Project Manager
(830)-249-9511 ext. 61148

Ryan Bass, Quality Assurance Officer
(830)-249-9511 ext. 61175

San Antonio River Authority
San Antonio, TX. P.O. Box 839980

Charles J. Lorea IV, Laboratory Supervisor
(210) 302-3674

Patricia M. Carvajal, Laboratory Quality Assurance Officer
(210) 302-3672

List of Acronyms

AWRL	Ambient Water Reporting Limit
BF	Biased Flow
BMP	Best Management Practice
CAP	Corrective Action Plan
COB	City of Boerne
COC	Chain of Custody
CWA	Clean Water Act
°C	Degrees Celsius
DO	Dissolved Oxygen
DOC	Demonstration of Capability
DMP	Data Management Plan
DMRG	Data Management Reference Guide
DM&A	Data Management and Analysis
DQO	Data Quality Objective
EPA	Environmental Protection Agency
GIS	Geographic Information System
GPS	Global Positioning System
IT	Information Technology
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
LOD	Limit of Detection
LOQ	Limit of Quantitation
mg/L	Milligrams per liter
MS	Matrix Spike
NELAC	National Environmental Laboratory Accreditation Conference
NPDES	National Pollutant Discharge Elimination System
NPS	Nonpoint Source
PO	Project Officer
QA/QC	Quality Assurance/Quality Control
QAM	Quality Assurance Manual
QAO	Quality Assurance Officer
QAPP	Quality Assurance Project Plan
QAS	Quality Assurance Specialist
QMP	Quality Management Plan
RPD	Relative Percent Difference
SARA-REL	San Antonio River Authority Regional Environmental Laboratory
SLOC	Station Location
SOP	Standard Operating Procedure
SWQM	Surface Water Quality Monitoring
SWQMIS	Surface Water Quality Monitoring Information System

TCEQ	Texas Commission on Environmental Quality
TMDL	Total Maximum Daily Load
TPWD	Texas Parks and Wildlife Department
TSWQS	Texas Surface Water Quality Standards
UCC	Upper Cibolo Creek
UCCW	Upper Cibolo Creek Watershed
WPP	Watershed Protection Plan
WQI	Water Quality Inventory

A4 PROJECT/TASK ORGANIZATION

TCEQ

Field Operations Support Division

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

Water Quality Planning Division

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

Lauren Bilbe
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 City of Boerne, the TCEQ, and the EPA. Tracks deliverables to ensure that tasks are completed as specified in the contract. Responsible for ensuring that the project deliverables are submitted on time and are of acceptable quality and quantity to achieve project objectives. Serves on planning team for NPS projects. Participates in the development, approval, implementation, and maintenance of the QAPP. Assists the TCEQ QAS in technical review of the QAPP. Responsible for verifying that the QAPP is followed by the City of Boerne. Notifies the TCEQ QAS of particular circumstances which may adversely affect the quality of data derived from the collection and analysis of samples. Enforces corrective action.

Anju Chalise
TCEQ NPS Project Quality Assurance Specialist
Assists Lead QAS with NPS QA management. Serves as liaison between NPS management and Agency QA management. Responsible for NPS guidance development related to program quality assurance. Serves on planning team for NPS projects. Participates in the development, approval, implementation, and maintenance of the QAPP.

Rebecca Ross
TCEQ NPS Data Manager
Responsible for coordination and tracking of NPS data sets from initial submittal through NPS Project Manager review and approval. Ensures that data is reported following instructions in the Surface Water Quality Monitoring Data Management Reference Guide (January 2010, or most current version). Runs automated data validation checks in SWQMIS and coordinates data verification and error correction with NPS Project Managers' data review. Generates SWQMIS summary reports to assist 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 for NPS data management. Serves on planning team for NPS projects.

City of Boerne

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

Ryan Bass
City of Boerne, QAO
Responsible for coordinating development and implementation of the QA program. Responsible for writing and maintaining the QAPP. Responsible for maintaining records of QAPP distribution, including appendices and amendments. Responsible for maintaining written records of sub-tier commitment to requirements specified in this QAPP. Responsible for identifying, receiving, and maintaining project quality assurance records. Responsible for coordinating with the TCEQ QAS to resolve QA- related issues. Notifies the contractor Project Manager and TCEQ Project Manager of particular circumstances which may adversely affect the quality of data. Responsible for validation and verification of all data collected according with Table 4 procedures and acquired data procedures after each task is performed. Coordinates the research and review of technical QA material and data related to water quality monitoring system design and analytical techniques. Conducts laboratory inspections. Develops, facilitates, and conducts monitoring systems audits.

Ryan Bass
City of Boerne, Data Manager
Responsible for the acquisition, verification, and transfer of data to the TCEQ. Oversees data management for the study. Performs data quality assurances prior to transfer of data to TCEQ. Responsible for transferring data to the TCEQ in the acceptable format. Ensures data are submitted according to workplan specifications. Provides the point of contact for the TCEQ

Data Manager to resolve issues related to the data. Responsible for transferring data to the TCEQ in the Event/Result format as specified in the DMRG (January 2010, or most recent version).

Ryan Bass
City of Boerne, Field Supervisor
Responsible for supervising all aspects of the sampling and measurement of surface waters and other parameters in the field. Responsible for the acquisition of water samples and field data measurements in a timely manner that meet the quality objectives specified in Section A7 (Table A.1), 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 Sections A6 and A8.

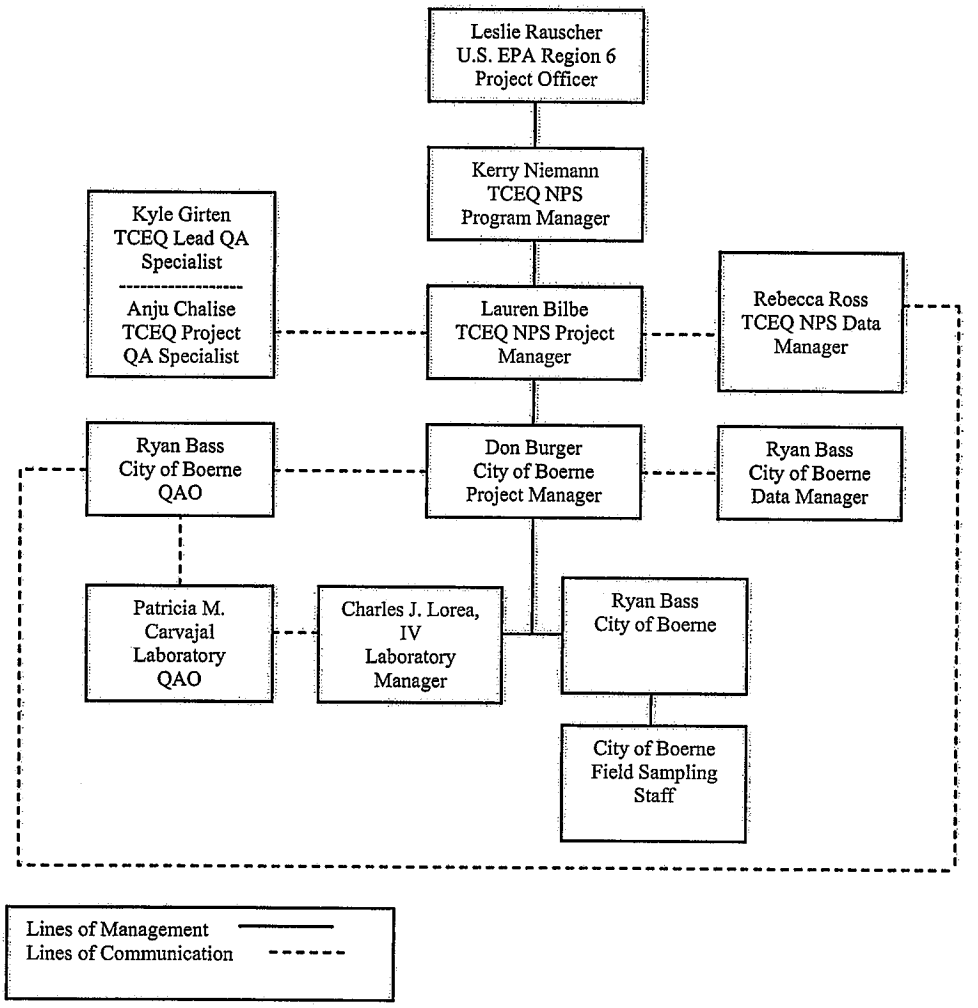
Charles J. Lorea, IV
Laboratory Manager
Responsible for supervision of laboratory personnel involved in generating analytical data for this project. Responsible for ensuring that laboratory personnel involved in generating analytical data have adequate training and a thorough knowledge of the QAPP and all SOPs specific to the analyses or task performed and/or supervised. Responsible for oversight of all operations, ensuring that all QA/QC requirements are met, and documentation related to the analysis is completely and accurately reported. Enforces corrective action, as required. Develops and facilitates monitoring systems audits.

Patricia M. Carvajal
Laboratory QAO
Monitors the implementation of the 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 written SOPs. Responsible for supervising and verifying all aspects of the QA/QC in the laboratory. Performs validation and verification of data before the report is sent to the City of Boerne. Insures that all QA reviews are conducted in a timely manner from real-time review at the bench during analysis to final pass-off of data to the QA officer.

U.S. EPA Region 6

Leslie Rauscher
EPA Project Officer
Responsible for managing the CWA Section 319 funded grant on the behalf on 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 workplans, draft deliverables, and works with the State in making these items approvable. Meets with the State at least semi-annually to evaluate the progress of each project and when conditions permit, participate in a site visit on the project. 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 the regional NPS coordinator in tracking a State's annual progress in its management of the NPS program. 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

Upper Cibolo Creek (UCC) (Segment 1908) originates in the hills west of Boerne two miles upstream of Highway 87 and ends at the confluence of Upper Cibolo and Balcones Creeks near the Kendall and Comal County line. The Upper Cibolo Creek Watershed (UCCW) has a drainage area of 76 square miles and contains just over 23 miles of UCC (See Figure A5.1). The watershed is characterized as mostly rural with light ranch and recreational use but recent changes in land use due to increased development and suburbanization are causes for concern, as an increase in nonpoint source pollution can be expected as a result of the increased development. See Figure A5.1 in Appendix A. Assessment units 1908-01 and 1908-02 comprise the UCC for the purposes of this QAPP and the WPP.

Upper Cibolo Creek (UCC) has a history of water quality impairments dating back almost 10 years (Table A5.1). In 1999 UCC was listed on the Texas Water Quality Inventory and Texas 303(d) List for depressed dissolved oxygen (DO) and elevated levels of fecal coliform bacteria. From 2000-2004 UCC was listed for depressed DO and from 2006-2008 UCC was again listed for elevated bacteria levels. In 2008 both Segment 1908_01 and 1908_02 were identified as areas of concern following the collection of screening samples. Segment 1908_01 (From the confluence with Balcones Creek to approximately 2 mi. upstream of Hwy 87 in Boerne) was identified for impaired habitat and ortho-phosphorus while Segment 1908_02 (From approximately 2 mi. upstream of Hwy 87 in Boerne to the upper end of the segment) was identified for ammonia.

The history of impairments coupled with the rate of development and projected population growth within the watershed require proactive actions to restore and maintain healthy water quality levels within UCC. Monitoring within UCC will be initiated to analyze water quality before and after implementation of BMP's (Best Management Practice) as a result of the UCC Watershed Protection Plan. Overall, the goal for monitoring is to quantify load reductions as a result of sustainable management measures and facilitate the removal of UCC from the 303(d) List, provide additional data regarding the 5c Listing, and identify sources and causes of pollution, particularly bacteria and nutrients.

This QAPP is reviewed by the TCEQ to help ensure that data generated for the purposes described above are scientifically valid and legally defensible. This process will ensure that all data submitted to SWQMIS have been collected and analyzed in a way that helps guaranty their reliability and therefore can be used by programs deemed appropriate by the TCEQ.

Table A5.1 Texas 303(d) listings for Upper Cibolo Creek (Segment 1908)			
303(d) List Year	**Segment/Area**	**Impairment**	**Category/Priority**
1999	1908[1]	Dissolved Oxygen (DO)[2] and Bacteria[3]	Medium
2000	1908[3]	DO	Medium
2002	1908[3]	DO	5c[4]
2004	1908[3]	DO	5c[4]
2006	1908_01[3] 1908_02[5]	Bacteria	5c[4]
2008	1908_02[5]	Bacteria	5c[4]
2010	1908_02[5]	Bacteria	5c[4]

[1] From confluence with Balcones Creek to approximately 2 miles upstream of Hwy 87 in Boerne.
[2] In a 2-mile reach southeast of Boerne, dissolved oxygen concentrations are occasionally lower than the standard established to assure optimum conditions for aquatic life.
[3] In a 2-mile reach southeast of Boerne, bacteria levels sometimes exceed the criterion established to assure the safety of contact recreation.
[4] Additional data and information will be collected before a TMDL is scheduled
[5] From approximately 2 miles upstream of Hwy 87 in Boerne to upper end of segment.

A6 PROJECT/TASK DESCRIPTION

The UCC Watershed Protection Plan will consist of routine monitoring as well as stormwater monitoring otherwise known as Bias Flow (BF).This data will be used to develop a Watershed Protection Plan to address impairments and/or concerns that have been identified in the Upper Cibolo Creek (Segment 1908).

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

Modeling is not covered in this QAPP.

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

Revisions to the QAPP

Until the work described is completed, this QAPP shall be revised as necessary and reissued annually on the anniversary date, or revised and reissued within 120 days of significant changes, whichever is sooner. The most recently approved QAPPs shall remain in effect until revisions have been fully approved; reissuances (i.e., annual updates) must be submitted to the TCEQ for approval before the last version has expired. If the entire QAPP is current, valid, and accurately reflects the project goals and organization's policy, the annual reissuance may be done by a certification that the plan is current. This can be accomplished by submitting a cover letter stating the status of the QAPP and a copy of new, signed approval pages for the QAPP.

Amendments

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

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

A7 QUALITY OBJECTIVES AND CRITERIA

Only data collected that have valid TCEQ parameter codes assigned in Tables A7.1 – A7.4 are stored in SWQMIS. Any parameters listed in Tables A7.1 – A7.4 that do not have a valid TCEQ parameter code assigned will not be stored in SWQMIS.

Table A7.1 Field Parameters

PARAMETER	UNITS	MATRIX	METHOD	PARAMETER CODE	AWRL	Limit of Quantitation (LOQ)	PRECISION (RPD of LCS/LCSD)	BIAS %Rec. of LCS	LOQ CHECK STANDARD %Rec	LAB
pH	S.U.	water	EPA 150.1 and TCEQ SOP, V1	00400	NA[5]	NA	NA	NA	NA	Field
DO	mg/L	water	SM 4500-O G and TCEQ SOP, V1	00300	NA[5]	NA	NA	NA	NA	Field
Specific Conductance	µS/cm	water	EPA 120.1 and TCEQ SOP, V1	00094	NA[5]	NA	NA	NA	NA	Field
Temperature	° C	water	SM 2550 B and TCEQ SOP V1	00010	NA[5]	NA	NA	NA	NA	Field
Transparency Secchi Disk	meters	water	TCEQ SOP V1	00078	NA[5]	NA	NA	NA	NA	Field
Days since precipitation event	days	NA	TCEQ SOP V1	72053	NA[5]	NA	NA	NA	NA	Field
Flow Stream, instantaneous	cfs	water	TCEQ SOP V1	00061	NA[5]	NA	NA	NA	NA	Field
Flow measurement method	1-gage 2-electric 3-mechanical 4-weir/flume 5-doppler	water	TCEQ SOP V1	89835	NA[5]	NA	NA	NA	NA	Field
Flow severity	1-no flow, 2-low, 3-normal, 4-flood, 5-high, 6-dry	water	TCEQ SOP V1	01351	NA[5]	NA	NA	NA	NA	Field
Estimated Flow	cfs	NA	TCEQ SOP V1	74069	NA[5]	NA	NA	NA	NA	Field
Water Color	1-brown 2-reddish 3-green 4-black 5-clear 6-other	NA	TCEQ SOP V1	89969	NA[5]	NA	NA	NA	NA	Field
Water Odor	1-sewage 2-oily/chemical 3- H_2S 4- musky 5-fishy 6-none 7-other	NA	TCEQ SOP V1	89971	NA[5]	NA	NA	NA	NA	Field
Present Weather	1-clear 2-partly cloudy 3- cloudy 4-rain 5-other	NA	TCEQ SOP V1	89966	NA[5]	NA	NA	NA	NA	Field

Table A7.2 Priority Parameters for Routine Monitoring

PARAMETER	UNITS	MATRIX	METHOD	PARAMETER CODE	AWRL	Limit of Quantitation (LOQ)[4]	PRECISION (RPD of LCS/LCSD & Sample/Sample Dup)	BIAS %Rec. of LCS	LOQ CHECK STANDARD %Rec	LAB
Residue, Total NonFiltrable (TSS)	mg/L	water	SM 2540 D[3]	00530	4	4.0	20	80-120	NA	SARA
E. coli, IDEXX Colilert	MPN/100 mL	water	SM 9223-B[3]	31699	1	1	.5[7]	NA	NA	SARA
holding time, E. coli, IDEXX Colilert[8]	hours	water	NA[5]	31704	NA	NA	NA	NA	NA	SARA
Ammonia-N, total (non distilled)	mg/L	water	SM 4500-NH_3 D[3]	00610	0.1	0.1	20	80-120	70-130	SARA
Total Kjeldahl N	mg/L	water	EPA 351.2	00625	0.2	0.2	20	90-110	70-130	SARA
Total Phosphorus - P	mg/L	water	EPA 365.3	00665	0.06	0.02	20	80-120	70-130	SARA
O-phosphate-P, field filter <15 min.	mg/L	water	EPA 365.3	00671	0.04	0.02	20	80-120	70-130	SARA
Chlorophyll a	µg/L	water	SM 10200-H[1]	32211	3	1[2]	20[6]	80-120	N/A	SARA
Pheophytin-a	µg/L	water	SM 10200-H[1]	32218	3	1[2]	N/A	N/A	N/A	SARA

Table A7.3 Conventional and Bacteriological Parameters for Routine Monitoring

PARAMETER	UNITS	MATRIX	METHOD	PARAMETER CODE	AWRL	Limit of Quantitation (LOQ)[4]	PRECISION (RPD of LCS/LCSD & Sample/Sample Dup)	BIAS %Rec. of LCS	LOQ CHECK STANDARD %Rec	LAB
Residue, Total NonFiltrable (TSS)	mg/L	water	SM 2540 D[3]	00530	4	4.0	20	80-120	NA	SARA
Sulfate	mg/L	water	EPA 300.0, Rev. 2.1 (1993)	00945	5.0	5.0	20	90-110	70-130	SARA
Chloride	mg/L	water	EPA 300.0 Rev. 2.1 (1993)	00940	5.0	5.0	20	90-110	70-130	SARA
E. coli, IDEXX Colilert	MPN/100 mL	water	SM 9223-B[3]	31699	1	1	.5[7]	NA	NA	SARA
holding time, E. coli, IDEXX Colilert	hours	water	NA[5]	31704	NA	NA	NA	NA	NA	SARA
Ammonia-N, total (non distilled)	mg/L	water	SM 4500-NH_3 D[3]	00610	0.1	0.1	20	80-120	70-130	SARA
Total Kjeldahl N	mg/L	water	EPA 351.2	00625	0.2	0.2	20	90-110	70-130	SARA

Table A7.3 Conventional and Bacteriological Parameters for Routine Monitoring

PARAMETER	UNITS	MATRIX	METHOD	PARAMETER CODE	AWRL	Limit of Quantitation (LOQ)[4]	PRECISION (RPD of LCS/LCSD & Sample/Sample Dup)	BIAS %Rec. of LCS	LOQ CHECK STANDARD %Rec	LAB
Nitrate-N, total	mg/L	water	EPA 300.0 Rev. 2.1 (1993)	00620	0.05	0.05	20	90-110	70-130	SARA
Nitrite-N, total	mg/L	water	EPA 300.0 Rev. 2.1 (1993)	00615	0.05	0.05	20	90-110	70-130	SARA
TOC	mg/L	water	SM 5310 C[3]	00680	2.0	1.0	20	80-120	70-130	SARA
Total Phosphorus - P	mg/L	water	EPA 365.3	00665	0.06	0.02	20	80-120	70-130	SARA
BOD	mg/L	water	SM 5210B[5]	00310	2	2	15.4 (RSD)	N/A	N/A	SARA
O-phosphate-P, field filter <15 min.	mg/L	water	EPA 365.3	00671	0.04	0.02	20	80-120	70-130	SARA
Chlorophyll a	µg/L	water	SM 10200-H[1]	32211	3	1[2]	20[6]	80-120	N/A	SARA
Pheophytin-a	µg/L	water	SM 10200-H[1]	32218	3	1[2]	N/A	N/A	N/A	SARA

Table A7.4 Stormwater Monitoring Parameters

PARAMETER	UNITS	MATRIX	METHOD	PARAMETER CODE	AWRL	Limit of Quantitation (LOQ)[4]	PRECISION (RPD of LCS/LCSD & Sample/Sample Dup)	BIAS %Rec. of LCS	LOQ CHECK STANDARD %Rec	LAB	Sample Type
Residue, Total NonFiltrable (TSS)	mg/L	water	SM 2540 D[3]	00530	4	4.0	20	80-120	NA	SARA	Composite
E. coli, IDEXX Colilert	MPN/100 mL	water	SM 9223-B[3]	31699	1	1	.5[7]	NA	NA	SARA	Composite
holding time, E. coli, IDEXX Colilert	hours	water	NA[5]	31704	NA	NA	NA	NA	NA	SARA	Composite
Ammonia-N, total (non distilled)	mg/L	water	SM 4500-NH_3 D[3]	00610	0.1	0.1	20	80-120	70-130	SARA	Composite
Total Kjeldahl N	mg/L	water	EPA 351.2	00625	0.2	0.2	20	90-110	70-130	SARA	Composite
Total Phosphorus - P	mg/L	water	EPA 365.3	00665	0.06	0.02	20	80-120	70-130	SARA	Composite
O-phosphate-P, field filter <15 min.	mg/L	water	EPA 365.3	00671	0.04	0.02	20	80-120	70-130	SARA	Composite

[1] SM 21st Edition
[2] Reporting limit. Not a NELAP-defined LOQ (commercially available spiking solution used as LOQ check standard).
[3] SM 20th Edition
[4] The ESD Laboratory analyses LOQ's at or below existing CRP AWRLs.
[5] NA – Not Applicable
[6] This criterion applies to Chlorophyll duplicates with average concentrations >10µg/L.
[7] 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 sample duplicates with average concentrations >10 MPN/100mL or >10 organisms/100mL.

[8] 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 48 hours.

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.

Field splits are used to assess the variability of sample handling, preservation, and storage, as well as the analytical process, and are prepared by splitting samples in the field. Control limits for field splits are defined in Section B5.

Laboratory precision is assessed by comparing replicate analyses of laboratory control samples 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 through A7.4.

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 Standards 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 through A7.4.

Representativeness
Site selection, the appropriate sampling regime, the sampling of all pertinent media according to TCEQ SOPs, and use of only approved analytical methods will assure that the measurement data represents the conditions at the site. Routine data collected for water quality assessment are considered to be spatially and temporally representative of routine water quality conditions. Water Quality data are collected on a routine frequency and are separated by approximately even time intervals. At a minimum, samples are collected over at least two seasons (to include inter-seasonal variation) and over two years (to include inter-year variation) and include some data collected during an index period (March 15- October 15). Although data may be collected during varying regimes of weather and flow, the data sets will not be biased toward unusual conditions of flow, runoff, or season. The goal for meeting total representation of the water body will be tempered by the potential funding for complete representativeness.

In sampling storm water, the project goals include the calculation of selected parameter normal pollutant loadings to the receiving stream. Toward this goal, typical rainfall events experienced in the region and suggested to be monitored, are defined in section B1 of this document as to

frequency duration, intensity and quantity. In addition, sample protocols to insure the representativeness of collected samples from typical rainfall events are described in section B1.

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

Comparability
Confidence in the comparability of routine data sets for this project and for water quality assessments is based on the commitment of project staff to use only approved sampling and analysis methods and QA/QC protocols in accordance with quality system requirements and as described in this QAPP and in TCEQ SOPs. Comparability is also guaranteed by reporting data in standard units, by using accepted rules for rounding figures, and by reporting data in a standard format as specified in Section B10.

Limit of Quantitation

Ambient Water Reporting Limits (AWRLs)
The AWRL establishes the reporting specification at **or below** which data for a parameter must be reported to be compared with freshwater screening criteria. The AWRLs specified in Table A7 are the program-defined reporting specifications for each analyte and yield data acceptable for the TCEQ's water quality assessment. A full listing of AWRLs can be found at http://www.tceq.state.tx.us/compliance/monitoring/crp/qa/index.html. The limit of quantitation is the minimum level, concentration, or quantity of a target variable (e.g., target analyte) that can be reported with a specified degree of confidence. The following requirements must be met in order to report results:

- **The laboratory's LOQ for each analyte must be at or below the AWRL as a matter of routine practice**
- **The laboratory must demonstrate its ability to quantitate at its LOQ for each analyte by running an LOQ check standard for each analytical batch of Samples analyzed for this project.**

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

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

A8 SPECIAL TRAINING/CERTIFICATION

Field Staff will receive training by the City of Boerne QA Officer on the proper methods of collecting, handling and transporting water quality samples. Field Staff will be provided instruction manuals and receive a day of hands-on instruction in the field. Field Staff must successfully demonstrate the ability to properly collect and handle samples before being assigned the duty. Upon completion of training, Field Staff will be signed off as qualified to collect samples by the City of Boerne QA Officer.

Contractors and subcontractors must ensure that laboratories analyzing samples under this QAPP meet the requirements contained in section 5.4.4 of the NELAC Standards (concerning Review of Requests, Tenders and Contracts).

Global Positioning System (GPS) equipment may be used as a component of the information required by the Station Location (SLOC) request process for creating the certified positional data that will ultimately be entered into the TCEQ's SWQMIS database. Any Positional data obtained by the Nonpoint Source Program grantees using a Global Positioning System will follow the TCEQ's OPP 8.11 and 8.12 policy regarding the collection and management of positional data.

Positional data entered into SWQMIS will be collected by a GPS certified individual with an agency approved GPS device to ensure that the agency receives reliable and accurate positional data. Certification can be obtained in any of three ways: completing a TCEQ training class, completing a suitable training class offered by an outside vendor, or by providing documentation of sufficient GPS expertise and experience. Contractors must agree to adhere to relevant TCEQ policies when entering GPS-collected data.

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

A9 DOCUMENTS AND RECORDS

Laboratory Test Reports

Laboratory test reports will be produced by the SARA-REL and emailed to the City of Boerne once sample validation has been completed. The SARA-REL is a NELAC accredited laboratory through the TCEQ. Test/data reports from the laboratory document the test results clearly and accurately. Routine data reports are consistent with the NELAC standards (Section 5.5.10) and include the information necessary for the interpretation and validation of data. The information provided in an analytical test report whether hard copy or electronic includes the following:

- Title;
- name and address of the laboratory, and the phone number and name of a contact person;
- unique identification of the test report, date and time stamp at the bottom of the report, on each page and a pagination system that ensures that each page is recognized as part of the test report and a clear identification of the end of the report, such as 3 of 10;
- name and address of the client if applicable;
- identification of the test method used;
- unambiguous identification of the sample(s), including the client identification code;
- date of sample receipt when it is critical to the validity and application of the results, date and time of sample collection, dates the tests were performed, the time of sample preparation and analysis if the required holding time for either activity is less than or equal to 72 hours;
- test results with failures identified, units of measurement, an indication of whether results are calculated on a dry weight or wet weight basis;
- the name, function, and signature or an equivalent electronic identification of the person authorizing the test report, and the date of issue;
- statement to the effect that the results relate only to the samples;
- a statement that the report shall not be reproduced except in full without written approval of the laboratory;
- Certification that the results are in compliance with the NELAC Standards if accredited to be in compliance or provide reasons and/or justification if they do not comply.
- Holding time for SM9223-B

Electronic Data

Data will be submitted to the TCEQ in the event/result format specified in the TCEQ Data Management Reference Guide (DMRG; January 2010 or most recent version) for upload to the Surface Water Quality Monitoring Information System (SWQMIS). The Data Review Checklist and Summary as contained in Appendix C of this document will be submitted with the data.

A station location request (SLOC) will be submitted to the TCEQ Project Manager for each sampling site to obtain a station identification number.

All reported 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 consist of a seven-character alphanumeric sequence with the structure of the two-letter Tag prefix followed by a five digit number: for example - KI12345, KI12346, etc.

Submitting Entity, Collecting Entity, and 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). The Project Manager should be consulted to assure proper use of the Monitoring Type code.

Sample Description	Submitting Entity	Collecting Entity	Monitoring Type	Tag Prefix
Routine Monitoring	BC	BC	RT	BC
Monitoring during rainfall runoff	BC	BC	AS	BC

Records and Documents Retention Requirements

The documents and records that describe specify, report, or certify activities, requirements procedures or results for this project and the items and materials that furnish objective evidence of the quality of items or activities listed.

Document/Record	Location	Retention	Form
QAPP, amendments, and appendices	Org.	5 years	Paper
QAPP distribution documentation	Org.	5 years	Paper
Training records	Org.	5 years	Paper
Field notebooks or field data sheets	Org.	5 years	Paper
Field equipment calibration/maintenance l	Org.	5 years	Paper
Chain of custody records	Org.	5 years	Paper
Field SOPs	Org.	5 years	Paper
Laboratory QA manuals	Lab	5 years	Paper
Laboratory SOPs	Lab	5 years	Paper
Laboratory procedures	Lab	5 years	Paper
Instrument raw data files	Lab	5 years	LIMS/ Electronic
Instrument readings/printouts	Lab	5 years	Paper
Laboratory data reports/results	Lab	5 years	Paper
Laboratory equipment maintenance logs	Lab	5 years	Paper
Laboratory calibration records	Lab	5 years	LIMS /Electronic
Corrective action documentation	Lab	5 years	Paper

B1 SAMPLING PROCESS DESIGN (EXPERIMENTAL DESIGN)

Routine samples will be collected at the sites listed in Table B1.2 in order to characterize the stream and to determine the impact of implemented BMP's.

See Table B1.2 for sampling process design information and monitoring tables associated with data collected under this QAPP. A Map of the project area is located in Appendix A; a map of the sampling stations is located in Appendix D.

Sample collection activities between the TCEQ Region Office and the City of Boerne will be coordinated so that both groups do not collect samples on the same day, both groups are monitoring site 16702 (CIBOLO CREEK SE OF BOERNE AT DOWNSTREAM END OF CITY PARK IN THE NATURE PRESERVE, 0.8K DOWNSTREAM OF SH46).

Stormwater Sampling Events

ISCO Samplers equipped with flow and rain fall modules will be used to collect stormwater samples. These events will require a minimum rise in the stream flow (see Table B1.1) as determined by the ISCO flow modules. A stormwater event must be preceded by 7 days of dry weather. Automated samplers will be used to collect composite samples. The composite sample will be analyzed for the parameters listed in Table A7.4

Table B1.1 Stormwater Sampling Criteria

Sample Site	Station ID	Minimum Rise (feet)
CIBOLO CREEK AT IH10 IN BOERNE	12857	0.25
CIBOLO CREEK AT BOERNE CITY PARK	12855	0.25

Table B1.2 Monitoring Sites

Site Description	Station	Region	Submitting Entity	Collecting Entity	Monitoring Type						Stormwater Parameters[4]	Full Set of Conventionals[3]	Priority Parameters[2]	Bacteria	Flow	Field Parameters[1]	Comments
Cibolo Creek at Sparkling Springs low water crossing	20830	13	BC	BC	RT							4	8	12	12	12	
Cibolo Creek upstream of Comanche Spring	20816	13	BC	BC	RT							4	8	12	12	12	
Comanche Spring above confluence with Cibolo Creek	20817	13	BC	BC	RT							4	8	12	12	12	
Easter Creek above confluence with Cibolo Creek	20818	13	BC	BC	RT							4	8	12	12	12	
Cibolo Creek upstream of Ranger Creek	20820	13	BC	BC	RT							4	8	12	12	12	
Ranger Creek above confluence with Cibolo Creek	20819	13	BC	BC	RT							4	8	12	12	12	
CIBOLO CREEK AT IH10 IN BOERNE	***12857***	**13**	BC	BC	**AS**						**3**			**3**		**3**	
CIBOLO CREEK AT IH10 IN BOERNE	***12857***	**13**	BC	BC	**RT**							**4**	**8**	**12**	**12**	**12**	
Cibolo Creek at Northrup Park NW of Boerne	20821	13	BC	BC	RT							4	8	12	12	12	
Frederick Creek above confluence with Cibolo Creek	20822	13	BC	BC	RT							4	8	12	12	12	
UPPER CIBOLO CREEK AT RIVER ROAD	20823	13	BC	BC	RT							4	8	12	12	12	

Site Description	Station	Region	Submitting Entity	Collecting Entity	Monitoring Type						Stormwater Parameters[4]	Full Set of Conventionals[3]	Priority Parameters[2]	Bacteria	Flow	Field Parameters[1]	Comments
PARK																	
CIBOLO CREEK AT BOERNE CITY PARK	***12855***	**13**	BC	BC	**AS**						**3**			**3**		**3**	
CIBOLO CREEK AT BOERNE CITY PARK	***12855***	**13**	BC	BC	**RT**							**4**	**8**	**12**	**12**	**12**	
MENGER CREEK UPSTREAM OF UPPER CIBOLO	20824	13	BC	BC	RT							4	8	12	12	12	
Cibolo Creek SE of Boerne below Browns Creek	12853	13	BC	BC	RT							4	8	12	12	12	
UPPER CIBOLO CREEK UPSTREAM OF KEENELAND DRIVE	20826	13	BC	BC	RT							4	8	12	12	12	

[1]Bacteria and Field Parameters will be collected every sampling event during the monitoring phase of the project, refer to Table A7.1
[2]Full set of conventional will be collected a minimum of 4 times, refer to Table A7.2
[3]Priority Parameters will be collected for those events where Full Conventionals are not collected, refer to Table A7.3
[4]A minimum of 3 stormwater events will be sampled, refer to Table A7.4

B2 SAMPLING METHODS

Field Sampling Procedures

Field sampling will be conducted according to procedures documented in the *TCEQ Surface Water Quality Monitoring Procedures Volume 1: Physical and Chemical Monitoring Methods for Water, Sediment, and Tissue, 2008(RG-415) and Volume 2: Methods for Collecting and Analyzing Biological Community and Habitat Data (RG-416).* Additional aspects outlined in Section B below reflect specific requirements for sampling under the Clean Rivers Program and/or provide additional clarification.

Table B2.1 Sample Storage, Preservation and Handling Requirements

Parameter	Matrix	Container	Preservation	Sample Volume	Holding Time
TSS	Water	Cubitainer	Cool to 0 ≤ 6°C	500 mL	7 days
Sulfate	Water	Cubitainer	Cool to 0 ≤ 6°C	100[2] mL	28 days
Chloride	Water	Cubitainer	Cool to 0 ≤ 6°C	100[2] mL	28 days
E. coli, IDEXX Colilert	Water	Whirl-pack containing Sodium Thiosulfate	Cool to 0 ≤ 6°C	250 mL	8 hrs[1]
Ammonia-N, total	Water	Cubitainer	H_2SO_4 to pH <2 Cool to 0 ≤ 6°C	500 mL	28 days
BOD	Water	Cubitainer	Cool to 0 ≤ 6° C	2 L	48 hours
Nitrate-N, total	Water	Cubitainer	Cool to 0 ≤ 6°C	100[2] mL	48 hours
Nitrite-N, total	Water	Cubitainer	Cool to 0 ≤ 6°C	100[2] mL	48 hours
Total phosphorous	Water	Cubitainer	H_2SO_4 to pH <2 Cool to 0 ≤ 6°C	100 mL	28 days
TOC	Water	Cubitainer	H_2SO_4 to pH <2 Cool to 0 ≤ 6°C	100 mL	28 days
Total Kjeldahl Nitrogen	Water	Cubitainer	H_2SO_4 to pH <2 Cool to 0 ≤ 6°C	500 mL	28 days
O-phosphate-P, field filter <15 min.	Water	Cubitainer	Cool to 0 ≤ 6° C	100 mL	48 hours[3]
Chlorophyll-a	Water	Amber Plastic	Dark and ice before filtration (within 48 hours) Dark and frozen after filtration (held up to 28 days)	2000 mL[4]	28 days
Pheophytin	Water	Amber Plastic	Dark and ice before filtration (within 48 hours) Dark and frozen after filtration (held up to 28 days)	2000 mL[4]	28 days

[1]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 48 hours.
[2]Sulfate, Chloride, Nitrite and Nitrate are analyzed together using Ion Chromotography; the volume required is a total of 100 mLs, not 100 mLs per parameter
[3]Filtered in the field by sampling staff
[4]Chlorophyll-a and pheophytin are analyzed together, the volume required is a total of 2000 mLs

Sample Containers

Sample containers (cubitainers) are purchased pre-cleaned for conventional parameters and are disposable. Whirl-pak bags are used for bacteriological samples and have 1% sodium thiosulfate tablets added. Amber plastic bottles are used routinely for chlorophyll samples.

ISCO Autosamplers will use four glass containers of sufficient size to collect a composite sample. Autosampler program details are contained in Appendix L.

Processes to Prevent Contamination

Procedures outlined in the *TCEQ Surface Water Quality Monitoring Procedures* outline the necessary steps to prevent contamination of samples. These include: direct collection into sample containers, when possible; clean sampling techniques for metals; and certified containers for organics. Field QC samples (identified in Section B5) are collected to verify that contamination has not occurred.

Documentation of Field Sampling Activities

Field sampling activities are documented on field data sheets as presented in Appendix E. The following will be recorded for all visits:

1. Station ID
2. Sampling Date
3. Location
4. Sampling depth
5. Sampling time
6. Sample collector's name/signature
7. Values for all field parameters
8. Detailed observational data, including:
   - water appearance
   - weather
   - biological activity
   - unusual odors
   - pertinent observations related to water quality or stream uses (e.g., exceptionally poor water quality conditions/standards not met; stream uses such as swimming, boating, fishing, irrigation pumps, etc.)
   - watershed or instream activities (events impacting water quality, e.g., bridge construction, livestock watering upstream, etc.)
   - specific sample information (number of sediments grabs, type/number of fish in a tissue sample, etc.)
   - missing parameters (i.e., when a scheduled parameter or group of parameters is not collected)
   - potential pollutant source identification (i.e., evidence of wildlife, vegetation, illegal dumping, illicit discharges, etc.)

Recording Data

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

1. Write legibly in indelible ink
2. Changes should be made by crossing out original entries with a single line, entering the changes, and initialing and dating the corrections.
3. Close-out incomplete pages with an initialed and dated diagonal line.

Sampling Method Requirement or Sampling Process Design Deficiencies and Corrective Action

Examples of sampling method requirement 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 the City of Boerne Project Manager, in consultation with the City of Boerne QAO, to ensure that the actions and resolutions to the problems are documented and that records are maintained in accordance with this QAPP. In addition, these actions and resolutions will be conveyed to the NPS Project Manager both verbally and in writing in the project progress reports and by completion of a corrective action plan (CAP).

The definition of and process for handling deficiencies and corrective actions 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
2. Date and time of collection
3. Preservative added, if applicable
4. Designation of 'field-filtered' *(for metals)* as applicable
5. Sample type (i.e., analysis(es)) to be performed

Sample Handling

Water quality samples (conventional and bacteriological parameters) are collected according to procedures identified in TCEQ's SOP, V1 - *TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods for Water, Sediment, and Tissue, 2003.* The field data sheet is filled out in the field when the sample is collected and the results of field parameters are posted on this sheet. This sheet documents sample collection, flow data collected is also documented with this form or by attachment.

Samples requiring analysis that require acid preservation are collected in containers prepared for acid preserved sample collection prior to departing for the days sample collection. These containers are prepared by dispensing 2 mL of acid in the container at the beginning of the day. The sample container is labeled with a permanent water proof marker directly on the container and placed in an ice chest where they are covered with ice.

The samples are transported to the SARA-REL. Upon arrival at the laboratory, all samples and paperwork are relinquished to the sample custodian. The sample custodian accepts the sample, checking for any abnormalities in the sample (i.e. leakers, missing or torn COC seals, etc.) and notes any abnormalities at log in. The sample custodian also checks and documents the temperature of the samples using an infrared thermometer, and that all acid preserved samples are below 2 S.U. pH. Paperwork is examined for completeness and the sample custodian accepts the sample and documentation by signing the chain of custody (field data sheet) and also posting the date and time of acceptance.

The sample custodian enters the sample information into the laboratory's information management system and prints out one set of labels. Each sample container brought in, gets a label with a unique identification number. The water quality samples are then either given directly to an analyst, preparing to analyze the sample(s) immediately, or placed in a refrigerator in a secured (access is controlled through the use of programmed access cards) portion of the laboratory.

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

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 City of Boerne staff. The following information concerning the sample is recorded on the COC form (See Appendix F).

1. Date and time of collection
2. Site identification
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 City of Boerne Project Manager. These include such items as delays in transfer, resulting in holding time violations; violations of sample preservation requirements; incomplete documentation, including signatures; possible tampering of samples; broken or spilled samples, etc. The City of Boerne Project Manager in consultation with the City of Boerne 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 progress report. Corrective Action Plans will be prepared by the City of Boerne QAO and submitted to TCEQ NPS Project Manager along with project progress report.

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

B4 ANALYTICAL METHODS

The analytical methods are listed in Table A7.1 through Table A7.4 of Section A7. Laboratories collecting data under this QAPP are compliant with the NELAC Standards.

Copies of laboratory SOPs are retained by the SARA-REL and are available for review by the TCEQ. Laboratory SOPs are consistent with EPA requirements as specified in the method.

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 such things as instrument malfunctions, failures in calibration, blank contamination, quality control samples outside QAPP defined limits, etc. In many cases, the field technician or lab analyst will be able to correct the problem. If the problem is resolvable by the field technician or lab analyst, then they will document the problem on the field data sheet or laboratory record and complete the analysis.

Laboratory Corrective Actions:

If the problem is not resolvable, then it is conveyed to the Quality Assurance Officer, who will make the determination and notify the City of Boerne QAO. If the analytical system failure compromises 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 City of Boerne

Project Manager. The City of Boerne Project Manager will include this information in the CAP and submit with the 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.

The TCEQ has determined that analyses associated with the qualifier codes holding time exceedance, sample received unpreserved, estimated value, etc. may have unacceptable measurement uncertainty associated with them. This will immediately disqualify analyses from submittal to SWQMIS. Therefore, data with these types of problems should not be reported to the TCEQ. Additionally, any data collected or analyzed by means other than those stated in the QAPP, or data suspect for any reason should not be submitted for loading and storage in SWQMIS.

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*. Specific requirements are outlined below. Field QC sample results are submitted with the laboratory data report (see Section A9.).

Field Split - A field split is a single sample subdivided by field staff immediately following collection and submitted to the laboratory as two separately identified samples according to procedures specified in the *SWQM Procedures*. Split samples are preserved, handled, shipped, and analyzed identically and are used to assess variability in all of these processes. Field splits apply to conventional samples only.

The precision of field split results is calculated by relative percent difference (RPD) using the following equation:

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

A 30% RPD criteria will be used to screen field split results as a possible indicator of excessive variability in the sample handling and analytical system. If it is determined that elevated quantities of analyte (i.e., > 5 times the LOQ) were measured and analytical variability can be eliminated as a factor, than variability in field split results will primarily be used as a trigger for discussion with field staff to ensure samples are being handled in the field correctly. Some individual sample results may be invalidated based on the examination of all extenuating information. The information derived from field splits is generally considered to be event specific and would not normally be used to determine the validity of an entire batch; however, some batches of samples may be invalidated depending on the situation. Professional judgment during data validation will be relied upon to interpret the results and take appropriate action. The qualification (i.e., invalidation) of data will be documented on the Data Summary. Deficiencies will be addressed as specified in this section under Quality Control or Acceptability Requirements Deficiencies and Corrective Actions.

Laboratory Measurement Quality Control Requirements and Acceptability Criteria

Batch – A batch is defined as environmental samples that are prepared and/or analyzed together with the same process and personnel, using the same lot(s) of reagents. A **preparation batch** is composed of one to 20 environmental samples of the same NELAC-defined matrix, meeting the above mentioned criteria and with a maximum time between the start of processing of the first and last sample in the batch to be 24 hours. An **analytical batch** is composed of prepared environmental samples (extract, digestates or concentrates) which are analyzed together as a group. An analytical batch can include prepared samples originating from various environmental matrices and can exceed 20 samples.

Method Specific QC requirements – QC samples, other than those specified later this section, are run (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 assurance manuals (QAMs). 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 on each day calibrations are performed. In addition, an LOQ check standard 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 Standard – An LOQ check standard 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 standard is spiked into the sample matrix at the LOQ for each analyte for each analytical batch of CRP samples run.

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

The percent recovery of the LOQ check standard 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 standard:

$$\%R = \frac{SR}{SA} \times 100$$

Measurement performance specifications are used to determine the acceptability of LOQ Check Standard analyses as specified in Table A7.1-A7.8.

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:

$$\%R = (SR / SA) \times 100$$

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, precision is calculated by the relative percent difference (RPD) of LCS duplicate results as defined by 100 times the difference (range) of each duplicate set, divided by the average value (mean) of the set. For duplicate results, X_1 and X_2, the RPD is calculated from the following equation:

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

A bacteriological duplicate is considered to be a special type of laboratory duplicate and applies when bacteriological samples are run in the field as well as in the lab. Bacteriological duplicate analyses are performed on samples from the sample bottle on a 10% basis. Results of bacteriological duplicates are evaluated by calculating the logarithm of each result and determining the range of each pair.

Measurement performance specifications are used to determine the acceptability of duplicate analyses as specified in Table A7.1. The specifications for bacteriological duplicates in Table A7.1 apply to samples with concentrations > 10 MPN/100mL.

$$| Log\ A - Log\ B | = Log\ Range$$

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, for example, to determine the effect of the matrix on a method's recovery efficiency.

Percent recovery of the known concentration of added analyte is used to assess accuracy of the analytical process. The spiking occurs prior to sample preparation and analysis. Spiked samples are routinely prepared and analyzed at a rate of 10% of samples processed, or once per preparation batch whichever is greater. The information from these controls is sample/matrix

specific and is not used to determine the validity of the entire batch. To the extent possible, matrix spikes prepared and analyzed over the course of the project should be performed on samples from different sites. The MS is spiked at a level less than or equal to the midpoint of the calibration or analysis range for each analyte. Percent recovery (%R) is defined as 100 times the observed concentration, minus the sample concentration, divided by the true concentration of the spike.

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 laboratory shall document the calculation for %R. The percent recovery of the matrix spike is calculated using the following equation in which %R is percent recovery, SSR is the observed spiked sample concentration, SR is the sample result, and SA is the reference concentration of the spike added:

$$\%R = \frac{(SSR - SR)}{SA} \times 100$$

Measurement performance specifications for matrix spikes are not specified in this document. Matrix spike criteria are method specific and acceptance criteria are stated in the applicable Standard Operating Procedures.

The results are compared to the acceptance criteria as published in the mandated test method. Where there are no established criteria, the laboratory shall determine the internal criteria and document the method used to establish the limits. For matrix spike results outside established criteria, corrective action shall be documented or the data reported with appropriate data qualifying codes.

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 City of Boerne Project Manager, in consultation with the City of Boerne QAO. In that differences in sample results are used to assess the entire sampling

process, including environmental variability, the arbitrary rejection of results based on pre-determined limits is not practical. Therefore, the professional judgment of the City of Boerne Project Manager and QAO will be relied upon in evaluating results. Rejecting sample results based on wide variability is a possibility. Field blanks for trace elements and trace organics are scrutinized very closely. Field blank values exceeding the acceptability criteria may automatically invalidate the sample, especially in cases where high blank values may be indicative of contamination which may be causal in putting a value above the standard. Notations of field split excursions and blank contamination are noted in the quarterly report and the final QC Report. Equipment blanks for metals analysis are also scrutinized very closely.

Laboratory measurement quality control failures are evaluated by the laboratory staff. The disposition of such failures and the nature and disposition of the problem is reported to the City of Boerne Laboratory QAO. The Laboratory QAO will discuss with the City of Boerne Project Manager. If applicable, the City of Boerne Project Manager will include this information in the CAP and submit with the Progress Report which is sent to the TCEQ NPS Project Manager.

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

B6 INSTRUMENT/EQUIPMENT TESTING, INSPECTION AND MAINTENANCE

Automated sampler testing and maintenance requirements are contained in Appendix G of this document.

All in-stream sampling equipment testing and maintenance requirements are detailed in the *TCEQ Surface Water Quality Monitoring Procedures, Volume 1.* Equipment records are kept on all field equipment and a supply of critical spare parts is maintained by the City of Boerne Field Supervisor.

All laboratory tools, gauges, instrument, and equipment testing and maintenance requirements are contained within laboratory QAM(s) and Technical SOP'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

Field equipment calibration requirements are contained in the *TCEQ Surface Water Quality Monitoring Procedures*. Post-calibration error limits and the disposition resulting from error are adhered to. Data not meeting post-error limit requirements invalidate associated data collected subsequent to the pre-calibration and are not submitted to the TCEQ.

Detailed laboratory calibrations are contained within the SOP(s). The laboratory SOP's identifies all tools, gauges, instruments and other sampling, measuring and test equipment used for data collection activities affecting quality that must be controlled and, at specified periods, calibrated to maintain bias within specified limits. Calibration records are maintained, are traceable to the instrument, and are available for inspection by the TCEQ. Equipment requiring periodic calibrations includes, but is not limited to, thermometers, pH meters, balances, incubators, turbidity meters and analytical instruments

B8 INSPECTION/ACCEPTANCE OF SUPPLIES AND CONSUMABLES

Inspection and acceptance of supplies and consumables is done by the analyst/technician ordering the supplies. SARA-REL has found that the best person to determine if the supplies are acceptable for use in the laboratory or field is the individual responsible for the analysis. Sample Containers will be provided by SARA-REL.

B9 NON-DIRECT MEASUREMENTS

Only data collected directly under this QAPP will be submitted to the SWQMIS database. Sampling conducted by the TCEQ, USGS, and Texas Clean Rivers Program partners, and Texas Watch quality assured volunteer monitors is not covered under this QAPP and will not be reported to the NPS Data Manager by the City of Boerne. However, data collected by the above listed organizations that meet the data quality objectives of this project may be useful in satisfying the data and informational needs of the NPS Program. The collection and qualifications of the TCEQ and USGS data are addressed in the TCEQ Surface Water Quality Monitoring QAPP. The collection and qualification of the Texas CRP data are addressed in the Texas Clean Rivers Program QAPP. The collection and qualification of the Texas Watch volunteer monitoring data are addressed in the Texas State University Texas Watch QAPP.

Current and historical data as specifically described below will be utilized for watershed assessment purposes. All TCEQ Surface Water Quality Monitoring data collected by the TCEQ Regional office or Clean Rivers partners from the watershed and data reported in previous TCEQ project watershed characterization reports will be incorporated into the plan. Specifically, data utilized to complete this project from sources outside of data collected under this QAPP include the following:

- Cibolo Creek Data Report – February 2010, Prepared by Texas Stream Team Texas State University – San Marcos. Texas Stream Team Volunteer Water Quality Monitoring Program 2009 Cibolo Creek Data Summary

- Draft – Cibolo Creek April 2006, Texas Watch Volunteer Water Quality Monitoring Program 2006 San Antonio River Authority – Cibolo creek Data Summary

- Simulation of Streamflow and Estimation of Ground-Water Recharge in the Upper Cibolo Creek Watershed, South-Central Texas, 1992-2004. Produced by the U.S. Geological Survey.

- SWQMIS data collected within the watershed.

- Flow data for the period of record collected by the USGS at station No. 08183890, Cibolo creek at Cibolo Creek Nature Center near Boerne, Texas

- GPS Information
    - Data used in development of Geographic Information System (GIS) maps for the Upper Cibolo Creek Watershed Protection Plan were acquired from the City of Boerne GIS Department and Texas Natural Resource Information Systems (TNRIS), part of the Texas Water Development Board.

- Watershed and Sub-watershed Delineation

  - Watershed boundaries were delineated using 24k USGS topographic maps in raster format. The Digital Raster Graphic (DRG) is a scanned image of a US Geological. Survey (USGS) standard series topographic map that includes all collar information (e.g., legend, scale bar, index map, etc.) The DRG is useful as a source or background layer in a GIS, as a means to perform quality assurance on other digital products, and as a source for the collection and revision of GIS data.

- Monitoring Station Locations

  - Existing monitoring stations were located using coordinates acquired thought Surface Water Quality Monitoring Information Systems. New stations were located using a handheld Garmin Global Positioning System with sub 3m accuracy and verified on 2009 high resolution aerial photography purchased by the City of Boerne.

B10 DATA MANAGEMENT

Personnel

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

Field personnel may consist of staff in the Public Works division of the city of Boerne. Any personnel that assist in collection of field samples will receive training to verify competency (Refer to A8).

Data Management Process

Field Data:

- Field measurements and observations will be recorded on loose-leaf field data sheets by project field staff.
- Individual field data sheets will be used at each sampling station.
- Field data will be entered into Excel spreadsheets by project staff and reviewed by the City of Boerne Project Manager. Data will be stored on the City of Boerne Data Manager's desktop computer and the City of Boerne's secure on site server, which is operated and maintained by the City of Boerne Information Technology Department.

Laboratory Data:

- Laboratory results will be submitted electronically (via PDF report) to the City of Boerne Data Manager. Lab results will be stored on the City of Boerne Data Manager's desktop computer and the City of Boerne's secure on site server.

Data Submittal:

- Laboratory and field results will be submitted to TCEQ Project Manager by the City of Boerne Data Manager for review and submittal to SWQMIS.

See Appendix H for the Data Management Process Flow Chart.

Archives/Data Retention

Complete original data sets are archived on permanent *(specify media type)* media and retained on-site by the City of Boerne for a retention period specified in section A9.

Data Verification/Validation

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

Forms and Checklists

See Appendix E for the Field Data Sheets.
See Appendix C for the Data Review Checklist and Summary.

Data Dictionary
Terminology and field descriptions are included in the SWQM DMRG (January 2010 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 is included below.

Name of Monitoring Entity	Tag Prefix	Submitting Entity	Collecting Entity
City of Boerne	*BC*	*BC*	*BC*

Data Handling
Data are processed using the Microsoft Excel suite of tools and applications. Data integrity is maintained by of peer review for data entry processes. The administrative assistant will enter the results into the worksheets; the project QAO will then review these entries for accuracy.

Hardware and Software Requirements
Hardware configurations are sufficient to run Microsoft Excel under the Windows operating system.

Information Resource Management Requirements
City of Boerne information technology (IT) policy is contained in IT SOPs which are available for review at City of Boerne offices.

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	City of Boerne Project Manager	Monitoring of the project status and records to ensure requirements are being fulfilled.	Report to TCEQ in Quarterly Report
Laboratory Inspections	Dates to be determined by the TCEQ lab inspector	TCEQ Lab Inspector	Analytical and quality control procedures employed at the laboratory and the contract laboratory	30 days to respond in writing to the TCEQ to address corrective actions
Laboratory Inspection	Based on work plan and or discretion of City of Boerne	City of Boerne QAO	Analytical and quality control procedures employed at the laboratory and the contract laboratory	30 days to respond in writing to the City of Boerne 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

Deficiencies are any deviation from the QAPP, SWQM Procedures Manual, SOPs, or Data Management Reference Guide. Deficiencies may invalidate resulting data and may require corrective action. Corrective action may include for samples to 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 City of Boerne Project Manager, in consultation with the City of Boerne QAO, to ensure that the actions and resolutions to the problems are documented and that records are maintained in accordance with this QAPP. In addition, these actions and resolutions will be conveyed to the NPS Project Manager both verbally and in writing in the project progress reports and by completion of a corrective action plan (CAP).

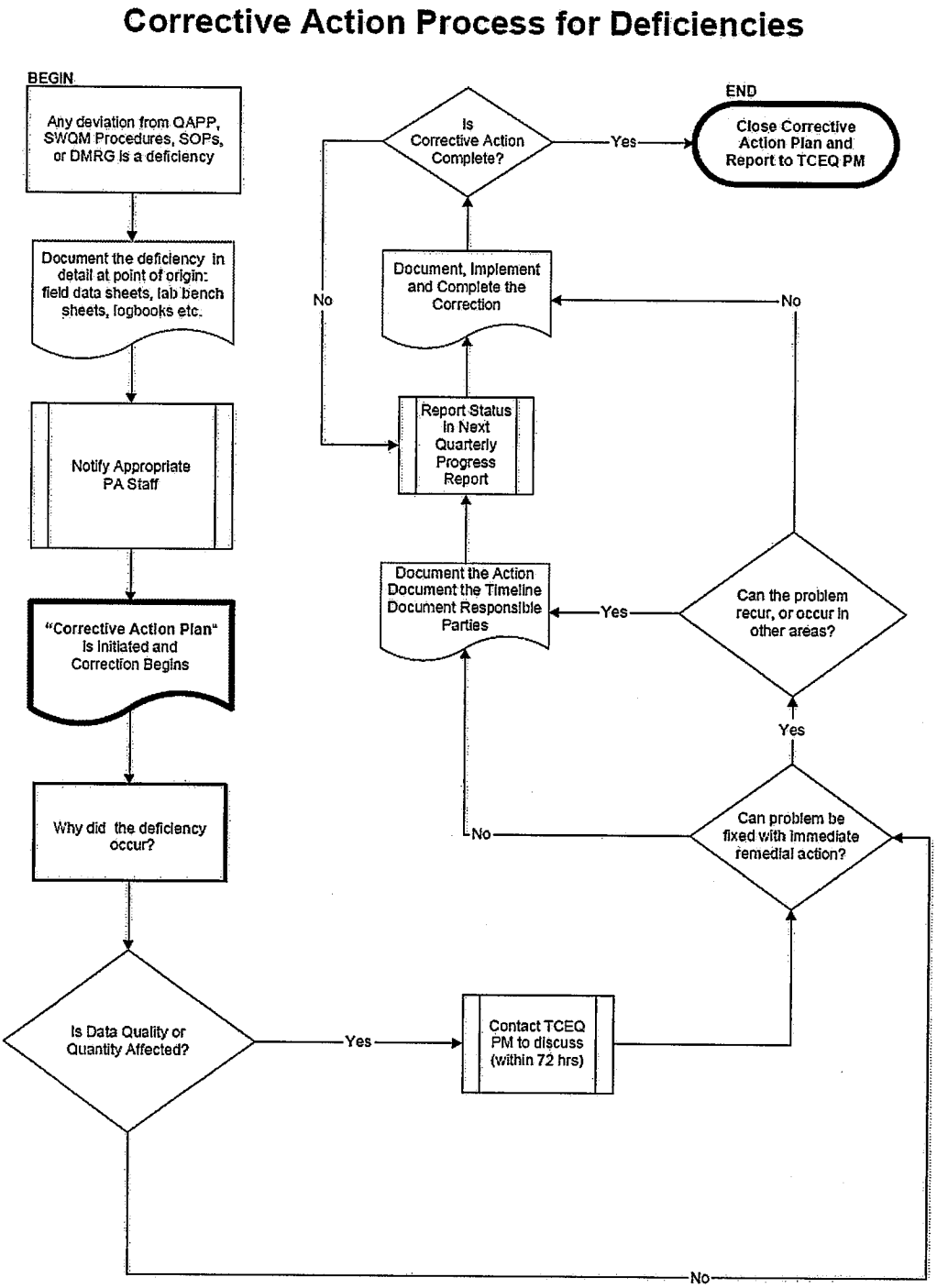
Corrective Action

CAPs should:

- Identify the problem, nonconformity, or undesirable situation
- Identify immediate remedial actions if possible
- Identify the underlying cause(s) of the problem
- Identify whether the problem is likely to recur, or occur in other areas
- Evaluate the need for Corrective Action
- Use problem-solving techniques to verify causes, determine solution, and develop an action plan
- Identify personnel responsible for action
- Establish timelines and provide a schedule
- Document the corrective action

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

Figure C1.1 Corrective Action Process for Deficiencies



Status of CAPs will be documented on the Corrective Action Status Table (See Appendix L) and included with Quarterly Progress Reports. In addition, significant conditions (i.e., situations which, if uncorrected, could have a serious effect on safety or on the validity or integrity of data) will be reported to the TCEQ immediately.

The City of Boerne Project Manager is responsible for implementing and tracking corrective actions. Corrective action plans will be documented on the Corrective Action Plan Form (See Appendix M) and submitted, when complete, to the TCEQ Project Manager. Records of audit findings and corrective actions are maintained by both the TCEQ and the City of Boerne QAO. Audit reports and corrective action documentation will be submitted to the TCEQ with the Quarterly Progress 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.

C2 REPORTS TO MANAGEMENT

Laboratory Data Reports

Laboratory data reports contain the results of all specified QC measures listed in Section B5, including but not limited to laboratory duplicates and method blanks. This information is reviewed by the San Antonio River Authority QAO and compared to the pre-specified acceptance criteria to determine acceptability of data before forwarding to the City of Boerne Project Manager. This information is available for inspection by the TCEQ.

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.

Quarterly Progress Report - Summarizes the City of Boerne's activities for each task; reports monitoring status, problems, delays, status of non-conformances and corrective actions; and outlines the status of each task's deliverables.

Final Project Report - Summarizes the City of Boerne'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.

Reports by TCEQ Project Management

City of Boerne Evaluation - The City of Boerne participates in a City of Boerne 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 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 for this project 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 *City of Boerne* 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, and reviewed for integrity. The *City of Boerne* Data Manager will be responsible for ensuring that all data are properly reviewed and verified, and submitted in the required format to the project database. The City of Boerne QAO is responsible for validating a minimum of 10% of the data produced in each task. Finally, the *City of Boerne* Project Manager, with the concurrence of the *City of Boerne* 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 2.1) 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 *City of Boerne* Project Manager and QAO are each responsible for validating that the verified data are scientifically valid, defensible, of known precision, bias, 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 monitoring systems audit conducted by the TCEQ QAS assigned to the project. Any issues requiring corrective action must be addressed, and the potential impact of these issues on previously collected data will be assessed. Finally, the *City of Boerne* 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

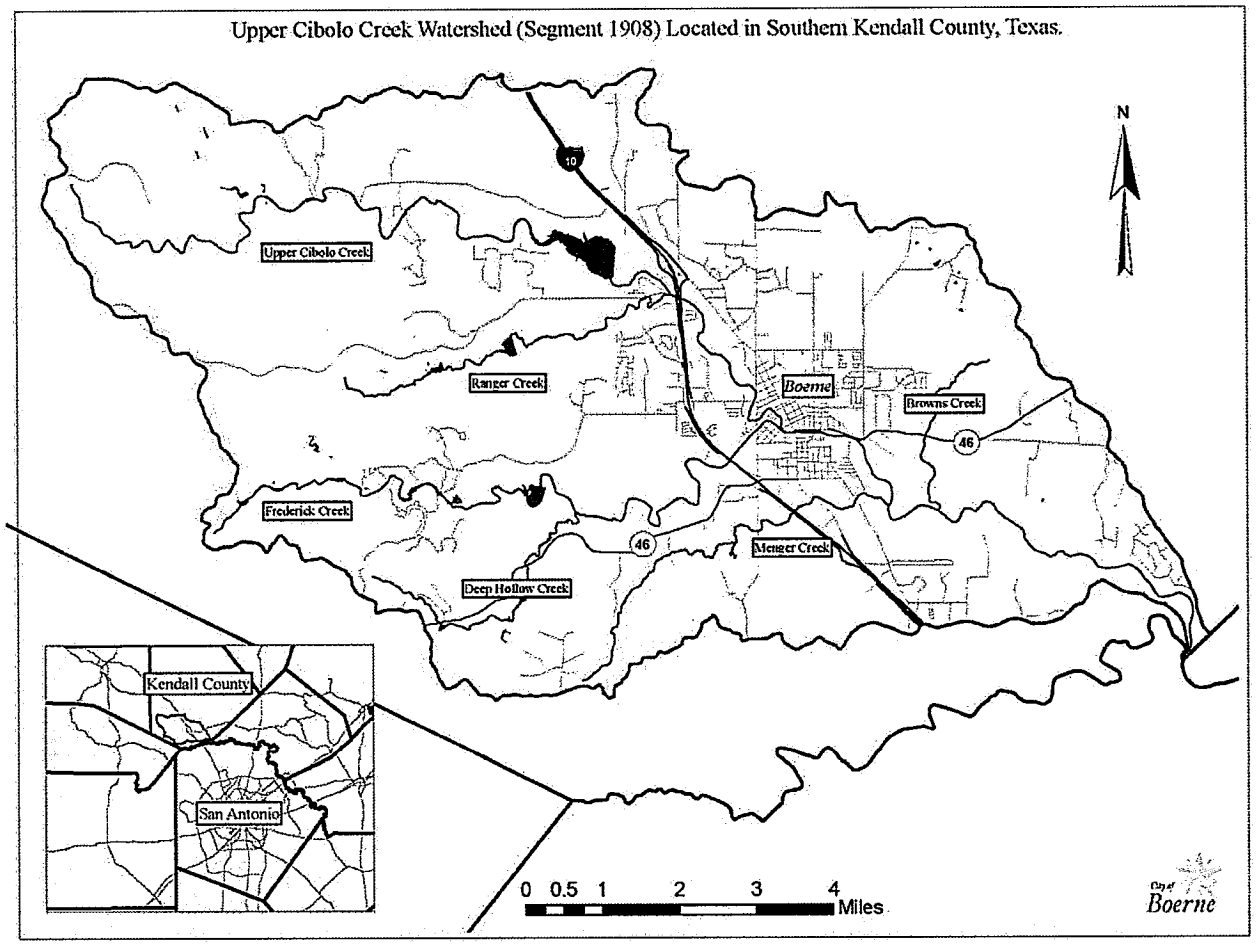
Data to be Verified	Field Task	Laboratory Task	Lead Organization Data Manager Task
Sample documentation complete; samples labeled, sites identified	Y	Y	
Field QC samples collected for all analytes as prescribed in the TCEQ *SWQM Procedures Manual*	Y		
Standards and reagents traceable	Y	Y	
Chain of custody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

D3 RECONCILIATION WITH USER REQUIREMENTS

Data collected under this QAPP will be used to characterize pollutant loads in the Upper Cibolo Creek Watershed in support of the development of a Watershed Protection Plan. These data and data collected by other organizations (e.g., USGS, TCEQ, etc.) may be subsequently analyzed and used by the TCEQ for TMDL development, stream standards modifications, permit decisions, and water quality assessments. Data which do not meet requirements will not be submitted to the SWQMIS nor will it be considered appropriate for any of the uses noted above.

Appendix A. Area Location Map

Figure A5.1 Area Location Map



Appendix B. Scope of Work

Scope of Work

Problem/Need Statement:

The 64-square mile Upper Cibolo Creek watershed is completely contained within Kendall County, and is central to the development of the City of Boerne and the surrounding community. The sensitive nature of the Cibolo Creek watershed, its abundant aquatic life and the riparian zone habitat make it vulnerable to a variety of changes occurring in the watershed. It was listed on the 1999 through 2004 303(d) Lists of impaired water bodies for depressed dissolved oxygen (DO). Studies conducted from 2002 to 2004 determined that the segment was supporting its uses, and the segment was removed from the 303(d) List for DO. Recent sampling has shown excessive bacteria counts, and the segment has returned to the 2006 303(d) List of impaired water bodies due to elevated bacteria.

A primary concern is the increase in nonpoint source pollution (NPS) from a rapidly growing population and the concurrent changes in land use. Land use in the Upper Cibolo Creek watershed is mostly rural with light ranch use and deer hunting. However, urban area is developing and a further increase in NPS pollution is expected.

Introduction:

Watershed planning is an iterative and adaptive process. A successful watershed protection plan (WPP) begins with adequate planning and a clear and consistent message of what is required. Development of this Scope of Work is based on the understanding and interpretation of 1) *the Nonpoint Source Program and Grants Guidelines for States and Territories* promulgated by the United States Environmental Protection Agency (EPA) in 2003 (hereafter referred to as the 2003 Guidelines), and 2) the *Handbook for Developing Watershed Plans to Restore and Protect Our Waters*, finalized by EPA in 2008 (hereafter referred to as the EPA Handbook). The Scope of Work structure is designed to ensure the project is consistent with and satisfies the EPA's nine elements fundamental to a successful watershed-based plan.

EPA's nine key elements are as follows, and will direct development of this WPP:

a. Identification of causes of impairment and pollutant sources or groups of similar sources that need to be controlled to achieve needed load reductions, and any other goals identified in the watershed plan. Sources that need to be controlled should be identified at the significant subcategory level along with estimates of the extent to which they are present in the watershed (e.g., X number of dairy cattle feedlots needing upgrading, including a rough estimate of the number of cattle per facility; Y acres of row crops needing improved nutrient management or sediment control; or Z linear miles of eroded streambank needing remediation).

b. An estimate of the load reductions expected for the management measures described under paragraph (c) below (recognizing the natural variability and the difficulty in precisely predicting the performance of management measures over time). Estimates should be provided at the same level as in item (a) above (e.g., the total load reduction expected for dairy cattle feedlots; row crops; or eroded streambanks).

c. A description of the NPS management measures that will need to be implemented to achieve the load reductions estimated under paragraph (b) above (as well as to achieve other watershed goals identified in this watershed-based plan), and an identification (using a map or a description) of the critical areas in which those measures will be needed to implement this plan.

d. An estimate of the amounts of technical and financial assistance needed, associated costs, and/or the sources and authorities that will be relied upon, to implement this plan. As sources of funding, States should consider the use of their Section 319 programs, State Revolving Funds, USDA's Environmental Quality Incentives Program and Conservation Reserve Program, and other relevant Federal, State, local and private funds that may be available to assist in implementing this plan.

e. An information/education component that will be used to enhance public understanding of the project and encourage their early and continued participation in selecting, designing, and implementing the NPS management measures that will be implemented.

f. A schedule for implementing the NPS management measures identified in this plan that is reasonably expeditious.

g. A description of interim, measurable milestones for determining whether NPS management measures or other control actions are being implemented.

h. A set of criteria that can be used to determine whether loading reductions are being achieved over time and substantial progress is being made towards attaining water quality standards and, if not, the criteria for determining whether this watershed-based plan needs to be revised or, if a NPS TMDL has been established, whether the NPS TMDL needs to be revised.

i. A monitoring component to evaluate the effectiveness of the implementation efforts over time, measured against the criteria established under item (h) immediately above.

To establish a good foundation for the development of EPA's nine elements for development of a WPP, steps 1 through 3 in the Watershed Planning and Implementation Process, as outlined in Chapter 2 of the EPA Handbook will be followed. Steps 4 through 6 will be captured within development of EPA's nine elements. Steps 1 through 3 of the Watershed Planning and Implementation Process are as follows:

- Build Partnerships
  - Identify key stakeholders
  - Identify issues of concern
  - Set preliminary goals
  - Develop indicators
  - Conduct public outreach
- Characterize the watershed to identify problems
  - Gather existing data and create a watershed inventory
  - Identify data gaps and collect additional data if needed
  - Analyze data
  - Identify causes and sources of pollution that need to be controlled
  - Estimate pollutant loads
- Set goals and identify solutions
  - Set overall goals and management objectives
  - Develop indicators/targets
  - Determine load reductions needed
  - Identify critical areas
  - Develop management measures to achieve goals

General Project Description:

The scope of this project has been defined with the consideration of the following factors:

- Geographic area
- Number of water quality issues to be addressed
- Type and breadth of potential goals to be attained
- Time required for plan implementation

The City of Boerne will develop a scientifically defensible plan which will:

- Lead to measurable results
- Provide an overall improvement in water quality
- Include watershed goals important to local communities

All reports and public documents produced as deliverables for this project will provide relevant information and data clearly and sufficiently explained in lay terminology. Additional documents may be produced by the City of Boerne or subcontractors that present and/or reference technical information explaining specifics of monitoring results, modeling exercises, proposed best management practices or other information. Such documents may be produced using technical terminology, with a nontechnical summary to be made available to stakeholders via the project website.

The Upper Cibolo Creek WPP project will be developed to address NPS pollution threats in the Upper Cibolo Creek watershed from the source at Champee Springs to the southern edge at Upper Balcones Creek. The project planners will use a watershed approach to addressing water quality, and will include coordinated priority setting and integrated solutions. The planning will be based on stakeholder input and involvement throughout the process. The project will be run by a full-time watershed plan coordinator and will include three methodologies: assessment/surveys/modeling, education/public outreach, and implementation with public involvement.

OBJECTIVE 1: PROJECT ADMINISTRATION

Goal: To effectively coordinate and monitor all technical and financial activities performed under this contract, prepare regular progress reports, and manage project files and data.

Task 1.1 **Project Oversight** – The City of Boerne will provide technical and fiscal oversight of the project staff and/or subgrantee(s)/subcontractor(s) to ensure Tasks and Deliverables are acceptable, and are completed as scheduled and within budget. With the Texas Commission on Environmental Quality (TCEQ) Project Manager's authorization, the City of Boerne may secure the services of subgrantee(s)/ subcontractor(s) as necessary for technical support, repairs, and training. Project oversight status will be provided to the TCEQ with the Quarterly Progress Reports (QPRs).

Task 1.2 **QPRs** –The City of Boerne will submit QPRs to the TCEQ by the 15th of the month following each state fiscal quarter for incorporation into the Grant Reporting and Tracking System (GRTS). Progress reports will contain a level of detail sufficient to document the activities that occurred under each task during the quarter, and will contain a comprehensive tracking of deliverable status under each task. Progress reports will be distributed to all project partners.

Task 1.3 **Reimbursement Forms** – The City of Boerne will submit Reimbursement Forms to the TCEQ by the last day of the month following each state fiscal quarter.

Task 1.4 **Contract Communication** – The City of Boerne will participate in a post-award orientation meeting with TCEQ within 60 days of contract execution. The City of Boerne will maintain regular telephone and/or email 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 call or meeting each January, April, July, and October. Minutes recording the important items discussed and decisions made during each call will be attached to each QPR. Matters that must be communicated to the TCEQ Project Manager in the interim between QPRs may include:

- Requests for prior approval of activities or expenditures for which the contract requires advance approval or that are not specifically included in the scope of work
- Notification in advance when City of Boerne has scheduled public meetings or events, initiation of construction, or other major task activities under this contract
- Information regarding events or circumstances that may require changes to the budget, scope of work, or schedule of deliverables. Such information must be reported within 48 hours of discovering these events or circumstances

Task 1.5 **Contractor Evaluation** – The City of Boerne will participate in an annual Contractor Evaluation.

Task 1.6 **Project Fact Sheet** – The City of Boerne will develop a one-page fact sheet of the project using the TCEQ NPS Projects Template. The fact sheet will briefly describe what the project is going to accomplish, and will provide background information on why the project is being conducted, the current status of the project, and who is involved in the project. The project fact sheet will be submitted to the TCEQ within 60 days after contract initiation. The fact sheet will be updated annually, and submitted with the fourth QPR. The fact sheet will be updated more often, as the project status changes. The fact sheet will be published on the City of Boerne's website after approval from the TCEQ Project Manager.

Task 1.7 **Annual Report Article** – The City of Boerne will provide an article for the Nonpoint Source Annual Report upon request by the TCEQ. This report is produced annually in accordance with Section 319(h) of the Clean Water Act (CWA), and is used to report Texas' progress toward meeting the CWA § 319 goals and objectives, and toward implementing it's strategies as defined in the Texas Nonpoint Source Management Program. The article will include a brief summary of the project and describe the activities of the past fiscal year.

Task 1.8 **Hire Watershed Plan Coordinator** – The City of Boerne will hire a watershed coordinator to provide a single point of contact, manage and track all the activities, facilitate information exchange among the participants and, ultimately, produce a document describing the WPP for Cibolo Creek. Other roles of the watershed coordinator will include identification and acquisition of additional resources, dispute resolution, and education and outreach efforts. Additionally, the Cibolo Creek watershed coordinator will be responsible for identifying and securing additional resources for use by the Cibolo Creek stakeholder group.

Measures of Success: Adherence to TCEQ's administrative requirements; timely completion and submittal of progress reports and deliverables.

Deliverables:

- Minutes of Post-Award Orientation Meeting
- QPRs
- Reimbursement Forms
- Minutes of Quarterly Contract Conference Calls
- Contractor Evaluation
- Project Fact Sheet
- Annual Report Article
- Reporting on the hiring of a watershed coordinator, with QPRs, and other communication with the TCEQ Project Manager

OBJECTIVE 2: BUILD PARTNERSHIPS

This Objective is the first step in watershed planning and meets a portion of Element E of the 2003 Guidelines. Guidance for developing this objective can be found in the EPA Handbook, Chapters 3, 4 and 12.

Goal: To lead the community-based component of the WPP and project by the development of a balanced and diversified Stakeholder Group, enhance public understanding of the project and encourage early and continued public participation in selecting, designing, and implementing appropriate NPS management measures.

Task 2.1 **Public Participation Plan** – The City of Boerne will develop a draft public participation plan (PPP) prior to initial Stakeholder Group development. The PPP will establish the proposed determination of Stakeholder Group membership and the ground rules for meetings and activities as well as for public participation in the project beyond the Stakeholder Group. The draft PPP must be approved by the TCEQ Project Manager. The final PPP must be approved by the WPP Stakeholder Group and TCEQ Project Manager.

Task 2.2 **Stakeholder Group Development** – The City of Boerne will develop a Stakeholder Group, which includes representatives of local, state and federal government; landowners and facility operators in all major land use categories present in the watershed; environmental groups, developers and other special interest groups active in the watershed; and other local residents.

Task 2.3 **Stakeholder Group Activities** – The City of Boerne will facilitate the Stakeholder Group's work to:

- Establish how meetings will be conducted and their frequency
- Identify issues of concern and develop WPP goals and objectives
- Determine guidelines for stakeholder involvement, roles, and responsibilities
- Gain community acceptance of the project
- Identify a lead organization to manage the WPP at the end of the project

Task 2.4 **Determination of WPP Goals** – The City of Boerne will facilitate the Stakeholder Group's work to set goals that will include (at a minimum) meeting the appropriate water quality standards for pollutants that threaten or impair the physical, chemical, or biological integrity and the designated uses of the watershed covered in the plan. If a

Total Maximum Daily Load (TMDL) has been developed in the watershed, the WPP goals must include achieving loading allocations identified in the TMDL. If a Texas Pollutant Discharge Elimination System (TPDES) permit has been issued or is anticipated, the WPP goals must include achieving water quality standards required in the permit.

Task 2.5 **Stakeholder Group Meetings** – The City of Boerne will facilitate Stakeholder Group meetings to establish priorities and focus work efforts. Meetings will be held on a regular basis to provide status of work progress to the group and obtain input on subsequent steps. Stakeholders will review and approve the plan prior to finalization.

Task 2.6 **Dissemination of Information on Project Status** – The City of Boerne will use Stakeholder Group meetings and the project webpage, to disseminate project information in accordance with the PPP. Activities will include:

- Presentation of all deliverable reports for Objectives 2 through 15
  - Solicit input from stakeholders upon initiation of Objective activities
  - Present draft reports to stakeholders
  - Solicit input/comments from stakeholders regarding each draft report
  - Track input/comments provided by stakeholders and the responses by the City of Boerne to comments
  - Present final reports to stakeholders

Additional activities may include:

- Texas Watershed Steward trainings
- Texas Stream Team education events and trainings
- Community partnerships to develop a group name and logo

Task 2.7 **Public Relations Campaign** – The City of Boerne will prepare various press releases and coordinate press conferences and other public events to raise public awareness with regard to watershed management and NPS pollution. The campaign will include advertising through local media and other forms of public information. Initially, project partners will use the NPS impairment information and goals set out by this project to select a summary or slogan (e.g. Protect Your Creek) to represent the project goals. This slogan will serve as the heart of project publicity.

Task 2.8 **Public Education Workshops** – The City of Boerne and its partners will host a number of public education workshops including:

- Teacher Education Workshops
- Storm water runoff management workshops
- Water safety and flood safety workshops

Task 2.9 **Information Signs and Storm Drain Labels** – The City of Boerne and its partners will develop signs to post in public areas along the Cibolo Creek to provide information regarding the protection of water quality and habitat. Warning labels will be placed on storm drain facilities to warn against illegal dumping of pollutants.

Task 2.10 **Cibolo Festival** – The City of Boerne with assistance from the partner organizations will arrange for a public event to "Celebrate the Cibolo". The event will include food, music and a variety of booths and information on the Cibolo Creek, various organizations with an emphasis on protecting the creek.

Task 2.11 **Citizen Scientist Projects and Surveys** – The City of Boerne and its partners will perform surveys of plant and animal life in the watershed using citizen scientist volunteers to engage the public in activities that are meaningful to the understanding of the watershed and the need to protect it. These surveys will be facilitated by biologists and researchers to ensure the surveys meet scientific standard methods. Surveys planned include:

- Guadalupe Bass population
- Riparian flora
- Odonates

Task 2.12 **PPP Progress Reports** – Biannual updates and a final document will be submitted documenting the status of:

- The completion of objectives and tasks of the PPP
- The strategy for achieving the remaining objectives and goals of the PPP through the completion of the project
- Outreach and education activities
- Activities of, and input provided by, the Stakeholder Group

Measures of Success: TCEQ and stakeholder approval of the PPP, an active, community-based Stakeholder Group process where information problems are identified, awareness and education are promoted, information is disseminated, dialogue and discussion of issues occurs, feedback is exchanged with the community, and the facilitation of implementation solutions is supported; Participation at workshops, at the festivals, and in the surveys; Feedback from public relations campaign, articles published in local media, and numbers of signs and markers installed.

Deliverables:

- Draft and Final PPP
- Project webpage and updates
- Stakeholder Group and Public meeting agendas, minutes, sign in sheets and other available documentation
- The following items will be submitted to the TCEQ Project Manager for approval prior to publishing/purchasing. Copies of the final materials will be included in the QPRs.
    - Press releases, press conference agendas
    - Meeting agendas
    - Public events/workshops/demonstrations plans, documents
    - Education and outreach materials
    - Signs and storm drain stencils implementation documentation, including maps and photographs
    - Citizens Scientist projects/surveys documents
- Attend local and regional meetings to communicate and obtain input on the project - describe activities in progress reports
- PPP Progress Reports

OBJECTIVE 3: ELEMENT A: WATERSHED CHARACTERIZATION – PHASE 1: DATA INVENTORY

This Objective meets a portion of Element A of the 2003 Guidelines. Guidance for developing this objective can be found in Chapter 5 of the EPA Handbook.

Goal: Gather existing data, create a data inventory, conduct land use surveys, and develop maps.

Task 3.1 **Gather existing data and create a Watershed Inventory** – The City of Boerne will compile available data (See the EPA Handbook *Chapter 5: Gather Existing Data and Create and Inventory, Table 5-1. Data Typically Used for Watershed Characterization,* and *Chapter 12: General Outline of a Watershed Plan)* on physical and natural features, land use and population characteristics, water body and watershed conditions and pollutant sources, and water body monitoring data into a comprehensive inventory for the watershed. The data summary will be updated during the course of the watershed planning effort so that a complete summary is available to stakeholders. The data inventory will include, though is not limited to, information relevant to the watershed regarding the following topics:

- Physical and Natural Features
  - Watershed Boundaries
  - Hydrology
  - Topography
  - Soils
  - Climate
  - Habitat
  - Wildlife
- Land Use and Population Characteristics
  - Land use and land cover
  - Existing land management practices
- Water body and Watershed Conditions
  - Water quality standards
  - Texas Water Quality Inventory (TWQI)
  - 303(d) List
  - Existing TMDL reports
  - Source Water Assessments
- Pollutant Sources
  - Point sources
  - Nonpoint sources
- Water body Monitoring Data
  - Water quality and flow
  - Biology
  - Geomorphology

Task 3.2 **Geographic Representation** – The City of Boerne will compile data from Task 3.1 to characterize the watershed to the subwatershed level using GIS software and existing data:

- Create maps for hydrology, soils and land use data
- Create data tables providing statistics and other relevant information including hydrologic data, soils and land use data
- Create maps that display general locations of point sources and potential nonpoint sources of pollution by groups
- Create tables of data detailing point sources and potential nonpoint sources of

pollution. The tables will provide statistics on sources of pollution and water quality parameters affected

Task 3.3 **Watershed Characterization – Phase 1: Data Inventory** - The City of Boerne will develop a report providing a data inventory, land use surveys, maps and modeling recommendations for stakeholders. The document will identify spatial, temporal and other data gaps that need to be filled for modeling to be conducted and the completion of the watershed characterization.

Measure of Success: Publication of a data inventory and map, or series of maps, which shows nonpoint sources pollution by group and provides tables of data regarding existing nonpoint sources of pollution, TCEQ and stakeholder approval of the Watershed Characterization – Phase 1 Report.

Deliverables:

- Draft and Final Watershed Characterization – Phase 1: Data Inventory Report

OBJECTIVE 4: ELEMENT A: WATERSHED CHARACTERIZATION – PHASE 2: DATA COLLECTION AND ANALYSIS

This Objective meets a portion of Element A of the 2003 Guidelines. Guidance for developing this objective can be found in Chapters 6 and 7 of the EPA Handbook.

Goal: To provide the baseline information for determination of loadings from existing point and nonpoint sources of pollution; To provide additional data for incorporation into a model, which will serve to determine the pollutant assimilative capacity of the water body, and to determine pollutant load reductions needed to achieve the goals of the WPP. The information collected will also form the baseline for future monitoring to determine if the pollutant load reduction goals are being met.

Task 4.1 **Data Quality Objectives (DQOs)** – The City of Boerne will develop DQOs which will clarify the purpose of the monitoring and modeling study, define the most appropriate type of data to collect, and help determine the most appropriate methods and conditions under which to collect them. The DQOs will incorporate data needs for:

- The development of the WPP, including
  - General characterization of water quality
  - Determination of pollutant loads
  - Modeling activities
- Measuring the effectiveness of implementation activities

Task 4.2 **Conduct a Data Review** – The City of Boerne will conduct a data review to identify data gaps, and to determine the types of data needed to identify causes and sources and acceptability of data.

Task 4.3 **Develop a Water Quality Monitoring Plan** – The City of Boerne will summarize the specific objectives of the project's monitoring effort, the data requirements of the model or other data analysis and interpretation to be used in the project, and the preliminary locations, times, and other details of planned monitoring activities. Demonstrate how the planned activities support the DQOs.

Task 4.4 **QAPP Planning Meetings** – The City of Boerne will schedule Quality Assurance Project Plan (QAPP) planning meetings with the TCEQ Project Manager, Quality Assurance staff, technical staff, management, and contractors, to implement a systematic planning process, based on the elements of the TCEQ NPS QAPP Shell. The information developed during the planning meetings will be incorporated into a QAPP. A planning meeting may also be conducted to determine if any changes need to be made to an existing QAPP.

Task 4.5 **QAPP for Monitoring** – The City of Boerne will develop and submit to the TCEQ a QAPP with project specific DQOs consistent with the *EPA Requirements for Quality Assurance Project Plans (QA/R5)* format and the TCEQ NPS QAPP Shell 120 days prior to the initiation of any data collection. All of the monitoring procedures and methods prescribed in the QAPP will be consistent with the guidelines detailed in the TCEQ Surface Water Quality Monitoring Procedures, Volume 1 and 2. The QAPP will be developed by the City of Boerne with technical assistance from TCEQ Project Manager, Quality Assurance staff, technical staff, management, and contractors. The QAPP will be approved by the TCEQ.

Task 4.6 **QAPP for Modeling** – The City of Boerne will develop and submit to the TCEQ a QAPP with project specific DQOs consistent with the *EPA Requirements for Quality Assurance Project Plans for Modeling* QA/G-5M format 120 days prior to the initiation of any modeling activities. The QAPP will be developed by the City of Boerne, with technical assistance from TCEQ Project Manager, Quality Assurance staff, technical staff, management, and contractors. The QAPP will be approved by the TCEQ.

Task 4.7 **QAPP Update** – The City of Boerne will provide input annually throughout the project period to TCEQ 60 days prior to the end of the effective period of the QAPP, and will develop annual QAPP revisions no less than 45 days prior to the end of the effective period of the QAPP.

Task 4.8 **QAPP Amendments** – The City of Boerne will prepare amendments to the QAPP. Amendments to the QAPP and the reasons for the changes will be documented, and revised pages will be forwarded to all persons on the QAPP distribution list by the Contractor Quality Assurance Officer (QAO). Amendments shall be reviewed, approved, and incorporated into a revised QAPP during the annual revision process or within 120 days of the initial approval in cases of significant changes.

Task 4.9 **Data Collection** – The City of Boerne will develop a monitoring program and conduct monitoring, as outlined in the QAPP, to achieve DQOs.

Task 4.10 **Modeling** – The City of Boerne will incorporate relevant data into a model selected by the City of Boerne with the approval of the TCEQ Project Manager and the Stakeholder Group, as outlined in the QAPP, to achieve DQOs. Data sources used in the model, including literature values and other assumptions will be presented to the Stakeholder Group and feedback will be solicited by the City of Boerne. The model will be calibrated using available water quality data and utilized to assist in the determination of causes and sources of pollution and pollutant loadings.

Task 4.11 **Data Submittal** – The City of Boerne will review, verify, and validate water quality monitoring modeling data before it is submitted to the TCEQ. Data will be submitted to

TCEQ quarterly and at least 1 month prior to use, or prior to presenting to stakeholders. A semi-annual report of water quality data consistent with TCEQ formatting requirements will be submitted for upload into the Surface Water Quality Monitoring Information System (SWQMIS).

Task 4.12 **Watershed Characterization – Phase 2: Data Collection and Analysis** – The City of Boerne will provide to the TCEQ and stakeholders a report that describes the results of sampling and modeling activities, and recommendations for future monitoring efforts.

Measures of Success: Acceptance of the original QAPP and annual updates by the TCEQ; continuing conformance to QAPP provisions; collection and submittal of monitoring and modeling data; TCEQ and stakeholder approval of the Watershed Characterization – Phase 2 Report.

Deliverables:

- QAPP Planning Meeting and Minutes
- Draft and Final Sampling Plan, including DQOs and data review
- Draft and Final QAPP
- Draft and Final QAPP Annual Updates
- Draft and Final QAPP Amendments
- Monitoring and Modeling status updates
- Data Submittals
- Water quality monitoring non-conformances will be reported in QPRs
- Draft and Final Watershed Characterization – Phase 2: Data Collection and Analysis Report

OBJECTIVE 5: ELEMENT A: WATERSHED CHARACTERIZATION – PHASE 3: IDENTIFICATION OF CAUSES AND SOURCES OF POLLUTION AND ESTIMATION OF POLLUTANT LOADS

This Objective completes Element A of the 2003 Guidelines. Guidance for developing this objective can be found in Chapters 5, 6, 7, and 8 of the EPA Handbook.

Goal: Identification of the causes and sources, or groups of similar sources, that will need to be controlled to achieve the load reductions estimated in this watershed-based plan (and to achieve any other watershed goals identified in the watershed-based plan), as discussed in Element A of the 2003 Guidelines. Sources that need to be controlled should be identified at the significant subcategory level with estimates of the extent to which they are present in the watershed (e.g., X number of dairy cattle feedlots needing upgrading, including a rough estimate of the number of cattle per facility; Y acres of row crops needing improved nutrient management or sediment control; or Z linear miles of eroded streambank needing remediation).

Task 5.1 **Watershed Goals and Targets** – The City of Boerne will further define watershed goals and refine numeric water quality targets for the pollutants or sources identified in Objective 5. The watershed goals and targets will be used to guide the identification and selection of management practices in Objective 6.

Task 5.2 **Identify Causes and Sources of Pollution** – The City of Boerne will analyze data to identify the causes and sources of water quality problems in the watershed. The analysis will:

- Identify pollutant sources and causes of impairments or water quality concerns,

including:
  - Point sources
  - Nonpoint sources
  - Stakeholders' concerns and observations
  - Effects on water quality and overall watershed functions
- Compare available monitoring data to water quality standards, and to the current TWQI and 303(d) List

An evaluation will be done of the relative magnitude of sources, the location of sources, and the timing of source loading:
- Major sources of pollution will be identified at a significant subcategory and subwatershed level
- Minor sources of pollution may be identified by a general characterization

The methods for analysis may include mapping, modeling, monitoring, field assessments, and stakeholder surveys.

Task 5.3 **Estimate Pollutant Loads** – The City of Boerne will estimate pollutant loads for water quality parameters that:
- Do not meet standards
- Are identified as a concern in the TWQI
- That may prohibit the water body from meeting designated uses
- And in addition, pollutant loads may be also be estimated for water quality parameters identified by stakeholders as a concern

Pollutant loads will be calculated based on the relative magnitude of sources, the location of sources, and the timing of source loading. The loading analysis will be used in subsequent Objectives of this project to plan restoration and/or protection strategies, target load reduction efforts, and project future loads under new conditions.

Task 5.4 **Geographic Representation** – The City of Boerne will provide high quality, well labeled maps of the watershed and subwatersheds that identify the major causes and sources of the water quality problems.

Task 5.5 **Element A: Watershed Characterization – Phase 3: Identification of Causes and Sources of Pollution and Estimation of Pollutant Loads Report** – The City of Boerne will develop a report using data developed in this phase to identify causes and sources of pollution that need to be controlled. Pollutant load data and associated maps developed under this Objective will be included in the report. The document will also identify additional gaps in data, and methods to deal with these gaps will be recommended.

Measures of Success: Identification of the causes and sources of water quality problems in the watershed, estimation of the pollutant loads from the associated causes and sources, identification of causes and sources of water quality problems at a subcategory level and subwatershed level, TCEQ and stakeholder approval of the Watershed Characterization – Phase 3 Report.

Deliverables:
- Revised/refined watershed goals & targets
- Watershed maps that identify the causes and sources of water quality problems

- Draft and Final Watershed Characterization - Phase 3: Identification of Causes and Sources of Pollution and Estimation of Pollutant Loads Report

OBJECTIVE 6: ELEMENT B: ESTIMATE OF POLLUTANT LOAD REDUCTIONS EXPECTED FROM MANAGEMENT MEASURES

This Objective meets Element B of the 2003 Guidelines. Guidance for developing this objective can be found in Chapters 8 and 9 of the EPA Handbook.

Goal: To provide an estimate of the load reductions expected for the management measures described under Element C. Estimates should be provided at the same level as in Element A (e.g., the total load reduction expected for dairy cattle feedlots; row crops; or eroded streambanks) to ensure the water body meets water quality standards and designated uses.

Task 6.1 **Determination of Load Reductions Needed to Achieve WPP Goals** – The City of Boerne will determine the load reductions that are needed to meet the watershed goals and water quality standards. Load reduction estimates will be calculated at key locations in the watershed in order to depict the major problem areas and sources, and to support efficient and targeted management. The load reductions should be calculated at the same spatial scale and level of detail as the causes and sources and pollutant loads identified in Objective 5. The load reductions identified should be sufficient to ensure that water quality standards and designated uses are met. The WPP load reductions must achieve water quality standards expected with a future MS4 Permit and NPDES permits.

Task 6.2 **Element B: Estimate of Pollutant Load Reductions from Management Measures Report** – The City of Boerne will provide a report describing the watershed goals, targets, and the load reductions that are needed to meet the watershed goals.

Measures of Success: Identification of the causes and sources of water quality problems in the watershed, estimation of the pollutant loads from the associated causes and sources, identification of causes and sources of water quality problems at a subcategory level and subwatershed level, TCEQ and stakeholder approval of the Element B: Estimate of Pollutant Load Reductions Expected from Management Measures Report.

Deliverables:

- Draft and Final Element B: Estimate of Pollutant Load Reductions Expected from Management Measures Report

OBJECTIVE 7: ELEMENT C: DESCRIPTION OF MANAGEMENT MEASURES

This Objective meets Element C of the 2003 Guidelines. Guidance for developing this objective can be found in Chapters 10 and 11 of the EPA Handbook.

Goals: Identify and describe the NPS management measures that will need to be implemented to achieve load reductions identified in Element B, and describe the critical areas where those measures will be needed to implement this plan. In addition, management measures may be identified to achieve other goals of the WPP.

Task 7.1 **Management Objectives** – The City of Boerne will develop management objectives targeted at specific pollutants or sources to achieve the goals of the WPP. Management objectives will be determined with the input and approval of the Stakeholder Group.

Task 7.2 **Identify Existing Management Efforts and Quantify their Effectiveness** – The City of Boerne will identify the programs, management strategies, and ordinances already being implemented in the watershed and determine the effectiveness of the measures in terms of achieving desired load reductions or meeting other management goals and objectives.

Task 7.3 **Select an Approach to Identifying, Quantifying the Effectiveness of, and Prioritizing BMPs** – The City of Boerne will select methodology(ies) and/or model(s) that will be used to identify needed BMPs, to quantify load reductions achieved by each proposed BMP and to prioritize the suite of potential BMPs. Methods and/or models will be determined with the input and approval of the Stakeholder Group.

Task 7.4 **Identify Critical Areas and New Management Measures Needed** – The City of Boerne will identify management practices that can be used to achieve the additional load reductions required, using the locations of pollutant sources identified in Element B. The critical areas and needed management measures will be determined with the input and approval of the Stakeholder Group.

Task 7.5 **Determine Load Reductions Provided by Each Proposed BMP** – The City of Boerne will provide estimated pollutant load reductions expected for each management measure proposed. This will be accomplished by using published literature values and other available data, with the recognition of the natural variability of site specific BMPs and the difficulty in precisely predicting the performance of management measures over time. A report detailing this information will be provided to the Stakeholder Group and the TCEQ Project Manager.

Task 7.6 **Prioritize BMPs** – The City of Boerne will prioritize potential BMPs, with consideration of water quality benefits, costs, stakeholder support and other factors identified. This Task is related to and is dependent upon Objective 8. The prioritization of management measures will be conducted with the input and approval of the Stakeholder Group.

Task 7.7 **Select Final Management Strategies** – The City of Boerne will develop Management Strategies and associated estimates of the total potential pollutant removal. Identify which combinations of management practices can meet the goals for load reductions and cost effectiveness.

Task 7.8 **Element C: Management Measures Report** –The City of Boerne will prepare a description and summary list of BMPs. Identify the specific need for each BMP and estimate load reductions that each BMP may provide. The suite of BMPs selected should reflect estimated load reductions needed to achieve water quality standards for the designated uses of the water body, and to achieve other goals of the WPP.

Measures of Success: A list of management measures which meets the watershed load reduction goals.

Deliverables:

- Draft and Final Element C: Management Measures Report

OBJECTIVE 8: ELEMENT D: ESTIMATE OF TECHNICAL AND FINANCIAL ASSISTANCE NEEDED

This Objective meets Element D of the 2003 Guidelines. Guidance for developing this objective can be found in Chapter 12 the EPA Handbook.

Goals: Estimate the amount of technical and financial assistance needed associated costs, and/or the sources and authorities that will be relied upon to implement the plan.

Task 8.1 **Estimate BMP Costs** – The City of Boerne will estimate the costs of implementing BMPs based on the type of management practice/restoration activity, installations, operation and maintenance, and method of cost calculation. Add the costs estimated to Element C: Description of Management Measures Report.

Task 8.2 **Identify Financial and Technical Assistance and Relevant Authorities Needed for WPP Implementation** – The City of Boerne will identify technical assistance needed for different stages of implementing the WPP, including:

- Continuation of watershed coordination and associated administrative costs
- Implementation, operation and maintenance of structural and educational BMPs
- Measuring the effectiveness of implementation measures through monitoring modeling, data analysis, and data management
- Updating the WPP

In addition, identify any relevant authority or legislation that specifically allows, prohibits, or requires action. Shortfalls between needs and available resources should be identified and addressed in the WPP.

Task 8.3 **Identify Funding Sources and Leverage Existing Resources** – The City of Boerne will identify opportunities to help fund each BMP listed in the WPP, including leveraging existing efforts and seeking in-kind services by using existing data sources, studies, partnerships and other contributions. Identify federal, state, local, and private funds or resources that are available to assist in implementing the plan.

Task 8.4 **Communicate with Potential Providers of Technical and Financial Assistance** – The City of Boerne will communicate with potential sources of technical and financial assistance to inform these entities/individuals about the WPP and the type and level of assistance desired. The City of Boerne will request letters of support for the development and implementation of the WPP.

Task 8.5 **Element D: Estimate of Technical & Financial Assistance Needed** – The City of Boerne will prepare a report that estimates BMP costs, identifies financial and technical assistance and relevant authorities needed, identifies funding sources and the existing sources leveraged, and provides the status of efforts to recruit technical and financial assistance needed.

Measures of Success: A report on financial and technical assistance needed to implement WPP, letters of support from potential providers of assistance for the WPP and its implementation.

Deliverables:

- Draft and Final Element D: Financial and Technical Assistance Report

OBJECTIVE 9: ELEMENT E: INFORMATION AND EDUCATION COMPONENT

This Objective meets a portion Element E of the 2003 Guidelines. Guidance for developing this objective can be found in Chapter 12 of the EPA Handbook.

Goals: Develop an information and education component used to enhance public understanding of the project and encourage the continued participation in implementation of WPP.

Task 9.1 **Define Education and Outreach Goals and Objectives** – The City of Boerne will identify education and outreach goals for WPP implementation. The outreach goals will be specific, measurable, action-oriented, and time-focused.

Task 9.2 **Identify and Analyze the Target Audience** – The City of Boerne will identify the audience which needs to be reached in order to meet the goals and objectives identified in Task 9.1.

Task 9.3 **Design the Education and Outreach Implementation Measures** – The City of Boerne will create an effective plan to reach the target audiences with specific information and social marketing solutions to inform the public, garner support and change behaviors. Activities may include:

- Partnerships with schools to conduct outreach water quality education
- Campaigns to distribute water protection brochures and market the outreach plan
- Urban growth workshops
- Septic system workshops
- Campaigns regarding illegal dumping and litter
- Agricultural waste collection days

Task 9.4 **Evaluate the Education and Outreach Program** – The City of Boerne will develop an evaluation component into the plan that measures success qualitatively and quantitatively to ensure the needed impact is generated through the education and outreach program and that the education and outreach goals of the WPP are met.

Task 9.5 **Element E: Information & Education Plan Report** – The City of Boerne will prepare a report that defines the education and outreach goals and objectives of the WPP, identifies and analyzes the target audience, designs the education and outreach measures to be implemented, and develops an evaluation component that measures success of education and outreach measures throughout implementation.

Measures of Success: Development of Education and Outreach Component in the Plan.

Deliverables:

- Draft and Final Element E: Information & Education Plan Report

OBJECTIVE 10: ELEMENT F: SCHEDULE FOR IMPLEMENTATION OF MANAGEMENT MEASURES

This Objective meets Element F of the 2003 Guidelines. Guidance for developing this objective can be found in Chapter 12 of the EPA Handbook.

Goals: Create a schedule for implementing the management measures identified in this plan that are reasonably expeditious.

Task 10.1 **Element F: Schedule of Implementing Management Measures Report** – The City of Boerne will develop a plan that will include a schedule of activities with dates for assessing progress in accomplishing the activities. The schedule should reflect the milestones developed in Element G. The schedule will be summarized in a table format.

Measures of Success: A schedule for the implementation of the management measures.

Deliverables:

- Draft and Final Element F: Schedule for Implementation of Management Measures Report

OBJECTIVE 11: ELEMENT G: DESCRIPTION OF INTERIM, MEASURABLE MILESTONES

This Objective meets Element G of the 2003 Guidelines. Guidance for developing this objective can be found in Chapter 12 of the EPA Handbook.

Goals: Develop descriptions of interim measurable milestones for determining whether NPS management measures or other control actions are being implemented.

Task 11.1 **Element G: Description of Interim and Long term Measurable Milestones Report** – The City of Boerne will develop a plan that will include measurable milestones to measure progress in implementing the management measures, and to determine whether they are being implemented on schedule. The milestones should reflect the schedule for implementing the WPP developed in Element F and the criteria for determining effectiveness of implementation measures developed in Element H. The milestones will be summarized in a table format.

Measures of Success: Interim and Measurable Milestones Defined

Deliverables:

- Draft and Final Element G: Description of Interim and Long term Measurable Milestones Report

OBJECTIVE 12: ELEMENT H: CRITERIA TO DETERMINE IF LOAD REDUCTIONS ARE ACHIEVED

This Objective meets Element H of the 2003 Guidelines. Guidance for developing this objective can be found in Chapter 12 of the EPA Handbook.

Goals: Establish a set of criteria that can be used to determine whether loading reductions are being achieved over time and substantial progress is being made toward attaining water quality standards.

In addition, a set of criteria will be established to determine if the other milestone measures and goals of the WPP are being achieved.

Task 12.1 **Criteria to Determine Load Reductions** – The City of Boerne will develop a plan that will measure the effectiveness of the management measures in regard to accomplishments in loading reductions and advances toward attaining water quality standards and other goals of the WPP. The plan will establish assessment criteria for water quality and outreach efforts and will consider other means to quantify the success of BMPs.

Task 12.2 **Plan for Adaptive Management** – The City of Boerne will develop a plan for adaptive management that will provide the basis for determining whether the WPP needs to be revised if interim targets are not met. Possible revisions could include changing management practices, updating the loading analyses, and reassessing the time it takes for pollution concentrations to respond to treatment.

Task 12.3 **Final Element H: Criteria to Determine if Load Reductions are Achieved Report** – The City of Boerne will develop a report that describes a plan to measure the effectiveness of the management measures implemented and a plan for adaptive management based on the effectiveness of implementation efforts.

Measures of Success: Criteria to Determine if Load Reductions are Achieved/Adaptive Management Report.

Deliverables:

- Draft and Final Element H: Criteria to Determine if Load Reductions are Achieved Report

OBJECTIVE 13: ELEMENT I: MONITORING COMPONENT TO EVALUATE EFFECTIVENESS

This Objective meets Element I of the 2003 Guidelines. Guidance for developing this objective can be found in Chapter 12 of the EPA Handbook.

Goals: Develop a monitoring component to evaluate the effectiveness of the implementation efforts over time, measured against the criteria established under Element H.

Task 13.1 **Element I: Monitoring Component to Evaluate Effectiveness Report** – The City of Boerne will develop a monitoring component to evaluate the effectiveness of implementation efforts. The monitoring component will determine whether progress is being made toward attaining or maintaining the applicable water quality standards and other goals of the WPP. The monitoring program should be fully integrated with the established schedule and with the interim milestone criteria identified. The monitoring component should be designed to determine whether loading reductions are being achieved over time and if substantial progress in meeting water quality standards is being made. Watershed-scale monitoring can be used to measure the effects of multiple programs, projects, and trends over time. Instream monitoring does not have to be conducted for individual BMPs.

Measures of Success: Element I: Monitoring Component to Evaluate Effectiveness Report

Deliverables:

- Draft and Final Element I: Monitoring Component to Evaluate Effectiveness Report

OBJECTIVE 14: COMPLETION OF THE WPP

Guidance for developing this objective can be found in Chapter 12 of the EPA Handbook.

Goals: Compile the WPP and receive approval from the Stakeholder Group.

Task 14.1 **Compile the WPP** – The City of Boerne will compile the approved sections of the WPP. The WPP will include the following information:

- Title
- Table of Contents
- Executive Summary (see Task 14.2)
- Acknowledgement of the Stakeholder Group and other contributors to the WPP Project
- Introduction
- Problem Definition
- Designated Uses and Water Quality Standards
- Description of Watershed
- Compilation of the reports produced under Objectives 2 through 13 and summaries of accomplishments under Objectives 15 and 16 of this project.
- Results and Observations
- List of references of data used
- Appendices of important documents or information needed for explanation and implementation of the WPP

Task 14.2 **9 Elements of the Watershed Plan Summary** – The City of Boerne will develop a plan that will include in the Executive Summary Section of the WPP, a summary of EPA's nine elements of watershed plans, how the WPP achieves these elements, and in which sections of the WPP these elements are addressed.

Task 14.3 **Receive Approval of the Final WPP from the TCEQ** – The City of Boerne will submit the Draft WPP to the TCEQ NPS Program for review, and will respond to comments provided by the TCEQ.

Task 14.4 **Receive Approval of the Final WPP from the Stakeholder Group** – The City of Boerne will present the Draft WPP to the Stakeholder Group for review and approval. The City of Boerne will respond to comments provided by the Stakeholder Group.

Task 14.5 **Present Final WPP to Relevant Officials** – The City of Boerne will present the Final WPP to local officials and programs which provide potential sources of funding for education and support.

Task 14.6 **Present Final WPP to the Public** – The City of Boerne will present the Final WPP to the public for education and support.

Measures of Success: Completion of the WPP.

Deliverable:
- Draft and Final WPP
- Letter of Approval from the Stakeholder Group
- Documentation of presentations to relevant officials and the public

OBJECTIVE 15: FIELD GUIDE TO THE CIBOLO CREEK

Goal: To develop a guide to the Cibolo Creek Watershed that will describe the flora and fauna of the watershed and its dependence upon the water quality of the Cibolo Creek. The guide will provide a public education tool that can be used in schools as well as in adult educational settings. The guide will compile the basic knowledge of the watershed into one document that is accessible to the general public.

Task 15.1 **Research and Write Field Guide** – The City of Boerne will contract with a professional aquatic biologist or other qualified scientist to research and write a field guide to the Cibolo Creek. The guide will be modeled after A Guide to Freshwater Ecology published by the TCEQ, but will be specifically geared towards the Cibolo Creek ecology.

Task 15.2 **Design Field Guide** – The City of Boerne will contract with professional graphic and book designers to design a finished form for the field guide publication to ensure it contains sufficient graphics and is easy to read and understandable to adults and children.

Task 15.3 **Publish Field Guide** – The City of Boerne will contract with a printer or other company to publish the field guide in a printed and/or electronic format. It is recognized that an electronic format may make it more accessible to children, and be less expensive to produce.

Measure of Success: A published field guide specific to the Cibolo Creek Watershed.

Deliverables:
- Draft Field Guide
- Published Field Guide

OBJECTIVE 16: DEMONSTRATIONS

Goal: To ensure stakeholder involvement and maintain public enthusiasm for the project and to act as a transition to the implementation of the plan developed under this project.

Task 16.1 **Reclamation Tree Planting** – The City of Boerne will coordinate the planting of trees along Cibolo Creek. This is a project to enhance the riparian habitat by reclaiming areas previously impacted by changes in land use. This project will help maintain enthusiasm for the WPP project by providing a means for more concrete involvement of the public.

Task 16.2 **Exotic, Invasive Tree Species Removal** – The City of Boerne will coordinate the removal of invasive plant species. Performance of this demonstration will help ensure the cooperation of project partners in the overall project.

Measure of Success: Maintained stakeholder involvement as evidenced by contribution of funds and/or volunteer hours to perform demonstrations.

Deliverables:

- Exotic, Invasive Tree Species Removal Report
- Reclamation Tree Planting Report

Schedule of Deliverables

The Schedule of Deliverables is based on the contract execution date. The Schedule of Deliverables will be adjusted accordingly if the contract execution is delayed.

Task No.	Deliverable	Due Date
	Post Award Meeting & Minutes	To be determined
1.1	Project oversight status	Quarterly
1.2	Quarterly Progress Reports	The 15th of the month following each state fiscal quarter
1.3	Quarterly Reimbursement Request Forms	The end of the month following each state fiscal quarter
1.4	Quarterly conference call or meeting with the TCEQ Project Manager & Minutes	The second month of each state fiscal quarter
1.5	Contractor Self-Evaluation	15 days following the end of the state fiscal year
1.6	Project Fact Sheet	Within 60 days of contract execution
1.6	Project Fact Sheet Update	15 days following the end of the state fiscal year
1.7	Project Annual Report Article (when requested)	15 days following the end of the state fiscal year or when requested
1.8	Hire Watershed Plan Coordinator	30 days after contract initiation
2.1	Draft PPP	8/15/09
2.1	1st Stakeholder Meeting	10/15/09
2.1	Final PPP	10/31/09
2.6	Project webpage completion reported	8/31/09
2.6	Project webpage updates reported	With QPRs
2	The following items will be submitted to the TCEQ Project Manager for approval prior to publishing/purchasing: o Press releases, press conference agendas o Meeting agendas o Public events /workshops/demonstrations plans, documents o Education and outreach materials o Signs and storm drain stencils implementation documentation, including maps and photographs o Citizens Scientist projects/surveys	Ongoing

2	Stakeholder Group and Public meetings/events agendas, minutes, sign in sheets, pictures and other available documentation	With QPRs
2	Final copies of all public information produced and media coverage regarding the Cibolo will be submitted to the TCEQ Project Manager	With QPRs
2	Report on attendance at local and regional meetings to communicate and obtain input on the project	With QPRs
2.8	Citizen Scientist projects and surveys – Guadalupe Bass population Draft Document	7/15/10
2.8	Citizen Scientist projects and surveys – Guadalupe Bass Population Final Document	8/31/10
2.8	Citizen Scientist projects and surveys – Riparian Flora Draft Document	7/15/10
2.8	Citizen Scientist projects and surveys – Riparian Flora Final Document	8/31/10
2.8	Citizen Scientist projects and surveys – Odonates Draft Document	7/15/10
2.8	Citizen Scientist projects and surveys – Odonates Final Document	8/31/10
2	PPP Progress Reports	Biannually (2 times per year) with QPRs
3	Draft Watershed Characterization – Phase 1: Data Inventory Report	2/28/10
3	Final Watershed Characterization – Phase 1: Data Inventory Report	4/15/10
4.1 - 4.3	Draft Sampling Plan, including DQOs and data review	Within 45 days of contract execution
4.4	QAPP Planning Meeting minutes	15 days after QAPP Planning Meeting
4.1 - 4.3	Final Sampling Plan, including DQOs and data review	30 days after QAPP Planning Meeting
4.5	Draft QAPP for Monitoring submitted to the TCEQ	20 days after receiving TCEQ comments on Draft QAPP
4.5	Final QAPP for Monitoring submitted to the TCEQ	Within 45 days of contract execution
4.6	Draft QAPP for Modeling submitted to the TCEQ	11/15/09
4.6	Final QAPP for Modeling submitted to the TCEQ	12/31/09

4.7	Draft QAPP Updates submitted to the TCEQ Annually	60 days prior to the end of the effective period of the QAPP
4.7	Final QAPP Updates submitted to the TCEQ Annually	45 days prior to the end of the effective period of the QAPP
4.8	Draft QAPP Amendments	75 days prior to change in sampling plan implemented
4.8	Final QAPP Amendments	45 days prior to change in sampling plan implemented
4.9	Data Collection status updates	With QPRs
4.10	Modeling status updates	With QPRs
4.11	Data Submittals	Quarterly & and at least 1 month prior to use, or prior to presenting to stakeholders
4.11	Water quality monitoring non-conformances will be reported	As soon as possible and with QPRs
4.12	Draft Watershed Characterization – Phase 2: Data Collection and Analysis Report	8/15/10
4.12	Final Watershed Characterization – Phase 2: Data Collection and Analysis Report	10/31/10
5.1	Revised/refined watershed goals & targets	8/30/10
5	Watershed maps that identify the causes and sources of water quality problems	10/15/10
5	Draft Watershed Characterization - Phase 3: Identification of Causes and Sources of Pollution and Estimation of Pollutant Loads Report	10/15/10
5	Final Watershed Characterization - Phase 3: Identification of Causes and Sources of Pollution and Estimation of Pollutant Loads Report	11/30/10
6	Draft Element B: Estimate of Pollutant Load Reductions Expected from Management Measures Report	2/15/11
6	Final Element B: Estimate of Pollutant Load Reductions Expected from Management Measures Report	3/31/11

7	Draft Element C: Management Measures Report	2/15/11
7	Final Element C: Management Measures Report	3/31/11
8	Draft Element D: Financial and Technical Assistance Report	2/15/11
8	Final Element D: Financial and Technical Assistance Report	3/31/11
9	Draft Element E: Information & Education Plan Report	2/15/11
9	Final Element E: Information & Education Plan Report	3/31/11
10	Draft Element F: Schedule for Implementation of Management Measures Report	3/15/11
10	Final Element F: Schedule for Implementation of Management Measures Report	4/30/11
11	Draft Element G: Element G: Description of Interim and Long term Measurable Milestones Report	3/15/11
11	Final Element G: Element G: Description of Interim and Long term Measurable Milestones Report	4/30/11
12	Draft Element H: Criteria to Determine if Load Reductions are Achieved Report	4/15/11
12	Final Element H: Criteria to Determine if Load Reductions are Achieved Report	5/31/11
13	Draft Element I: Monitoring Component to Evaluate Effectiveness Report	4/15/11
13	Final Element I: Monitoring Component to Evaluate Effectiveness Report	5/31/11
14	Draft WPP	9/31/11
14	Final WPP	1/31/12
14.4	Letter of Approval from the Stakeholder Group	2/29/12
14.5, 14.6	Documentation of presentations to relevant officials and the public	2/29/12
15	Draft Field Guide	3/31/10
15	Published Field Guide	5/15/10
16	Exotic, Invasive Tree Species Removal reported	10/31/11
16	Reclamation Tree Planting reported	11/30/11

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 City of Boerne.

Data Format and Structure		**Y, N, or N/A**
A.	Are there any duplicate *Tag_Ids* in the *Events* file?	
B.	Are all *StationIds* associated with assigned station location numbers?	
C.	Are all dates in the correct format, MM/DD/YYYY?	
D.	Are all times based on the 24 hour clock format, HH:MM?	
E.	Is the *Comment* field filled in where appropriate (e.g. unusual occurrence, sampling problems)?	
F.	Are *Submitting Entity*, *Collecting Entity*, and *Monitoring Type* codes used correctly?	
G.	Do the *Enddates* in the *Results* file match those in the *Events* file for each *Tag_Id*?	
H.	Are all measurements represented by a valid *Parameter code* with the correct units?	
I.	Are there any duplicate *Parameter code* for the same *Tag_Id*?	
J.	Are there any invalid symbols in the Greater Than/Less Than (*Gt/lt*) field?	
K.	Are there any tag numbers in the *Result* file that are not in the *Event* file?	
L.	Have verified outliers been identified with a "1" in the *Remark* field?	
Data Quality Review		
A.	Are all the "less-than" values reported at or below the specified reporting limit?	
B.	Have checks on correctness of analysis or data reasonableness performed? e.g.: Is ortho-phosphorus less than total phosphorus? Are dissolved metal concentrations less than or equal to total metals?	
C.	Have at least 10% of the data in the data set been reviewed against the field and laboratory data sheets?	
D.	Are all *Parameter codes* in the data set listed in the QAPP?	
E.	Are all *StationIds* in the data set listed in the QAPP?	
Documentation Review		
A.	Are blank results acceptable as specified in the QAPP?	
B.	Was documentation of any unusual occurrences that may affect water quality included in the *Event* table's *Comments* field?	
C.	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.	
D.	Were there any failures in field and laboratory measurement systems that were not resolvable and resulted in unreportable data? If yes, explain on next page.	

Describe any data reporting inconsistencies with performance specifications. Explain failures in sampling methods and field and laboratory measurement systems that resulted in data that could not be reported to the TCEQ. (attach another page if necessary):

Date Submitted to TCEQ: _____

TAG Series: _____

Date Range: _____

Data Source: _____

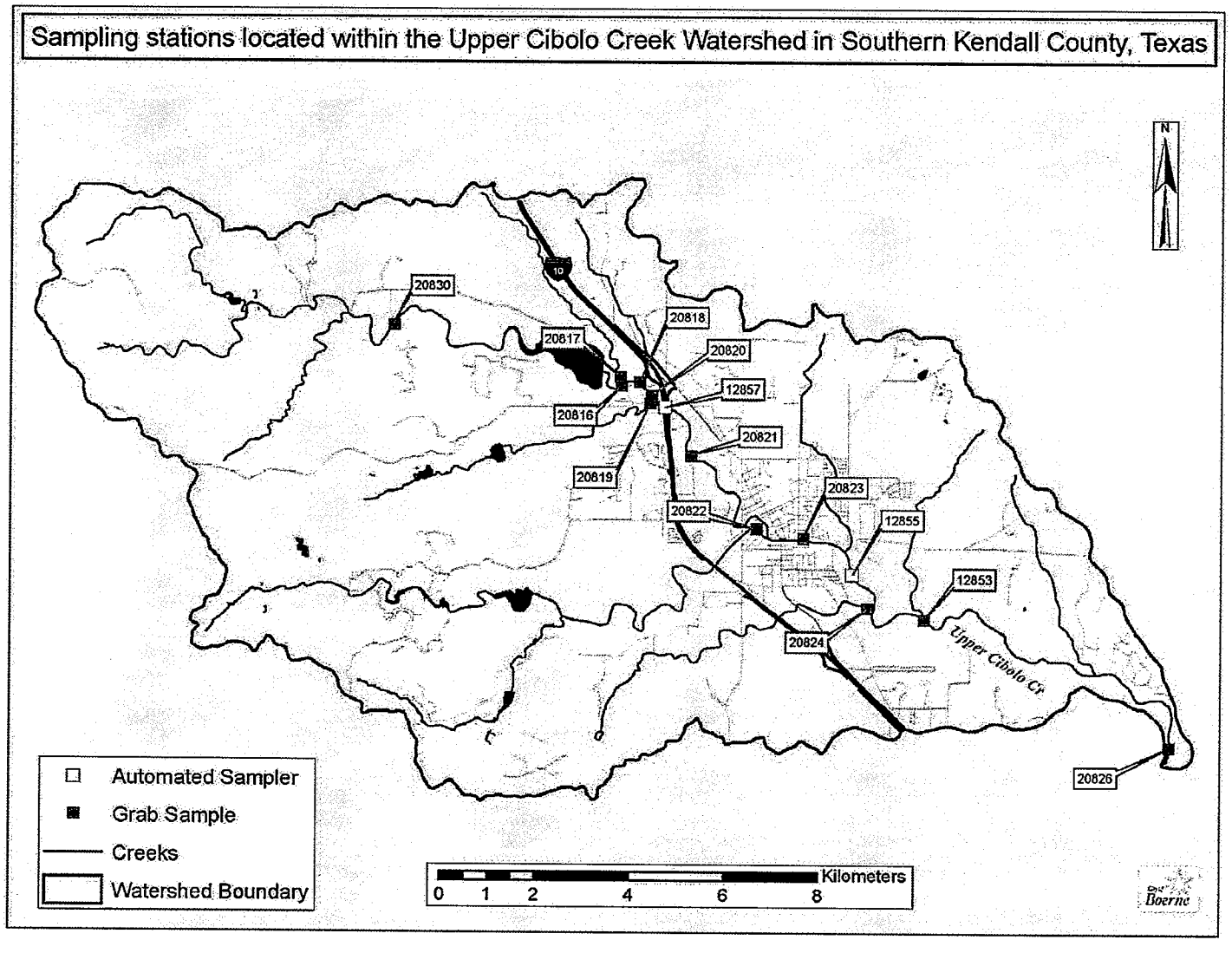
Comments (attach file if necessary): _____
_____
_____
_____
_____
_____
_____

City of Boerne's Signature: _____

Date: _____

Appendix D. Detailed Site Location Map

Figure D1.1 Sampling Station



Map

Appendix E. Field Data Reporting Form

Field Data Sheet

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

Station Id: (TCEQ-#####)_____ Station Location: _____

Program Code: ☐(Specify) _____

Sample Type: ☐ RT ☐ BF ☐ SS (Specify Requestor in Comments)

Collection Method: ☐ Grab ☐ Composite Instrument #:_____

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

Collector(s) Signature(s): _____

# of Containers/Container Type	Type of Field Preservation
_____GC - Gallon Cubitainer	☐ Ice ☐ H_2SO_4 ☐ HNO_3 ☐ Filtered
_____QC - Quart Cubitainer	☐ Ice ☐ H_2SO_4 ☐ HNO_3 ☐ Filtered
_____AP - Amber Plastic Bottle	☐ Ice ☐ H_2SO_4 ☐ HNO_3 ☐ Filtered
_____LW - Large Whirlpak	☐ Ice ☐ H_2SO_4 ☐ HNO_3 ☐ Filtered
_____PB - Plastic Bottle	☐ Ice ☐ H_2SO_4 ☐ HNO_3 ☐ Filtered
_____Other (Specify)_____	☐ Ice ☐ H_2SO_4 ☐ HNO_3 ☐ Filtered
_____Other (Specify)_____	☐ Ice ☐ H_2SO_4 ☐ HNO_3 ☐ Filtered

☐ Field Parameters ☐ Flow (See back of page)

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

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

Parameter	Code	Field Observations			
Flow Severity	01351	☐ 1 – No Flow ☐ 2 – Low	☐ 3 – Normal ☐ 4 – Flood	☐ 5 – High ☐ 6 - Dry	
Water Color	89969	☐ 1 – Brown ☐ 2 – Reddish	☐ 3 – Green ☐ 4 – Black	☐ 5 – Clear ☐ 6 – Other (Specify in Comments)	
Water Odor	89971	☐ 1 – Sewage ☐ 2 – Oily / Chemical	☐ 3 – H_2S ☐ 4 – Musky	☐ 5 – Fishy ☐ 6 – None	☐ 7 – Other (Specify in Comments)
Present Weather	89966	☐ 1 – Clear ☐ 2 – Partly Cloudy	☐ 3 – Cloudy ☐ 4 – Rain		

COMMENTS: _____

_____

_____

CHAIN OF CUSTODY

Relinquished By:_____ Date:_____ Time:_____

Received By:_____ Date:_____ Time:_____

Relinquished By:_____ Date:_____ Time:_____

Received By:_____ Date:_____ Time:_____

Stream Discharge Measurement

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

Appendix F. Chain-of-Custody Form

SAN ANTONIO RIVER AUTHORITY
Water Brings Us Together

CHAIN OF CUSTODY

600 E. Euclid
San Antonio, TX 78212
Phone: (210) 302-3649
FAX (210) 302-3694

Report To: _____ Phone #: _____ Collector's Name: _____

Address: _____ FAX #: _____ Field Comments: _____

City, State, ZIP: _____ E-mail: _____

☐Rush Analysis(Additional Fees Apply) ☐0-3 days ☐ 4-6 days Report Delivery: ☐Mail ☐Fax ☐E-mail Method of Shipment: ☐Hand Delivered ☐Mailed ☐Ice

Sample # Lab Use Only	Client Sample Location	1. Collection Method	2. Sample Type	3. Matrix	4. Composite Start Date/Time	Collection Date/Time	5. Container Type	Requested Analyses										6. Type of Preservation	Lab Use ONLY: Receipt Temp (°C) Therm. ID: C01-15 Observed / Corrected	Lab Use ONLY: pH <2 Y or N pH Paper: R006336

Relinquished by: Date/Time: Received by: Date/Time:

Relinquished by: Date/Time: Received by: Date/Time:

Relinquished by: Date/Time: Received by: Date/Time:

Relinquished by: Date/Time: Received by: Date/Time:

Lab Comments:

NA - Not Applicable

1. **Collection Method**: G - Grab C - Composite
2. **Sample Type**: EF – Effluent, IF – Influent, BW – Bottled Water SW – Surfacewater, ST – Stormwater, PW – Private Well, O – Other (Specify in Comments
3. **Matrix**: DW – Drinking Water, NPW – Non-Potable Water, SE – Sediment, SO – Soil, O – Other (Specify in Comments)
4. Composite Samples require Composite Start Date/Time and Collection Date/Time
5. **Container Type**: GC – Gallon Cubitainer, QC Quart Cubitainer, AB – Amber Glass Bottle, CB – Clear Glass Bottle, DS Drinking Water Screwtop, PB-Plastic Bottle, AP-Amber Plastic
6. **Type of Preservation** : U – Unpreserved (No Chemical Preservation), S – Sulfuric Acid, H – Hydrochloric Acid, N – Nitric Acid, P – Phosphoric Acid, O – Other (Specify in Comments

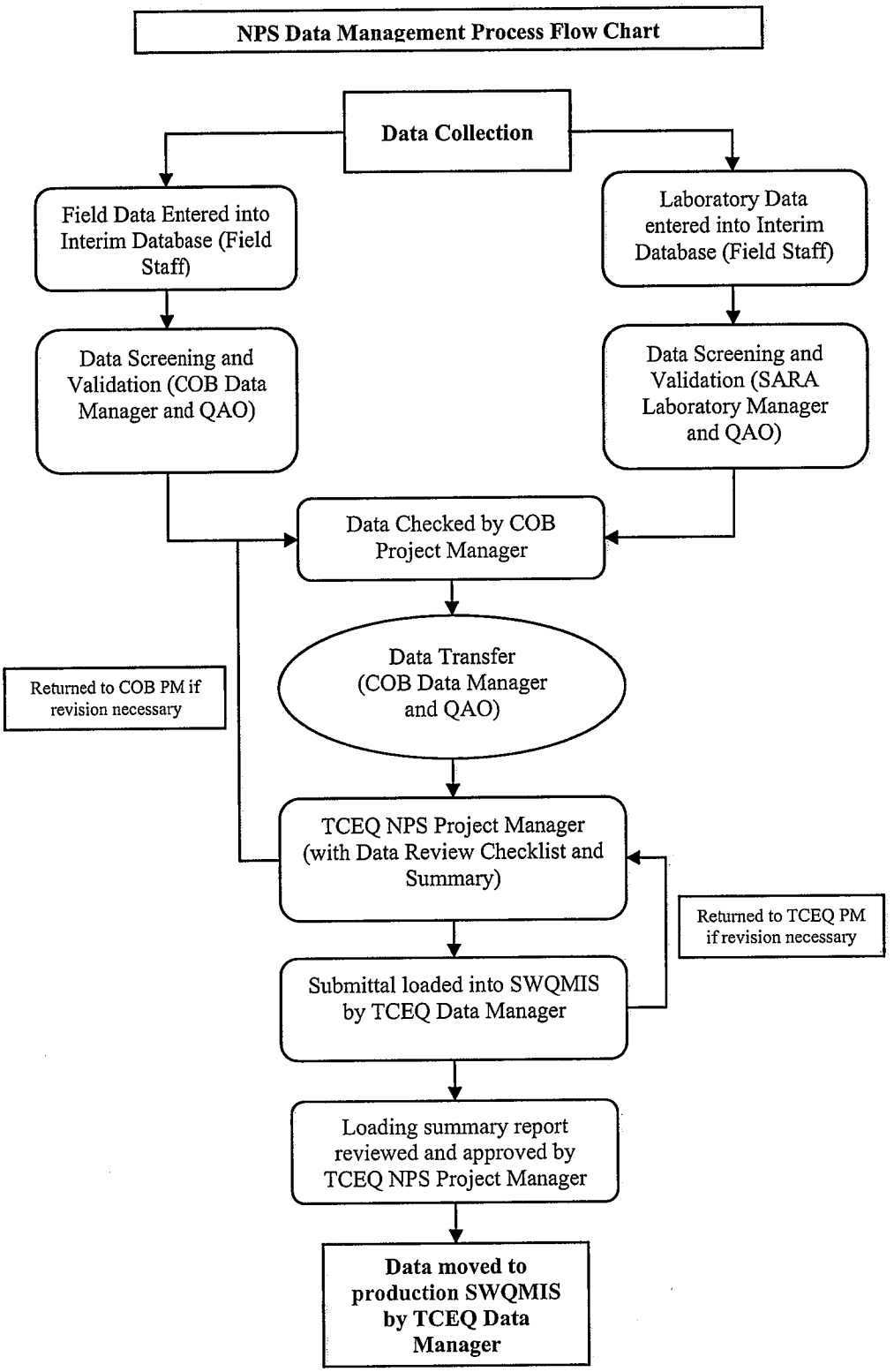
Appendix G. Automated Sampler Testing and Maintenance Requirements

Testing Requirements – Units will be tested at least once prior to a sampling event to determine if the settings have been properly entered and that the autosampler collects the required samples according to the desired schedule. Refer to Table B1.

Maintenance Requirements – Regular maintenance for the autosampler units will be performed prior to deploying the unit for a stormwater event. Refer to auto-sampler manual for specific information regarding maintenance and replacement of parts.

1. Check for proper time settings
2. Inspect the pump tube for wear. Replace it if necessary
3. Clean the pump tubing housing
4. Change the suction line if necessary.
5. Clean the bottles, suction line, strainer, and pump tube.
6. Check the humidity indicator.
7. When the battery warning appears on the display, replace the controller's internal battery.

Appendix H. Data Management Flow Chart


NPS Data Management Process Flow Chart
Data Collection
Field Data Entered into Interim Database (Field Staff)
Laboratory Data entered into Interim Database (Field Staff)
Data Screening and Validation (COB Data Manager and QAO)
Data Screening and Validation (SARA Laboratory Manager and QAO)
Data Checked by COB Project Manager
Data Transfer (COB Data Manager and QAO)
Returned to COB PM if revision necessary
TCEQ NPS Project Manager (with Data Review Checklist and Summary)
Returned to TCEQ PM if revision necessary
Submittal loaded into SWQMIS by TCEQ Data Manager
Loading summary report reviewed and approved by TCEQ NPS Project Manager
Data moved to production SWQMIS by TCEQ Data Manager

Appendix I: Corrective Action Status Table

Appendix I - Corrective Action Status Table

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

Appendix J: Corrective Action Plan Form

Appendix J - Corrective Action Plan Form

Corrective Action Plan
Issued by:_____ Date Issued_____ Report No._____
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?
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?

Appendix K: Example Letter to Document Adherence to the QAPP

Example Letter to Document Adherence to the QAPP

TO: (name)
(organization)

FROM: Ryan Bass
Watershed Coordinator
City of Boerne
402 E. Blanco
Boerne, TX 78006

RE: Upper Cibolo Creek Watershed Protection Plan Quality Assurance Project Plan

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

Ryan Bass
Watershed Coordinator
City of Boerne
402 E. Blanco
Boerne, TX 78006

I acknowledge receipt of the "QAPP Title, Revision Date". I understand the document(s) describe 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 pertaining to my program. Furthermore, I will ensure that all staff members participating in Clean Rivers Program activities will be required to familiarize themselves with the document contents and adhere to them as well.

_____

Signature Date

Appendix L: Autosampler Programs

********** PROGRAM SETTINGS **********

PROGRAM NAME:
"Upper Cibolo Creek "
SITE DESCRIPTION:
"IH-10 Station 12857 "

UNITS SELECTED:
LENGTH: ft

UNITS SELECTED:
FLOW RATE: cfs
FLOW VOLUME: Mgal

BUBBLER MODULE:
DATA POINTS
"DATA SET 1"
30 POINTS ENTERED

---

15 MINUTE
DATA INTERVAL

1, 16.0 lit BTLS
24 ft SUCTION LINE
AUTO SUCTION HEAD
1 RINSES, 0 RETRIES

ONE-PART PROGRAM

PACING:
FLOW, EVERY
95.90 Mgal
NO SAMPLE AT START

COMPOSITE:

RUN CONTINUOUSLY

VOLUME:
1,260 ml SAMPLES

ENABLE:

LEVEL >0.25 ft

ENABLE:
ONCE ENABLED,
STAY ENABLED
NO SAMPLE AT ENABLE

ENABLE:
0 MINUTE DELAY TO
START OF SAMPLING

ENABLE:
0 PAUSE & RESUMES

NO DELAY TO START

LIQUID DETECT ON

QUICK VIEW/CHANGE

TAKE MEASUREMENTS
EVERY 1 MINUTES

DUAL SAMPLER OFF
BTL FULL DETECT OFF
TIMED BACKLIGHT

EVENT MARK SENT
DURING PUMP CYCLE

PUMP COUNTS FOR
EACH PURGE CYCLE:
200 PRE-SAMPLE
AUTO POST-SAMPLE

NO PERIODIC
SERIAL OUTPUT

INTERROGATOR

CONNECTOR
POWER ALWAYS ON

NO RAIN GAUGE

NO SDI-12 SONDE

AUTO SDI-12 SCAN OFF

I/O1= NONE
I/O2= NONE
I/O3= NONE

---

0 ANALOG OUTPUTS

NO DIALOUT
CONDITIONS SET

********** PROGRAM SETTINGS **********

PROGRAM NAME:
"Upper Cibolo Creek "
SITE DESCRIPTION:
"CNC Station 12855 "

UNITS SELECTED:
LENGTH: ft

UNITS SELECTED:
FLOW RATE: cfs
FLOW VOLUME: Mgal

BUBBLER MODULE:
DATA POINTS
"DATA SET 1"
30 POINTS ENTERED

---

15 MINUTE
DATA INTERVAL

1, 16.0 lit BTLS
24 ft SUCTION LINE
AUTO SUCTION HEAD
1 RINSES, 0 RETRIES

ONE-PART PROGRAM

PACING:
FLOW, EVERY
191.78 Mgal
NO SAMPLE AT START

COMPOSITE:

RUN CONTINUOUSLY

VOLUME:

1,260 ml SAMPLES

ENABLE:

LEVEL >0.25 ft

ENABLE:
ONCE ENABLED,
STAY ENABLED
NO SAMPLE AT ENABLE

ENABLE:
0 MINUTE DELAY TO
START OF SAMPLING

ENABLE:
0 PAUSE & RESUMES

NO DELAY TO START

LIQUID DETECT ON

QUICK VIEW/CHANGE

TAKE MEASUREMENTS
EVERY 1 MINUTES

DUAL SAMPLER OFF
BTL FULL DETECT OFF
TIMED BACKLIGHT

EVENT MARK SENT
DURING PUMP CYCLE

PUMP COUNTS FOR
EACH PURGE CYCLE:
200 PRE-SAMPLE
AUTO POST-SAMPLE

NO PERIODIC
SERIAL OUTPUT

INTERROGATOR
CONNECTOR
POWER ALWAYS ON

NO RAIN GAUGE

NO SDI-12 SONDE

AUTO SDI-12 SCAN OFF

I/O1= NONE
I/O2= NONE
I/O3= NONE

---

0 ANALOG OUTPUTS

NO DIALOUT
CONDITIONS SET
