SURFACE WATER QUALITY MONITORING PROJECT
FOR THE
GUADALUPE RIVER BASIN

QUALITY ASSURANCE PROJECT PLAN

Guadalupe-Blanco River Authority
933 E. Court St.
Seguin, Texas 78155

CLEAN RIVERS PROGRAM
WATER QUALITY PLANNING DIVISION
TEXAS COMMISSION ON ENVIRONMENTAL QUALITY
P.O. BOX 13087, MC 234
AUSTIN, TEXAS 78711-3087

EFFECTIVE PERIOD: FY 2012 TO FY 2013

QUESTIONS CONCERNING THIS QAPP SHOULD BE DIRECTED TO:

Debbie Magin
Director of Water Quality Services
933 E. Court St.
Seguin, Texas 78155
(830) 379-5822
dmagin@gbra.org

A1 APPROVAL PAGE

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Water Quality Planning Division

Laurie Curra, Manager Date
Water Quality Monitoring & Assessment Section

Allison Woodall, Work Leader Date
Clean Rivers Program

Jennifer Delk Date
Project QA Specialist
Clean Rivers Program

Allison Woodall Date
Project Manager, Clean Rivers Program

Nancy Ragland, Team Leader Date
Data Management and Analysis

Field Operations Support Division

Stephen Stubbs Date
TCEQ Quality Assurance Manager

Daniel R. Burke Date
Lead CRP Quality Assurance Specialist
Quality Assurance Section

GUADALUPE-BLANCO RIVER AUTHORITY and REGIONAL LABORATORY

Debbie Magin GBRA Project Manager	Date	Josephine Longoria GBRA Quality Assurance Officer	Date

UPPER GUADALUPE RIVER AUTHORITY LABORATORY

Tara Bushnoe UGRA Project Manager	Date	Amy Bryant UGRA Laboratory Manager	Date

SAN ANTONIO RIVER AUTHORITY ENVIRONMENTAL LABORATORY

Chuck Lorea SARA Laboratory Director	Date	Patricia Carvajal SARA Quality Assurance Officer	Date

LOWER COLORADO RIVER AUTHORITY ENVIRONMENTAL LABORATORY SERVICES

Alicia Gill LCRA Laboratory Manager	Date	Hollis Pantalion LCRA Quality Assurance Officer	Date

GBRA will secure written documentation from each sub-tier project participant (e.g., subcontractors, other units of government) stating the organization's awareness of and commitment to requirements contained in this quality assurance project plan and any amendments or added appendices of this plan. GBRA will maintain this documentation as part of the project's quality assurance records, and will ensure the documentation is available for review. (See sample letter in Attachment 1 of this document.)

A2 TABLE OF CONTENTS

Tables:

Figures:

LIST OF ACRONYMS

AWRL	Ambient Water Reporting Limit
BMP	Best Management Practices
CAP	Corrective Action Plan
COC	Chain of Custody
CRP	Clean Rivers Program
DOC	Demonstration of Capability
DMRG	Data Management Reference Guide
DM&A	Data Management and Analysis
DQO	Data Quality Objective
EPA	United States Environmental Protection Agency
FY	Fiscal Year
GBRA	Guadalupe-Blanco River Authority
GIS	Geographical Information System
GPS	Global Positioning System
HZ	Hays County Development Services Department
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
LIMS	Laboratory Information Management System
LOD	Limit of Detection
LOQ	Limit of Quantitation
LCRA	Lower Colorado River Authority
NELAP	National Environmental Lab Accreditation Program
QA	Quality Assurance
QM	Quality Manual
QAO	Quality Assurance Officer
QAPP	Quality Assurance Project Plan
QAS	Quality Assurance Specialist
QC	Quality Control
QMP	Quality Management Plan
RBP	Rapid Bioassessment Protocol
RWA	Receiving Water Assessment
SARA	San Antonio River Authority
SLOC	Station Location
SOP	Standard Operating Procedure
SWQM	Surface Water Quality Monitoring
SWQMIS	Surface Water Quality Monitoring Information System
TMDL	Total Maximum Daily Load
TCEQ	Texas Commission on Environmental Quality
TNI	The NELAP Institute
TSWQS	Texas Surface Water Quality Standards
UGRA	Upper Guadalupe River Authority
VOA	Volatile Organic Analytes
WVWA	Wimberley Valley Watershed Association

A3 DISTRIBUTION LIST

Texas Commission on Environmental Quality
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San Marcos, TX 78667

Brooke Leftwich
(512)393-2177

LCRA ENVIRONMENTAL LAB SERVICES
3505 Montopolis
Austin, TX 78744

Gary Franklin
(512) 356-6023

GBRA will provide copies of this project plan and any amendments or appendices of this plan to each person on this list and to each sub-tier project participant, e.g., subcontractors, other units of government. GBRA will document distribution of the plan and any amendments and appendices, maintain this documentation as part of the project's quality assurance records, and will ensure the documentation is available for review.

A4 PROJECT/TASK ORGANIZATION

Description of Responsibilities

TCEQ

Allison Woodall
CRP Work Leader

Responsible for TCEQ activities supporting the development and implementation of the Texas Clean Rivers Program. Responsible for verifying that the QMP is followed by CRP staff. Supervises TCEQ CRP staff. Reviews and responds to any deficiencies, corrective actions, or findings related to the area of responsibility. Oversees the development of QA guidance for the CRP. Reviews and approves all QA audits, corrective actions, reviews, reports, work plans, contracts, QAPPs, and TCEQ QMP. Enforces corrective action, as required, where QA protocols are not met. Ensures CRP personnel are fully trained.

Daniel R. Burke
CRP Lead Quality Assurance Specialist

Participates in the development, approval, implementation, and maintenance of written quality assurance standards (e.g., Program Guidance, SOPs, QAPPs, QMP). Assists program and project manager in developing and implementing quality system. Serves on planning team for CRP special projects. Coordinates the review and approval of CRP QAPPs. Prepares and distributes annual audit plans. Conducts monitoring systems audits of Planning Agencies. Concurs with and monitors implementation of corrective actions. Conveys QA problems to appropriate management. Recommends that work be stopped in order to safeguard programmatic objectives, worker safety, public health, or environmental protection. Ensures maintenance of QAPPs and audit records for the CRP.

Allison Woodall
CRP Project Manager

Responsible for the development, implementation, and maintenance of CRP contracts. Tracks, reviews, and approves deliverables. Participates in the development, approval, implementation, and maintenance of written quality assurance standards (e.g., Program Guidance, SOPs, QAPPs, QMP). Assists CRP Lead QA Specialist in conducting Basin Planning Agency audits. Verifies QAPPs are being followed by contractors and that projects are producing data of known quality. Coordinates project planning with the Basin Planning Agency Project Manager. Reviews and approves data and reports produced by contractors. Notifies QA Specialists of circumstances which may adversely affect the quality of data derived from the collection and analysis of samples. Develops, enforces, and monitors corrective action measures to ensure contractors meet deadlines and scheduled commitments.

Nancy Ragland
Team Leader, Data Management and Analysis Team

Participates in the development, approval, implementation, and maintenance of written quality assurance standards (e.g., Program Guidance, SOPs, QAPPs, QMP). Ensures DM&A staff perform

data management related tasks, including coordination and tracking of CRP data sets from initial submittal through CRP Project Manager review and approval; ensuring that data is reported following instructions in the *Surface Water Quality Monitoring Data Management Reference Guide* (January 2010, or most current version); running automated data validation checks in SWQMIS and coordinating data verification and error correction with CRP Project Managers; generating SWQMIS summary reports to assist CRP Project Managers' data review; identifying data anomalies and inconsistencies; providing training and guidance to CRP and Planning Agencies on technical data issues to ensure that data are submitted according to documented procedures; reviewing QAPPS for valid stream monitoring stations, validity of parameter codes, submitting entity code(s), collecting entity code(s), and monitoring type code(s); developing and maintaining data management-related standard operating procedures for CRP data management; and coordinating and processing data correction requests.

Peter Bohls
CRP Data Manager, Data Management and Analysis Team

Responsible for coordination and tracking of CRP data sets from initial submittal through CRP 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 CRP Project Managers. Generates SWQMIS summary reports to assist CRP Project Managers' data review. Identifies data anomalies and inconsistencies. Provides training and guidance to CRP and Planning Agencies on technical data issues to ensure that data are submitted according to documented procedures. Reviews QAPPS for valid stream monitoring stations. Checks validity of parameter codes, submitting entity code(s), collecting entity code(s), and monitoring type code(s). Develops and maintains data management-related standard operating procedures for CRP data management. Coordinates and processes data correction requests. Participates in the development, implementation, and maintenance of written quality assurance standards (e.g., Program Guidance, SOPs, QAPPs, QMP).

Jennifer Delk
CRP Project Quality Assurance Specialist

Serves as liaison between CRP management and TCEQ QA management. Participates in the development, approval, implementation, and maintenance of written quality assurance standards (e.g., Program Guidance, SOPs, QAPPs, QMP). Serves on planning team for CRP special projects and reviews QAPPs in coordination with other CRP staff. Coordinates documentation and implementation of corrective action for the CRP.

Guadalupe-Blanco River Authority

Debbie Magin
GBRA Project Manager

Responsible for implementing and monitoring CRP requirements in contracts, QAPPs, and QAPP amendments and appendices. Coordinates basin planning activities and work of basin partners. Ensures monitoring systems audits are conducted to ensure QAPPs are followed by GBRA participants

and that projects are producing data of known quality. Ensures that subcontractors are qualified to perform contracted work. Ensures CRP project managers and/or QA Specialists are notified of deficiencies and corrective actions, and that issues are resolved. Responsible for validating that data collected are acceptable for reporting to the TCEQ. Responsible for writing and maintaining the QAPP and monitoring its implementation. Responsible for maintaining records of QAPP distribution, including appendices and amendments. Responsible for maintaining written records of sub-tier commitment to requirements specified in this QAPP.

Josie Longoria
GBRA Quality Assurance Officer

Responsible for coordinating the implementation of the QA program. Responsible for identifying, receiving, and maintaining project quality assurance records. Responsible for coordinating with the TCEQ QAS to resolve QA-related issues. Notifies the GBRA Project Manager of particular circumstances which may adversely affect the quality of data. Coordinates and monitors deficiencies, and corrective actions. Coordinates and maintains records of data verification and validation. Coordinates the research and review of technical QA material and data related to water quality monitoring system design and analytical techniques. Ensures that monitoring systems audits on project participants are conducted to determine compliance with project and program specifications, reviews written reports, and follows through on findings. Ensures that field staff are properly trained and that training records are maintained.

Debbie Magin
GBRA Data Manager

Responsible for ensuring that field data are properly reviewed and verified. Responsible for the transfer of basin quality-assured water quality data to the TCEQ in a format compatible with SWQMIS. Maintains quality-assured data on GBRA internet site.

Lee Gudgell
GBRA Water Quality Investigator/Field Technician

Responsible for coordinating sampling events, including maintenance of sampling bottles, supplies, and equipment. Maintains records of field data collection and observations. Conducts monitoring systems audits on project participants to determine compliance with project and program specifications, issues written reports, and follows through on findings.

Josephine Longoria
GBRA Regional Laboratory Director

The responsibilities of the lab director include supervision of laboratory, purchasing of equipment, maintain quality assurance manual for laboratory operations, and supervision of lab safety program. Additionally, the lab director will review and verify all field and laboratory data for integrity and continuity, reasonableness and conformance to project requirements, and then validated against the data quality objectives listed in Tables A7.1.

GBRA Laboratory Analyst/Technicians (5.5)

Perform laboratory analysis for inorganic constituents, nutrients, etc.; assist in collection of field data and samples for stream monitoring and chemical sampling of environmental sites. Perform sample custodial duties.

LCRA ENVIRONMENTAL LABORATORY SERVICES

Gary Franklin
LCRA Project Manager

Reviews and verifies all laboratory data for integrity and continuity, reasonableness and conformance to project requirements, and then validated against the measurement performance specifications listed in Table A7.1.

Alicia C. Gill
LCRA Lab Manager

Responsible for overall performance, administration, and reporting of analyses performed by LCRA's Environmental Laboratory Services. Responsible for supervision of laboratory personnel involved in generating analytical data for the project. Ensures that laboratory personnel have adequate training and a thorough knowledge of the QAPP and related SOPs. Responsible for oversight of all laboratory operations ensuring that all QA/QC requirements are met, documentation is complete and adequately maintained, and results are reported accurately.

Hollis Pantalion
LCRA Quality Assurance Officer

Maintains operating procedures that are in compliance with the QAPP, amendments and appendices. Responsible for the overall quality control and quality assurance of analyses performed by LCRA's Environmental Laboratory Services. Assists with monitoring systems audits for CRP projects.

SAN ANTONIO RIVER AUTHORITY

Chuck Lorea
SARA Lab Manager

The responsibilities of the lab director include supervision of laboratory, purchasing of equipment, and supervision of lab safety program. The SARA lab director will review and verify all laboratory data for integrity and continuity, reasonableness and conformance to project requirements, and then validated against the measurement performance specifications listed in Table A7.1.

Patricia Carvajal
SARA Quality Assurance Officer

Maintains quality assurance manual for laboratory operations, maintains operating procedures that are in compliance with the QAPP, amendments and appendices. Responsible for the overall quality control and quality assurance of analyses performed by SARA's Environmental Services Department. Assists with monitoring systems audits for CRP projects.

UPPER GUADALUPE RIVER AUTHORITY

Tara Bushnoe
UGRA Project Manager

Responsible for directing CRP activities in the upper Guadalupe River Basin, in Kerr County. Assures strict compliance with the CRP requirements for project administration and quality assurance. Responsible for coordinating and conducting sampling events, including maintenance of sampling bottles, supplies, and equipment. Maintains records of field data collection and observations. Assists GBRA staff in collecting and analyzing bioassessment samples.

Tara Bushnoe
UGRA Quality Assurance Officer

Maintains operating procedures that are in compliance with the QAPP, amendments and appendices. Assists with monitoring systems audits for CRP projects. Ensures that field staff are properly trained and that training records are maintained. Additionally, the UGRA QAO will review and verify all field and laboratory data for integrity and continuity, reasonableness and conformance to project requirements, validating the field and lab data in accordance with the data quality objectives listed in Table A7.2.

Tara Bushnoe
UGRA Data Manager

Responsible for ensuring that field and lab data are properly reviewed and verified. Responsible for the transfer of basin quality-assured water quality data to the TCEQ in a format compatible with SWQMIS. Maintains link from the water monitoring section of the UGRA web page to the Kerr County monitoring sites section of the GBRA web page.

Amy Bryant
UGRA Laboratory Manager

The responsibilities of the lab manager include supervision of the laboratory and lab staff, maintaining quality assurance manual for laboratory operations, and supervision of lab safety program. Additionally, the lab manager will review and verify all laboratory data for integrity and continuity, reasonableness and conformance to project requirements, validating the laboratory data for integrity and continuity, reasonableness and conformance with project requirements, validating the lab data in accordance with the data quality objectives listed in Table A7.2.

UGRA Laboratory Analyst/Field Technicians

Perform laboratory analyses for inorganic constituents, nutrients, etc.; assist in the collection of field data and samples for stream monitoring and chemical sampling of environmental sites.

WIMBERLEY VALLEY WATERSHED ASSOCIATION

David Baker
Wimberley Valley Watershed Association Project Manager

Responsible for directing CRP activities for the Wimberley Valley Watershed Association for the Blanco River-Cypress Creek Water Quality Monitoring Study. Assures strict compliance with the CRP requirements for project administration and quality assurance. Maintains operating procedures that are in compliance with the QAPP. Assists with monitoring systems audits for CRP projects. Responsible for ensuring that field data are properly reviewed and verified. Responsible for the transfer of project quality-assured water quality data to GBRA Project Manager.

Wimberley Valley Watershed Association Field Technicians

Responsible for coordinating sampling events, including maintenance of sampling bottles, supplies, and equipment. Maintains records of field data collection and observations. Responsible for the transfer of project quality-assured water quality data to GBRA Project Manager.

HAYS COUNTY DEVELOPMENT SERVICES DEPARTMENT

Brooke Leftwich
Hays County Project Manager

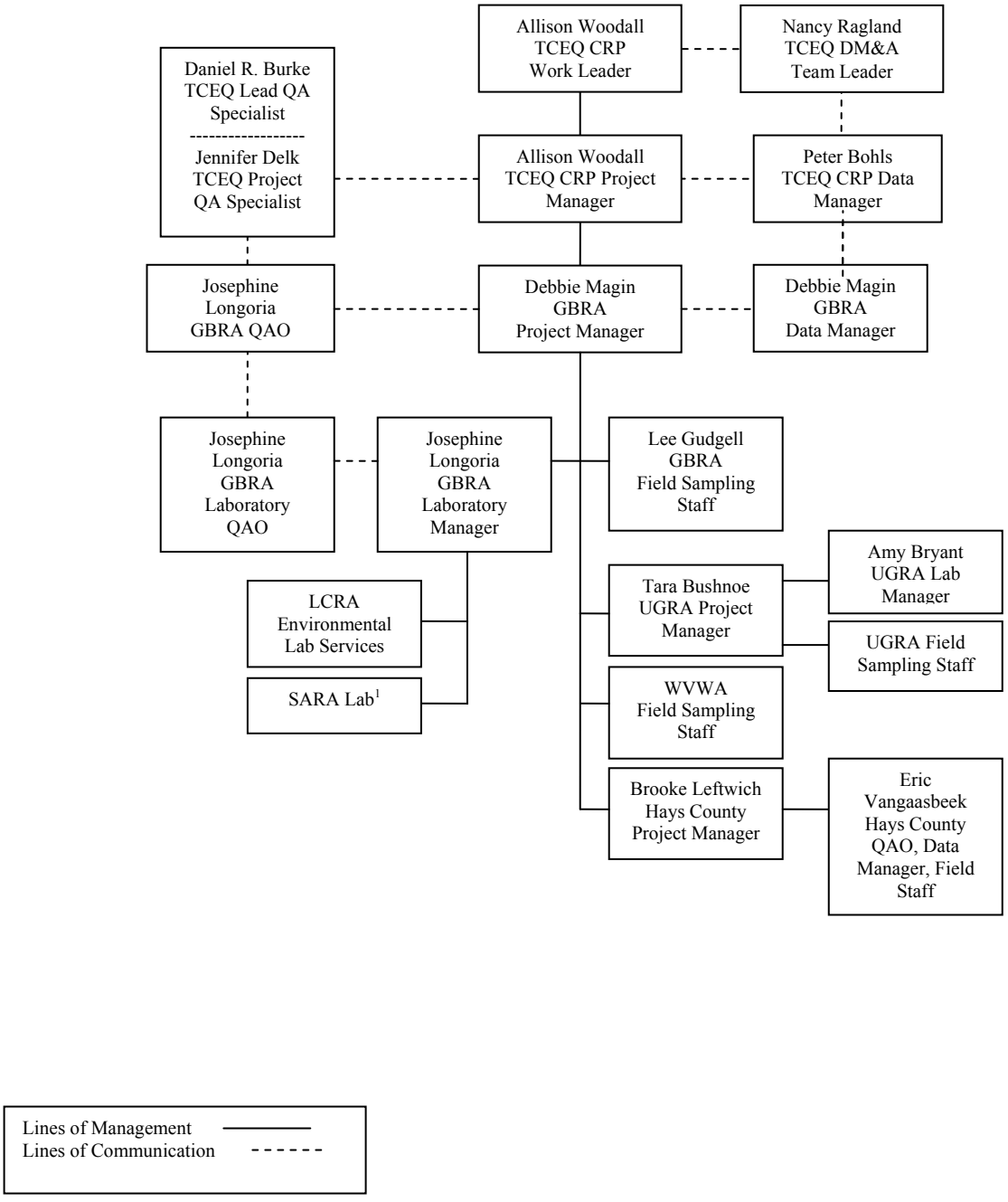
Responsible for implementing and monitoring CRP requirements in the QAPP, amendments and appendices. Serve as liaison between Hays County and GBRA CRP management. Responsible for overall performance, administration and management of Hays County project participation.

Eric Vangaasbeek
Hays County Quality Assurance Officer/Data Manager/Field Technician

Responsible for overall quality control and quality assurance of samples and analytical results of the samples collected by Hays County. Coordinates activities with GBRA laboratory staff. Responsible for coordination of field team activities and necessary staff training. Performs monitoring as specified in the latest edition of SWQM Procedures Manual. Responsible for transmittal of field data to GBRA and review of analytical results of samples collected by Hays County and produced by GBRA laboratory.

PROJECT ORGANIZATION CHART

Figure A4.1. Organization Chart - Lines of Communication



1 SARA will be used in the event of an equipment failure and the need to meet holding times.

A5 PROBLEM DEFINITION/BACKGROUND

In 1991, the Texas Legislature passed the Texas Clean River Act (Senate Bill 818) in response to growing concerns that water resource issues were not being pursued in an integrated, systematic manner. The act requires that ongoing water quality assessments be conducted for each river basin in Texas, an approach that integrates water quality issues within the watershed. The CRP legislation mandates that each river authority (or local governing entity) shall submit quality-assured data collected in the river basin to the commission. Quality-assured data in the context of the legislation means data that comply with commission rules for surface water quality monitoring programs, including rules governing the methods under which water samples are collected and analyzed and data from those samples are assessed and maintained. This QAPP addresses the program developed between GBRA and the TCEQ to carry out the activities mandated by the legislation. The QAPP was developed and will be implemented in accordance with provisions of the *TCEQ Quality Management Plan* (most recent version).

The purpose of this QAPP is to clearly delineate GBRA QA policy, management structure, and procedures which will be used to implement the QA requirements necessary to verify and validate the surface water quality data collected. The QAPP is reviewed by the TCEQ to help ensure that data generated for the purposes described above are scientifically valid and legally defensible. This process will ensure that data collected under this QAPP and submitted to SWQMIS have been collected and managed in a way that guarantees its reliability and therefore can be used in water quality assessments, total maximum daily load development, establishing water quality standards, making permit decisions and used by other programs deemed appropriate by the TCEQ. Project results will be used to support the achievement of Clean Rivers Program objectives as contained in the *Clean Rivers Program Guidance and Reference Guide FY 2012 -2013.*

The GBRA in conjunction with UGRA have been monitoring water quality since the mid-1980s and have been actively involved in water quality planning since the early 1970s. Through the Clean Rivers Program's Surface Water Quality Monitoring Project, the river authorities have enhanced and modified their existing programs. The expansion of the existing monitoring efforts has allowed the river authorities' staffs to gather data to characterize water quality conditions in areas not previously monitored. The program for FY 2012-2013 includes continuation of the existing monitoring program, including biological monitoring, and annual sampling for trace metals concentrations in water and in sediment at selected sites. Additionally, organics analyses in sediment will be performed in FY 2012 at one site on the lower Plum Creek, and in both water and sediment at the Dry Comal site in New Braunfels and the Cypress Creek in Wimberley. Metals and organics in sediment will be performed on samples collected from Geronimo Creek in Guadalupe County. Diurnal data will be collected at the Guadalupe River at Nursery in FY2012. Total dissolved solids will be added to the conventional parameters collected at the San Marcos River at IH 35 in San Marcos in order to develop a site-specific factor to estimate the total dissolved solids from specific conductance.

The monitoring goals for the CRP program in the Guadalupe River Basin are to verify that the overall health of the stream is and remains in good condition.

The Wimberley Valley Watershed Association is a monitoring entity in the Guadalupe River Basin that contributes data collected under the GBRA QAPP. The WVWA will collect data at sites on the Blanco River and Cypress Creek monthly March through October. These sites are coordinated with the GBRA and TCEQ monitoring schedule annually.

The Hays County Development Services Department is a monitoring entity in the Guadalupe River Basin that contributes data collected under the GBRA QAPP. Hays County will collect field data at sites on the Blanco River monthly and conventional parameters quarterly. These sites are coordinated with the GBRA and TCEQ monitoring schedule annually.

Maps of the sampling locations for FY 2012 can be found in Appendix B.

A6 PROJECT/TASK DESCRIPTION

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

See Appendix B for sampling design and monitoring pertaining to this QAPP.

Amendments to the QAPP

Revisions to the QAPP may be necessary to address incorrectly documented information or to reflect changes in project organization, tasks, schedules, objectives, and methods. Requests for amendments will be directed from the GBRA Project Manager to the CRP Project Manager electronically. Amendments are effective immediately upon approval by the GBRA Project Manager, the GBRA QAO, the CRP Project Manager, the CRP Lead QA Specialist, the CRP Project QA Specialist, and additional parties affected by the amendment. Amendments are not retroactive. They will be incorporated into the QAPP by way of attachment and distributed to personnel on the distribution list by the GBRA Project Manager.

Special Project Appendices

Projects requiring QAPP appendices will be planned in consultation with the GBRA and the TCEQ Project Manager and TCEQ technical staff. Appendices will be written in an abbreviated format and will reference the Basin QAPP where appropriate. Appendices will be approved by the GBRA Project Manager, the GBRA QAO, the participating Laboratories, the CRP Project Manager, the CRP Project QA Specialist, the CRP Lead QA Specialist and other TCEQ personnel as appropriate. Copies of approved QAPPs appendices will be distributed by GBRA to project participants before data collection activities commence.

A7 QUALITY OBJECTIVES AND CRITERIA

The purpose of routine water quality monitoring is to collect surface water quality data that can be used to characterize water quality conditions, identify significant long-term water quality trends, support water quality standards development, support the permitting process, and conduct water quality assessments in accordance with *TCEQs Guidance for Assessing Texas Surface and Finished Drinking Water Quality Data*. These water quality data, and data collected by other organizations (e.g., USGS, TCEQ, etc.), will be subsequently reconciled for use and assessed by the TCEQ.

Systematic watershed monitoring is defined by sampling that is planned for a short duration (1 to 2 years) and is designed to: screen waters that would not normally be included in the routine monitoring program, monitor at sites to check the water quality situation, and investigate areas of potential concern. Due to the limitations regarding these data (e.g., not temporally representative, limited number of samples, biological sampling does not meet the specimen vouchering requirements), the data will be used to determine whether any locations have values exceeding the TCEQ's water quality criteria and/or screening levels (or in some cases values elevated above normal). GBRA will use this information to determine future monitoring priorities. These water quality data, and data collected by other organizations (e.g., USGS, TCEQ, etc.), will be subsequently reconciled for use and assessed by the TCEQ.

GBRA will conduct biological monitoring using a systematic approach. The biological monitoring will adhere to the specifications described in the TCEQ *Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Community and Habitat Data, 2007* (RG-416). One difference in methods is with respect to vouchering requirements: GBRA will maintain voucher specimens for each species found in the basin, and will retain questionable or unusual vouchers found during a sampling event. The objectives of the Routine Biological Monitoring are to:

* inventory fish and benthic macroinvertebrate communities,
* collect data to be used for community structure trend analysis,
* where possible, correlate measures of chemical water quality to biological information,
* verify the Aquatic Life Use designations assigned to these water bodies, and
* collect data useful to the TCEQ for assessing Aquatic Life Use assessment.

The organics in sediment and organics in water sampling scheduled in Appendix B follows the systematic approach. The purpose for this sampling is to determine whether and at what concentrations pollutants associated with urban activities are found in the stream. The sites chosen for this sampling are downstream of urban areas or areas of oil production. The organic compounds to be analyzed by the LCRA Environmental Laboratory are identified in Table A7.1 (See Appendix A).

The total and dissolved metals identified in Table A7.1 will be collected following the systematic approach. LCRA Environmental Laboratory Services will analyze for metals in the stream and sediment samples collected at the selected sites.

The SARA laboratory has been included in the QAPP and on Table A7.1 so that in the event of an equipment failure, samples can be processed within the prescribed holding time.

Total filterable residue will be analyzed at the San Marcos River at IH 35 site in the first year in order to confirm that the factor of 0.65 is appropriate for estimating total dissolved solids from the field

conductivity. The frequency will be quarterly at a minimum under the Clean Rivers Program.

The measurement performance specifications to support the project objectives for a minimum data set are specified in Appendix A Tables A7.1 through A7.4, and in the text following.

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 Appendix A Table A7.1 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 to the CRP:

- 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 sample for each analytical batch of CRP Samples analyzed.

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

Precision

Precision is the degree to which a set of observations or measurements of the same property, obtained under similar conditions, conform to themselves. It is a measure of agreement among replicate measurements of the same property, under prescribed similar conditions, and is an indication of random error.

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 Appendix A.

Bias

Bias is a statistical measurement of correctness and includes multiple components of systematic error. A measurement is considered unbiased when the value reported does not differ from the true value. Bias is determined through the analysis of laboratory control samples and LOQ Check Samples prepared with verified and known amounts of all target analytes in the sample matrix (e.g. deionized

water, sand, commercially available tissue) and by calculating percent recovery. Results are compared against measurement performance specifications and used during evaluation of analytical performance. Program-defined measurement performance specifications for bias are specified in Appendix A.

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 under the Clean Rivers Program 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.

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 the Data Management Plan Section B10.

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.

A8 SPECIAL TRAINING/CERTIFICATION

New field personnel receive training in proper sampling and field analysis. Before actual sampling or field analysis occurs, they will demonstrate to the QA Officer (or designee) their ability to properly calibrate field equipment and perform field sampling and analysis procedures. Field personnel training is documented and retained in the personnel file and will be available during a monitoring systems audit.

The requirements for Global Positioning System (GPS) certification are located in Section B10, Data Management.

Contractors and subcontractors must ensure that laboratories analyzing samples under this QAPP meet

the requirements contained in section TNI Volume 1 Module 2, Section 4.5.5 (concerning Review of Requests, Tenders and Contracts).

A9 DOCUMENTS AND RECORDS

The documents and records that describe, specify, report, or certify activities are listed. The list below is limited to documents and records that may be requested for review during a monitoring systems audit. Add other types of project documents and records as appropriate.

Table A9.1 Project Documents and Records

Document/Record	Location	Retention ** (Paper/electronic)	Format
QAPPs, amendments and appendices	GBRA/UGRA	8 years/one year/ indefinitely	Paper/Electronic
QAPP distribution documentation	GBRA	one year/ indefinitely	Paper/Electronic
QAPP commitment letters	GBRA	one year/ indefinitely	Paper/Electronic
Field notebooks or data sheets	GBRA/UGRA/WVWA/HZ	one year/ indefinitely	Paper/electronic
Field equipment calibration/maintenance logs	GBRA/UGRA/WVWA/HZ	one year/ indefinitely	Paper/electronic
Field staff training records	GBRA/UGRA/WVWA/HZ	one year/ indefinitely	Paper/electronic
Chain of custody records	GBRA/UGRA/WVWA/HZ	one year/ indefinitely	Paper/electronic
Field SOPs	GBRA/UGRA/WVWA/HZ	one year/ indefinitely	Paper/electronic
Laboratory QA Manuals	GBRA/UGRA/LCRA/SARA	one year/ indefinitely/5 years*	Paper/electronic
Laboratory SOPs	GBRA/UGRA/LCRA/SARA	one year/ indefinitely/5 years*	Paper/electronic
Laboratory staff training records	GBRA/UGRA/LCRA/SARA	one year/ indefinitely/5 years*	Paper/electronic
Laboratory data reports/results	GBRA/UGRA/LCRA/SARA	one year/ indefinitely/5 years*	Paper/electronic
Instrument printouts	GBRA/UGRA/LCRA/SARA	one year/ indefinitely/5 years*	Paper/electronic
Laboratory equipment maintenance logs	GBRA/UGRA/LCRA/SARA	one year/ indefinitely/5 years*	Paper/electronic
Laboratory calibration records	GBRA/UGRA/LCRA/SARA	one year/ indefinitely/5 years*	Paper/electronic
Corrective Action Documentation	GBRA/UGRA/LCRA/SARA	one year/ indefinitely/5 years*	Paper/electronic

* UGRA and LCRA

** GBRA - Retention of data in paper format is for one year and indefinitely in electronic or microfilm format.

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

* title of report and unique identifiers on each page
* name and address of the laboratory
* name and address of the client
* a clear identification of the sample(s) analyzed
* date and time of sample receipt
* date and time of collection
* sample depth
* identification of method used
* identification of samples that did not meet QA requirements and why (e.g., holding times exceeded)
* sample results
* units of measurement
* sample matrix
* dry weight or wet weight (as applicable)
* clearly identified subcontract laboratory results (as applicable)
* a name and title of person accepting responsibility for the report
* project-specific quality control results to include field split results (as applicable); equipment, trip, and field blank results (as applicable); and LOQ and LOD confirmation (% recovery)
* narrative information on QC failures or deviations from requirements that may affect the quality of results or is necessary for verification and validation of data
* certification of NELAP compliance on a result by result basis.

Electronic Data

Data will be submitted electronically to the TCEQ in the Event/Result file format described in the most current version of *the Surface Water Quality Monitoring Data Management Reference Guide* (http://www.tceq.state.tx.us/compliance/monitoring/water/quality/data/wdma/dmrg_index.html). A completed Data Summary (see Appendix E) will be submitted with each data submittal. The management of electronic data by non-GBRA entities is described in Appendix F.

B1 SAMPLING PROCESS DESIGN

See Appendix B for sampling process design information and monitoring tables associated with data collected under this QAPP.

B2 SAMPLING METHODS

Field Sampling Procedures

Field sampling will be conducted 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.

Sample volume, container types, minimum sample volume, preservation requirements, and holding time requirements.

Table B2.1 Sample Storage, Preservation and Handling Requirements

Parameter	Matrix	Container	Preservation*	Sample Volume	Holding Time
Specific Conductance	Water	Plastic or glass	Cool, 0-6°C	100 mL	28 days
Turbidity	Water	Plastic or glass	Cool, 0-6°C	100 mL	48 hours
Hardness	Water	Plastic or glass	Cool, 0-6°C, H_2SO_4 to pH < 2*	1 L	6 months
Solids (TSS,TDS)	Water	Plastic or glass	Cool, 0-6°C	1 L	7 days
Nitrate-nitrogen	Water	Plastic or glass	Cool, 0-6°C	1 L	48 hours
Ammonia-nitrogen	Water	Plastic or glass	Cool, 0-6°C, H_2SO_4 to pH < 2*	1 L	28 days
Total phosphorus	Water	Plastic or glass	Cool, 0-6°C, H_2SO_4 to pH < 2*	1 L**	28 days
Total Kjeldahl Nitrogen	Water	Plastic or glass	Cool, 0-6°C, H_2SO_4 to pH < 2*	1 L	28 days
Sulfate	Water	Plastic or glass	Cool, 0-6°C	1 L	28 days
Chloride	Water	Plastic or glass	Cool, 0-6°C	1 L	28 days
Chlorophyll a /Pheophytin	Water	Amber plastic or glass	Dark, Cool, 0-6°C before Filtration; Dark, 0°C after Filtration	1 L	Filter within 48 hours/28 days at 0°C
E. coli	Water	Sterile, plastic	Cool, 0-6°C	100 mL	6 hours
Metals, total	Water	Plastic or glass	Cool, 0-6°C, HNO_3 to pH < 2*	1 L	6 months
Metals, dissolved	Water	Plastic or glass	Cool, 0-6°C, HNO_3 to pH < 2*	1 L	Filtered on site/6 months
Mercury, total	Water	Teflon or glass	Cool, 0-6°C, HNO_3 to pH < 2*	1 L	28 days

Table B2.1 Sample Storage, Preservation and Handling Requirements (cont.)

Parameter	Matrix	Container	Preservation*	Sample Volume	Holding Time
BTEX	Water	Glass	Cool, 0-6°C, HCl to pH <2*	40 mL	7 days
TPH	Water	Glass	Cool, 0-6°C	40 mL	7 days
BTEX	Sediment	Glass	Cool, 0-6°C	40 mL	7 days
TPH	Sediment	Glass	Cool, 0-6°C	40 mL	7 days
Biological	Water	Plastic or glass	Ethanol CDA 19 (field); 10% Formalin (voucher)	1 L/5 mL specimen jars	1 day (field); indefinitely (voucher)
Metals, total	Sediment	Plastic or glass	Cool, 0-6°C	100 g	6 months
Mercury, total	Sediment	Plastic or glass	Cool, 0-6°C	100 g	28 days

* Preservation occurs within 15 minutes of collection.
** UGRA collects 250 mL for Total Phosphorus.

Sample Containers

Sample containers are plastic one liter bottles that are cleaned and reused for conventional parameters. The bottles are cleaned with the following procedure: 1) wash containers with tap water and alconox (laboratory detergent), 2) triple rinse with hot tap water, and 3) triple rinse with deionized water. The sample containers for metals in water are provided by LCRA and are new, certified glass or plastic bottles, or glass or plastic bottles cleaned and documented according to EPA method 1669, and come with the appropriate preservative. The sample containers for organic analyses are provided pre-cleaned from LCRA and are 40 mL VOA vials for BTEX and TPH. Amber plastic bottles are used routinely for chlorophyll samples. Disposable, pre-cleaned, sterile bottles are purchased for bacteriological samples. Certificates are maintained in a notebook by each laboratory. The sample containers for metals in sediment are provided by LCRA and are new, certified glass or plastic bottles, or glass or plastic bottles.

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 (or actual name of the documents used to record field data) as presented in Appendix C. Flow worksheets, aquatic life use monitoring checklists, habitat assessment forms, field biological assessment forms, and records of bacteriological analyses (if applicable) are part of the field data record. The following will be recorded for all visits:

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)

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 Requirements or Sampling Process Design Deficiencies, and Corrective Action

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

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

B3 SAMPLE HANDLING AND CUSTODY

Sample Tracking

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

A sample is in custody if it is in actual physical possession or in a secured area that is restricted to authorized personnel. The Chain of Custody (COC) form is a record that documents the possession of the samples from the time of collection to receipt in the laboratory. The following information concerning the sample is recorded on the COC form (See Appendix D). The following list of items matches the COC form in Appendix D.

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 Labeling

Samples from the field are labeled on the container (or on a label; please specify) with an indelible marker. Label information includes:

1. Site identification
2. Date and time of collection
3. Preservative added, if applicable
4. Indication of field-filtration (for metals) as applicable
5. Sample type (i.e., analysis(es)) to be performed

Sample Handling

After collection of samples are complete, sample containers are immediately stored in an ice chest for transport to the laboratories (GBRA, UGRA), accompanied by the chain of custody. Ice chests will remain in the possession of the field technician or in the locked vehicle until delivered to the respective lab. After samples for trace metal are filtered in the field, these sample containers are immediately stored in an ice chest for transport to the LCRA Environmental Laboratory Services, Austin, Texas by regional lab or field staff, accompanied by the chain of custody. Samples for metals in sediment will be carried on ice, to the LCRA Environmental Laboratory Services, Austin, Texas by regional lab or field staff, accompanied by the chain of custody. Samples for organics analyses are immediately stored in an ice chest and delivered by GBRA lab or field staff, along with the chain of custody, to the

LCRA Environmental Laboratory Services in Austin, Texas. If in the event of laboratory equipment failure and in order to meet holding times, chain of custodies and samples will be delivered on ice to the SARA laboratory, in San Antonio, Texas by GBRA personnel. After receipt at the GBRA or UGRA lab, the samples are stored in the refrigeration unit or given to the analyst for immediate analysis. Only authorized laboratory personnel will handle samples received by the laboratory.

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 Lead Organization 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 GBRA Project Manager in consultation with the GBRA 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 CRP Project Manager in the project progress report. Corrective Action Plans will be prepared by the Lead Organization QAO and submitted to TCEQ CRP Project Manager along with project progress report.

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

B4 ANALYTICAL METHODS

The analytical methods, associated matrices, and performing laboratories are listed in Appendix A. The authority for analysis methodologies under the Clean Rivers Program is derived from the TSWQS (§§307.1 - 307.10) in that data generally are generated for comparison to those standards and/or criteria. The Standards state that "Procedures for laboratory analysis must be in accordance with the most recently published edition of the book entitled *Standard Methods for the Examination of Water and Wastewater*, the TCEQ *Surface Water Quality Monitoring Procedures* as amended, 40 CFR 136, or other reliable procedures acceptable to the commission, and in accordance with chapter 25 of this title."

Laboratories collecting data under this QAPP are compliant with the TNI Standards. Copies of laboratory QMs and SOPs are available for review by the TCEQ.

Standards Traceability

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

Analytical Method Deficiencies and Corrective Actions

Deficiencies in field and laboratory measurement systems involve, but are not limited to such things as

instrument malfunctions, failures in calibration, blank contamination, quality control samples outside QAPP defined limits, etc. In many cases, the field technician or lab analyst will be able to correct the problem. If the problem is resolvable by the field technician or lab analyst, then they will document the problem on the field data sheet or laboratory record and complete the analysis. If the problem is not resolvable, then it is conveyed to the GBRA Laboratory Director, who will make the determination and notify the GBRA QAO. If the analytical system failure may compromise the sample results, the resulting data will not be reported to the TCEQ. The nature and disposition of the problem is reported on the data report which is sent to the GBRA Project Manager. The Lead Organization Project Manager will include this information in the CAP and submit with the Progress Report which is sent to the TCEQ CRP Project Manager.

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

The TCEQ has determined that analyses associated with the qualifier codes (e.g."holding time exceedance", "sample received unpreserved", "estimated value", etc...) may have unacceptable measurement uncertainty associated with them. This will immediately disqualify 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 blank - Field blanks are required for total metals-in-water samples when collected without sample equipment (i.e., as grab samples) and a minimum of one field blank for total metals- in-water samples is collected per sample run or one for every 10 samples if more the 10 samples are collected. A field blank consists of deionized water that is taken to the field and poured into the sample container. Field blanks are used to assess the contamination from field sources such as airborne materials, containers, and preservatives. Field blanks are collected when sampling for total mercury, total selenium, as per the coordinated monitoring schedule.

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

Field equipment blank - Field equipment blanks are required for metals-in-water samples when collected using sampling equipment. A minimum of one field equipment blank for metals-in-water samples is collected per sample run or one for every 10 samples if more the 10 samples are collected. A field equipment blank is a sample of reagent water poured into or over a sampling device or pumped through a sampling device. It is collected in the same type of container as the environmental sample, preserved in the same manner and analyzed for the same parameter. Field equipment blanks are

collected when sampling for dissolved metals as per Appendix B.

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

Field 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 and are collected on a 10% basis or one per batch, whichever is more frequent. To the extent possible, field splits prepared and analyzed over the course of the project should be performed on samples from different sites.

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

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

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.

Trip blank - Trip blanks are required for volatile organic analyses (VOA) only. VOA trip blanks are samples prepared in the laboratory with laboratory pure water and preserved as required. A trip blank is submitted with each ice chest of VOA samples submitted to the laboratory. They are transported to the sampling site, handled like an environmental sample, and returned to the laboratory for analysis. Trip blanks are not opened in the field. Their purpose is to check contamination of the sample through leaching of the septum. The analysis of trip blank should yield values less than the LOQ. When target analyte concentrations are very high, blank values should be less then 5% of the lowest value of the batch, or corrective action will be implemented.

Laboratory Measurement Quality Control Requirements and Acceptability Criteria

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

digestates or concentrates) which are analyzed together as a group. An analytical batch can include prepared samples originating from various environmental matrices and can exceed 20 samples.

Method Specific QC requirements – QC samples, other than those specified later this section, are 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 manuals (QMs). The minimum requirements that all participants abide by are stated below.

Limit of Quantitation (LOQ) – The laboratory will analyze a calibration standard (if applicable) at the LOQ on each day calibrations are performed. In addition, an LOQ check sample will be analyzed with each analytical batch. Calibrations including the standard at the LOQ listed in Appendix A 7.1 will meet the calibration requirements of the analytical method or corrective action will be implemented.

> **LOQ Sediment Samples** – When considering LOQs for solid samples and how they apply to results, two aspects of the analysis are considered: (1) the LOQ of the sample, based on the "real-world" in which moisture content and interferences affect the result and (2) the LOQ in the QAPP which is a value less than or equal to the AWRL based on an idealized sample with zero % moisture.
>
> The LOQ for a solid sample is based on the lowest non-zero calibration standard (as are those for water samples), the moisture content of the solid sample, and any sample concentration or dilution factors resulting from sample preparation or clean-up.
>
> To establish solid-phase LOQs to be listed in Appendix A Table A7.1 of the QAPP, the laboratory will adjust the concentration of the lowest non-zero calibration standard for the amount of sample extracted, the final extract volume, and moisture content (assumed to be zero % moisture). Each calculated LOQ will be less than or equal to the AWRL on the dry-weight basis to satisfy the AWRL requirement for sediment and tissue analyses. When data are reviewed for consistency with the QAPP, they are evaluated based on this requirement. Results may not "appear" to meet the AWRL requirement due to high moisture content, high concentrations of non-target analytes necessitating sample dilution, etc. These sample results will be submitted to the TCEQ with an explanation on the data summary as to why results do not appear to meet the AWRL requirement.

LOQ Check Sample – An LOQ check sample consists of a sample matrix (e.g., deionized water, sand, commercially available tissue) free from the analytes of interest spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes. It is used to establish intra-laboratory bias to assess the performance of the measurement system at the lower limits of analysis. The LOQ check sample is spiked into the sample matrix at a level less than or near the LOQ published in Appendix A, Table A7.1 – 4, for each analyte for each analytical batch of CRP samples run. If it is determined that samples have exceeded the high range of the calibration curve, samples should be diluted or run on another curve. For samples run on batches with calibration curves

that do not include the LOQ published in Appendix A, Table A7.1-4, a check sample will be run at the low end of the calibration curve.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

The precision criterion in Appendix A Table A7.1 for bacteriological duplicates applies only to samples with concentrations > 10 MPN/100mL. Field splits will not be collected for bacteriological analyses.

Laboratory equipment blank - Laboratory equipment blanks are prepared at the laboratory where collection materials for metals sampling equipment are cleaned between uses. These blanks document that the materials provided by the laboratory are free of contamination. The QC check is performed before the metals sampling equipment is sent to the field. The analysis of laboratory equipment blanks should yield values less than the LOQ. Otherwise, the equipment should not be used.

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 indicate the effect of the sample on the precision and accuracy of the results generated using the selected method. The frequency of matrix spikes is specified by the analytical method, or a minimum of one per preparation batch, whichever is greater. To the extent possible, matrix spikes prepared and analyzed over the course of the project should be performed on samples from different sites.

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

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

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

Matrix spike recoveries are compared to the same acceptance criteria established for the associated

LCS recoveries, rather than the matrix spike recoveries published in the mandated test method. The EPA 1993 methods (i.e. ammonia-nitrogen, ion chromatography, TKN) that establish matrix spike recovery acceptance criteria are based on recoveries from drinking water that has very low interferences and variability and do not represent the matrices sampled in the CRP. If the matrix spike results are outside laboratory-established criteria, there will be a review of all other associated quality control data in that batch. If all of quality control data in the associated batch passes, it will be the decision of the laboratory QAO or GBRA Project Manager to report the data for the analyte that failed in the parent sample to TCEQ or to determine that the result from the parent sample associated with that failed matrix spike is considered to have excessive analytical variability and does not meet project QC requirements. Depending on the similarities in composition of the samples in the batch, GBRA may consider excluding all of the results in the batch related to the analyte that failed recovery.

Method blank –A method blank is a sample of matrix similar to the batch of associated samples (when available) that is free from the analytes of interest and is processed simultaneously with and under the same conditions as the samples through all steps of the analytical procedures, and in which no target analytes or interferences are present at concentrations that impact the analytical results for sample analyses. The method blanks are performed at a rate of once per preparation batch The method blank is used to document contamination from the analytical process. The analysis of method blanks should yield values less than the LOQ. For very high-level analyses, the blank value should be less then 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 one 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 Requirements Deficiencies and Corrective Actions

Sampling QC excursions are evaluated by the Lead Organization Project Manager, in consultation with the Lead Organization 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 GBRA 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 GBRA Regional Laboratory QAO. The Laboratory QAO will discuss with the GBRA Project Manager. If applicable, the GBRA Project Manager will include this information in the CAP and submit with the Progress Report which is sent to the TCEQ CRP Project Manager.

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

B6 INSTRUMENT/EQUIPMENT TESTING, INSPECTION AND MAINTENANCE

All sampling equipment testing and maintenance requirements are detailed in the TCEQ *Surface Water Quality Monitoring Procedures*. Sampling equipment is inspected and tested upon receipt and is assured appropriate for use. Equipment records are kept on all field equipment and a supply of critical spare parts is maintained.

All laboratory tools, gauges, instrument, and equipment testing and maintenance requirements are contained within laboratory QM(s).

B7 INSTRUMENT 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 QM(s).

B8 INSPECTION/ACCEPTANCE OF SUPPLIES AND CONSUMABLES

All sampling equipment testing and maintenance requirements are detailed in the *TCEQ Surface Water Quality Monitoring Procedures*. Sampling equipment is inspected and tested upon receipt and is assured appropriate for use. Equipment records are kept on all field equipment and a supply of critical spare parts is maintained.

All laboratory tools, gauges, instrument, and equipment testing and maintenance requirements are contained within laboratory QSM(s).

B9 NON-DIRECT MEASUREMENTS

The following non-direct measurement source(s) will be used for this project:

USGS gage station data will be used throughout the project to aid in determining gage height and flow. Rigorous QA checks are completed on gage data by the USGS and the data is approved by the USGS and permanently stored at the USGS. This data will be submitted to the TCEQ under parameter code 00061 Flow, or Instantaneous or parameter code 74069 Flow Estimate, depending on the proximity of monitoring station to the USGS gage station.

B10 DATA MANAGEMENT

Data Management Process

Data Dictionary - Terminology and field descriptions are included in the *SWQM Data Management Reference Guide*, 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.

Table B10.1 Entity Codes

Name of Monitoring Entity	Tag Prefix	Submitting Entity	Collecting Entity
Guadalupe-Blanco River Authority	*GB*	*GB*	*GB*
Wimberley Valley Watershed Association	*GB*	*GB*	*WV*
Upper Guadalupe River Authority	*UG*	*GB*	*UG*
Hays County Development Services Dept.	*GB*	*GB*	*HZ*

GBRA and UGRA Data Management Process

Field technicians and laboratory personnel follow protocols that ensure that the CRP database maintains its integrity and usefulness. Field data collected at the time of the sampling event is logged by the field technician, along with notes on sampling conditions in field logs or on field data sheets. The field log/sheet is the responsibility of the field technician and is transported with the sample to the laboratory. The lab technician /sample custodian logs the sample in the Lab Samples Database. Each sample is assigned a separate and distinct sample number. The sample is accompanied by a chain of custody. The lab technician /sample custodian must review the chain of custody to verify that it is filled out correctly and complete. Lab technicians take receipt of the sample and review the chain of custody, begin sample prep or analysis and transfer samples into the refrigerator for storage. Examples of the field data sheets and chains of custody used can be found in Appendices C and D. Samples that are outsourced to other laboratories are accompanied by a copy of the chain of custody. For an explanation of the data management process used by outside laboratories, as well as Hays County and the Wimberley Valley Watershed Association, see Appendix F.

Data generated by lab technicians are logged permanently on analysis bench sheets. The data are reviewed by the analyst prior to entering the data into the Lab Samples Database. In the review, the analyst verifies that the data includes date and time of analysis, that calculations are correct, that data includes documentation of dilutions and correction factors, that data meets data quality objectives and that the data includes documentation of instrument calibrations, standard curves and control standards. A second review by another lab analyst/technician validates that the data meets the data quality objectives and that the data includes documentation of instrument calibrations, standard curves and control standards. After this review the lab analyst/technician inputs the data and quality control information into the Lab Samples Database for report generation and data storage.

The GBRA Regional Laboratory Director supervises the GBRA Regional laboratory and reviews the report that is generated when all analyses are complete. The UGRA Laboratory Director supervises

the UGRA lab and reviews the analysis logs when all data is complete. The analysis log is reviewed to see that all necessary information is included and that the data quality objectives have been met. When the report generated by the GBRA laboratory is complete, the lab director signs the report. If the GBRA /UGRA lab director or QAO designee feel there has been an error or finds that information is missing, the report is returned to the analyst for review and tracking to correct the error and generate a corrected copy. The GBRA Project Manager and the UGRA Project Manager reviews the respective data for reasonableness and if errors or anomalies are found the report is returned to the laboratory staff for review and tracking to correct the error. After review for reasonableness the data is cross-checked to the analysis logs by the GBRA and UGRA Project Managers. If at any time errors are identified, the laboratory and water quality databases are corrected. The GBRA and UGRA Project Managers are responsible for transmitting the data to TCEQ. If errors are found after the TCEQ review, those errors are corrected by the GBRA or UGRA Project Manager and logged in a data correction log.

The following flow diagram outlines the path that data that is generated in the field takes:

Field data collected → Field data sheets → Lab database → Quality control review by GBRA/UGRA QAO → Report generation → Data checked for reasonableness by GBRA/UGRA Project Manager → Data transferred to GBRA/UGRA water quality databases → Data verification to analysis logs by GBRA/UGRA Project Manager → ASCII file format created → TCEQ CRP Project Manager→ TCEQ Data Management and Analysis Data Manager→ SWQMIS

The following flow diagram outlines the path that data that is generated by the lab takes:

Laboratory data → Laboratory analysis logs → Lab database → Quality control review by GBRA/UGRA QAO→ Report generation → Data checked for reasonableness by GBRA/UGRA Project Manager → Data transferred to GBRA/UGRA water quality databases → Data verification to analysis logs by GBRA/UGRA Project Manager → ASCII file format created → TCEQ CRP Project Manager → TCEQ Data Management and Analysis Data Manager→ SWQMIS

The following flow diagram outlines the path that data that are generated by outsource labs takes:

Sample delivered to outsource lab → Laboratory data → Laboratory analysis logs → Lab database → Report generation→ Quality control review by laboratory QAO → Data transferred to GBRA→ Data checked for reasonableness by GBRA/UGRA Project Manager → Data transferred to GBRA water quality database (GBRA only) → Data verification to outsource lab reports by GBRA/UGRA Project Manager → ASCII file format created → TCEQ CRP Project Manager→ TCEQ Data Management and Analysis Data Manager→ SWQMIS

Data Errors and Loss

The GBRA Regional Laboratory Director supervises the GBRA Regional laboratory and reviews the report that is generated when all analyses are complete. The UGRA Laboratory Director supervises the UGRA lab and reviews the report when all data is complete. The report is reviewed to see that all necessary information is included and that the data quality objectives have been met. When the report is complete, the lab director signs the report. If the lab director or QAO feel there has been an error or finds that information is missing, the report is returned to the analyst for review and tracking to correct the error and generate a corrected copy. The GBRA/UGRA Project Manager reviews the data for

reasonableness and if errors or anomalies are found the report is returned to the laboratory director for review and tracking to correct the error. After review for reasonableness the data is cross-checked to the analysis logs by the GBRA/UGRA Project Manager. If at any time errors are identified, the laboratory and water quality databases are corrected. The GBRA/UGRA Project Manager is responsible for transmitting the data to TCEQ. If errors are found after the TCEQ review, those errors are corrected by the GBRA/UGRA Project Manager and logged in a data correction log.

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

Record Keeping and Data Storage

After data is collected and recorded on field data sheets, the data sheets are filed for review and use later. These files are kept in paper form for a minimum of one year and then scanned for permanent record.

The data produced during each analysis is recorded on analysis bench sheets. The information contained in the bench sheets include all quality control data associated with each day's or batch's analysis. The data on the logs are transferred to the laboratory database for report generation. The bench sheets are kept in paper form for a minimum of one year and then scanned for permanent record.

The data reports that are generated are reviewed by the laboratory director and signed. They are then given to the GBRA/UGRA Project Manager for verification. If an anomaly or error is found, the report is marked and returned to the laboratory for review, verification and correction, if necessary. If a correction is made, a supplemental laboratory report is created. These reports may or may not be kept in paper form since the reports can be regenerated from the lab database at any time. If kept, the paper form is kept for a minimum of one year and then sent for scanning into the ITRAX records management system.

The laboratory database is housed on the laboratory computer and is backed up on the network server nightly. The GBRA back-up copy of the network server files is made every Friday and that copy is stored off-site at a protected location. The UGRA back-up copies of the network server files are stored on -site. The network administrator is responsible for the servers and back up generation.

After data is sent to the TCEQ CRP Project Manager for review, the file that has been created is kept on the network server permanently. The network server is backed up nightly. Paper copies of the data and field duplicate sample reports are kept for a minimum of one year and then microfilmed for permanent record.

The database containing the scanned images of all lab records is contained on a network server and backed up nightly. A back-up copy of the network server files is made every Friday and that copy for GBRA is stored off-site at a protected location. UGRA stores back-up copies on-site. The GBRA records manager is the custodian of these files.

Data Handling, Hardware, and Software Requirements

The laboratory database is housed on a GBRA server and backed up each evening. The laboratory database uses SQL 2005 database software. The systems are operating in Windows XP and any

additional software needed for word processing, spreadsheet or presentations uses Microsoft Office 2010.

Information Resource Management Requirements

Data will be managed in accordance with the TCEQ *Surface Water Quality Monitoring Data Management Reference Guide*, and applicable GBRA and UGRA information resource management policies.

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. Positional data obtained by the Clean Rivers 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. All 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 Maps. The verified coordinates and map interface can then be used to develop a new station location.

C1 ASSESSMENTS AND RESPONSE ACTIONS

The following table presents the types of assessments and response actions for data collection activities applicable to the QAPP.

Table C1.1 Assessments and Response Requirements

Assessment Activity	Approximate Schedule	Responsible Party	Scope	Response Requirements
Status Monitoring Oversight, etc.	Continuous	GBRA	Monitoring of the project status and records to ensure requirements are being fulfilled	Report to TCEQ in Quarterly Report
Monitoring Systems Audit of GBRA	Dates to be determined by TCEQ CRP	TCEQ	Field sampling, handling and measurement; facility review; and data management as they relate to CRP	30 days to respond in writing to the TCEQ to address corrective actions
Monitoring Systems Audit of Program Subparticipants	Dates to be determined by GBRA (at least once per contract period)	GBRA	Field sampling, handling and measurement; facility review; and data management as they relate to CRP	30 days to respond in writing to the GBRA. PA will report problems to TCEQ in Progress Report.
Laboratory Inspection	Dates to be determined by TCEQ	TCEQ Laboratory 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

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

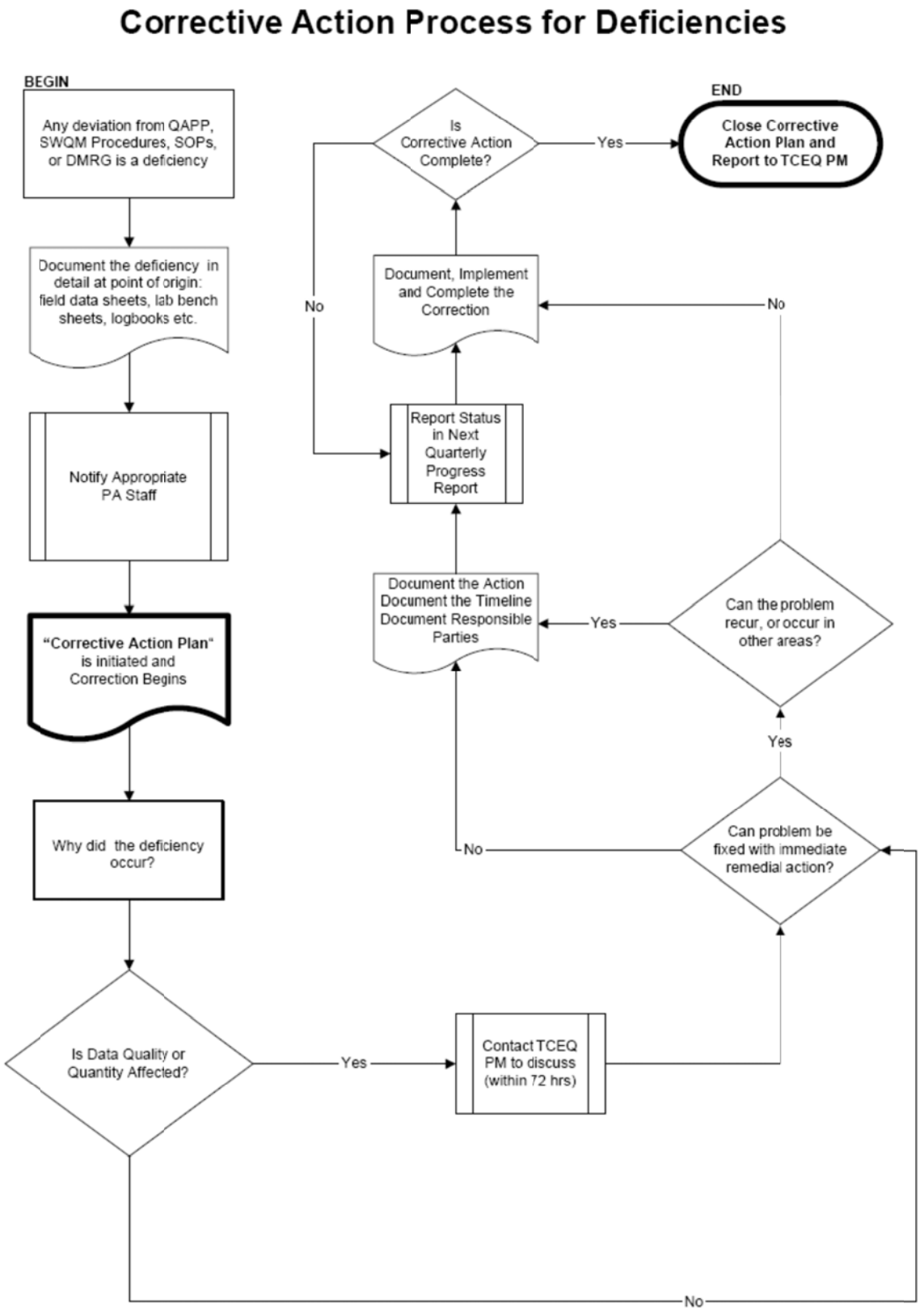
Corrective Action

Corrective Action Plans (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 Corrective Action Plans will be 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 GBRA Project Manager is responsible for implementing and tracking corrective actions. Records of audit findings and corrective actions are maintained by the GBRA Project Manager. Audit reports and corrective action documentation will be submitted to the TCEQ with the 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

Table C2.1 QA Management Reports

Type of Report	Frequency (daily, weekly, monthly, quarterly, etc.)	Projected Delivery Date(s)	Person(s) Responsible for Report Preparation	Report Recipients
GBRA Progress Report	Quarterly	15th day after quarter end	GBRA Project Manager	TCEQ Project Manager
UGRA Progress Report	Quarterly	15th day after quarter end	UGRA Project Manager	GBRA Project Manager
Monitoring Systems Audit Report Response	After audit report received by GBRA	With quarterly report	GBRA Project Manager	TCEQ Project Manager
Corrective Action Plans (CAP)	Status and at time of completion of CAP	Monthly	GBRA Data Manager	TCEQ Project Manager
		Quarterly	UGRA Data Manager	GBRA Project Manager and TCEQ Project Manager
Data Review Checklist	Prior to submission of data to TCEQ	Monthly	GBRA Data Manager	TCEQ Project Manager
		Quarterly	UGRA Data Manager	TCEQ Project Manager
Data Summary	Prior to submission of data to TCEQ	Monthly	GBRA Data Manager	TCEQ Project Manager
		Quarterly	UGRA Data Manager	TCEQ Project Manager

D1 DATA REVIEW, VERIFICATION, AND VALIDATION

All field and laboratory data will be reviewed and verified for integrity and continuity, reasonableness, and conformance to project requirements, and then validated against the project objectives and measurement performance specifications which are listed in Section A7. Only those data which are supported by appropriate quality control data and meet the measurement performance specifications defined for this project will be considered acceptable, and will be reported to the TCEQ for entry into SWQMIS.

D2 VERIFICATION AND VALIDATION METHODS

All field and laboratory data will be reviewed, verified and validated to ensure they conform to project specifications and meet the conditions of end use as described in Section A7 of this document.

Data review, verification, and validation will be performed using self-assessments and peer and management review as appropriate to the project task. The data review tasks to be performed by field and laboratory staff are listed in the first two columns of Table D2, respectively. Potential errors are identified by examination of documentation and by manual *(or computer-assisted)* examination of corollary or unreasonable data. If a question arises or an error is identified, the manager of the task responsible for generating the data is contacted to resolve the issue. Issues which can be corrected are corrected and documented. If an issue cannot be corrected, the task manager consults with higher level project management to establish the appropriate course of action, or the data associated with the issue are rejected. Field and laboratory reviews, verifications, and validations are documented.

After the field and laboratory data are reviewed, another level of review is performed once the data are combined into a data set. This review step as specified in Table D2 is performed by the GBRA Data Manager and QAO. Data review, verification, and validation tasks to be performed on the data set include, but are not limited to, the confirmation of laboratory and field data review, evaluation of field QC results, additional evaluation of anomalies and outliers, analysis of sampling and analytical gaps, and confirmation that all parameters and sampling sites are included in the QAPP.

The Data Review Checklist (See Appendix E) covers three main types of review: data format and structure, data quality review, and documentation review. The Data Review Checklist is transferred with the water quality data submitted to the TCEQ to ensure that the review process is being performed.

Another element of the data validation process is consideration of any findings identified during the monitoring systems audit conducted by the TCEQ CRP Lead Quality Assurance Specialist. Any issues requiring corrective action must be addressed, and the potential impact of these issues on previously collected data will be assessed. After the data are reviewed and documented, the GBRA Project Manager validates that the data meet the data quality objectives of the project and are suitable for reporting to TCEQ.

If any requirements or specifications of the CRP are not met, based on any part of the data review, the responsible party should document the nonconforming activities and submit the information to the GBRA Data Manager with the data. This information is communicated to the TCEQ by GBRA in the Data Summary (see Appendix E).

Table D2.1: Data Review Tasks - GBRA

Data to be Verified	Field Task	Laboratory Task	Lead Organization Data Manager Task
Sample documentation complete; samples labeled, sites identified - GBRA	GBRA Water Quality Investigator/Field Technician		GBRA Data Manager
Field QC samples collected for all analytes as prescribed in the TCEQ *SWQM Procedures Manual*- GBRA	GBRA Water Quality Investigator/Field Technician		GBRA Data Manager
Standards and reagents traceable - GBRA	GBRA Water Quality Investigator/Field Technician	GBRA Lab Director and Quality Assurance Officer	
Chain of custody complete/acceptable – GBRA	GBRA Water Quality Investigator/Field Technician	GBRA Laboratory Analysts/ Technicians	
NELAP Accreditation is current – GBRA		GBRA Lab Director and Quality Assurance Officer	
Sample preservation and handling acceptable - GBRA	GBRA Water Quality Investigator/Field Technician	GBRA Laboratory Analysts/ Technicians	
Holding times not exceeded - GBRA	GBRA Water Quality Investigator/Field Technician	GBRA Laboratory Analysts/ Technicians	GBRA Data Manager
Collection, preparation, and analysis consistent with SOPs and QAPP - GBRA	GBRA Water Quality Investigator/Field Technician	GBRA Laboratory Analysts/ Technicians	GBRA Data Manager
Preparation, and analysis consistent with SOPs and QAPP - LCRA		LCRA Lab Manager LCRA Quality Assurance Officer	GBRA Data Manager
Preparation, and analysis consistent with SOPs and QAPP - SARA		SARA Lab Manager SARA Quality Assurance Officer	GBRA Data Manager
Field documentation (e.g., biological, stream habitat) complete - GBRA	GBRA Water Quality Investigator/Field Technician		GBRA Data Manager

Data to be Verified	Field Task	Laboratory Task	Lead Organization Data Manager Task
Instrument calibration data complete - GBRA	GBRA Water Quality Investigator/Field Technician	GBRA Laboratory Analysts/ Technicians GBRA Quality Assurance Officer	GBRA Data Manager
Instrument calibration data complete - LCRA		LCRA Lab Manager LCRA Quality Assurance Officer	GBRA Data Manager
Instrument calibration data complete - SARA		SARA Lab Manager SARA Quality Assurance Officer	GBRA Data Manager
Bacteriological records complete - GBRA		GBRA Laboratory Analysts/ Technicians	GBRA Data Manager
QC samples analyzed at required frequency - GBRA	GBRA Water Quality Investigator/Field Technician	GBRA Lab Director and Quality Assurance Officer	
QC results meet performance and program specifications - GBRA		GBRA Laboratory Analysts/ Technicians GBRA Lab Director and Quality Assurance Officer	GBRA Data Manager
Analytical sensitivity (Minimum Analytical Levels/Ambient Water Reporting Limits) consistent with QAPP - GBRA		GBRA Laboratory Analysts/ Technicians GBRA Lab Director and Quality Assurance Officer	GBRA Data Manager

Data to be Verified	Field Task	Laboratory Task	Lead Organization Data Manager Task
Results, calculations, transcriptions checked - GBRA		GBRA Laboratory Analysts/ Technicians GBRA Lab Director and Quality Assurance Officer	GBRA Data Manager
Laboratory bench-level review performed - GBRA			GBRA Data Manager
All laboratory samples analyzed for all parameters - GBRA		GBRA Laboratory Analysts/ Technicians GBRA Lab Director and Quality Assurance Officer	GBRA Data Manager
Corollary data agree - GBRA			GBRA Data Manager
Nonconforming activities documented - GBRA		GBRA Laboratory Analysts/ Technicians GBRA Lab Director and Quality Assurance Officer	GBRA Data Manager
Outliers confirmed and documented; reasonableness check performed - GBRA			GBRA Data Manager
Dates formatted correctly - GBRA			GBRA Data Manager
Depth reported correctly - GBRA			GBRA Data Manager
TAG IDs correct - GBRA			GBRA Data Manager
TCEQ ID number assigned - GBRA			GBRA Data Manager
Valid parameter codes - GBRA			GBRA Data Manager
Codes for submitting entity(ies), collecting entity(ies), and monitoring type(s) used correctly - GBRA			GBRA Data Manager
Time based on 24-hour clock - GBRA			GBRA Data Manager
Absence of transcription error confirmed - GBRA			GBRA Data Manager
Absence of electronic errors confirmed - GBRA			GBRA Data Manager

Data to be Verified	Field Task	Laboratory Task	Lead Organization Data Manager Task
Sampling and analytical data gaps checked (e.g., all sites for which data are reported are on the coordinated monitoring schedule) - GBRA			GBRA Data Manager
Field QC results attached to data review checklist - GBRA			GBRA Data Manager
Verified data log submitted - GBRA			GBRA Data Manager
100% of data manually reviewed - GBRA			GBRA Data Manager

Table D2.2: Data Review Tasks - UGRA

Data to be Verified	Field Task	Laboratory Task	Lead Organization Data Manager Task
Sample documentation complete; samples labeled, sites identified - UGRA	UGRA Field Technicians		UGRA Data Manager
Field QC samples collected for all analytes as prescribed in the TCEQ *SWQM Procedures Manual*- UGRA	UGRA Field Technicians		UGRA Data Manager
Standards and reagents traceable - UGRA	UGRA Field Technicians	UGRA Quality Assurance Officer UGRA Laboratory Manager	
Chain of custody complete/acceptable – UGRA	UGRA Field Technicians	UGRA Laboratory Analyst/Field Technicians	
NELAP Accreditation is current – UGRA		UGRA Quality Assurance Officer UGRA Laboratory Manager	
Sample preservation and handling acceptable - UGRA	UGRA Field Technicians	UGRA Laboratory Analyst/Field Technicians	
Holding times not exceeded - UGRA	UGRA Field Technicians	UGRA Laboratory Analyst/Field Technicians	UGRA Data Manager
Collection, preparation, and analysis consistent with SOPs and QAPP - UGRA	UGRA Field Technicians	UGRA Laboratory Analyst/Field Technicians	UGRA Data Manager
Field documentation (e.g., biological, stream habitat) complete - UGRA	UGRA Field Technician		UGRA Data Manager
Instrument calibration data complete - UGRA	UGRA Field Technicians	UGRA Laboratory Analyst/Field Technicians	UGRA Data Manager
Bacteriological records complete - UGRA		UGRA Laboratory Analyst/Field Technicians	UGRA Data Manager
QC samples analyzed at required frequency - UGRA	UGRA Field Technicians	UGRA Quality Assurance Officer	
QC results meet performance and program specifications - UGRA		UGRA Laboratory Manager UGRA Quality Assurance Officer	UGRA Data Manager

Data to be Verified	Field Task	Laboratory Task	Lead Organization Data Manager Task
Analytical sensitivity (Minimum Analytical Levels/Ambient Water Reporting Limits) consistent with QAPP - UGRA		UGRA Laboratory Manager UGRA Quality Assurance Officer	UGRA Data Manager
Results, calculations, transcriptions checked - UGRA		UGRA Laboratory Manager UGRA Quality Assurance Officer	UGRA Data Manager
Laboratory bench-level review performed - UGRA			UGRA Data Manager
All laboratory samples analyzed for all parameters - UGRA		UGRA Laboratory Manager UGRA Quality Assurance Officer	UGRA Data Manager
Corollary data agree - UGRA			UGRA Data Manager
Nonconforming activities documented - UGRA			UGRA Data Manager
Outliers confirmed and documented; reasonableness check performed - UGRA			UGRA Data Manager
Dates formatted correctly - UGRA			UGRA Data Manager
Depth reported correctly - UGRA			UGRA Data Manager
TAG IDs correct - UGRA			UGRA Data Manager
TCEQ ID number assigned - UGRA			UGRA Data Manager
Valid parameter codes - UGRA			UGRA Data Manager
Codes for submitting entity(ies), collecting entity(ies), and monitoring type(s) used correctly - UGRA			UGRA Data Manager
Time based on 24-hour clock- UGRA			UGRA Data Manager
Absence of transcription error confirmed - UGRA			UGRA Data Manager
Absence of electronic errors confirmed - UGRA			UGRA Data Manager
Sampling and analytical data gaps checked (e.g., all sites for which data are reported are on the coordinated monitoring schedule) - UGRA			UGRA Data Manager
Field QC results attached to data review checklist - UGRA			UGRA Data Manager
Verified data log submitted - UGRA			UGRA Data Manager
10% of data manually reviewed - UGRA			UGRA Data Manager

Table D2.3: Data Review Tasks - WVWA

Data to be Verified	Field Task	Laboratory Task	Lead Organization Data Manager Task
Sample documentation complete; samples labeled, sites identified - WVWA	Wimberley Valley Watershed Association Field Technicians		GBRA Data Manager
Field QC samples collected for all analytes as prescribed in the TCEQ *SWQM Procedures Manual*- WVWA	Wimberley Valley Watershed Association Field Technicians	GBRA Water Quality Investigator/Field Technician WVWA Project Manager	
Standards and reagents traceable - WVWA	Wimberley Valley Watershed Association Field Technicians		
Chain of custody complete/acceptable – WVWA	Wimberley Valley Watershed Association Field Technicians	GBRA Laboratory Analysts/ Technicians	
Sample preservation and handling acceptable - WVWA	Wimberley Valley Watershed Association Field Technicians	GBRA Water Quality Investigator/Field Technician GBRA Laboratory Analysts/ Technicians	
Holding times not exceeded - WVWA	Wimberley Valley Watershed Association Field Technicians	GBRA Laboratory Analysts/ Technicians	GBRA Data Manager
Collection, preparation, and analysis consistent with SOPs and QAPP – WVWA	Wimberley Valley Watershed Association Field Technicians	GBRA Laboratory Analysts/ Technicians	GBRA Data Manager
Field documentation (e.g., biological, stream habitat) complete- WVWA	Wimberley Valley Watershed Association Field Technicians		GBRA Data Manager
Instrument calibration data complete - WVWA	Wimberley Valley Watershed Association Field Technicians	GBRA Laboratory Analysts/ Technicians GBRA Quality Assurance Officer	GBRA Data Manager

Data to be Verified	Field Task	Laboratory Task	Lead Organization Data Manager Task
Bacteriological records complete – WVWA		GBRA Laboratory Analysts/ Technicians	GBRA Data Manager
QC samples analyzed at required frequency - WVWA	Wimberley Valley Watershed Association Field Technicians	GBRA Water Quality Investigator/Field Technician	
QC results meet performance and program specifications - WVWA		GBRA Water Quality Investigator/Field Technician	GBRA Data Manager
Analytical sensitivity (Minimum Analytical Levels/Ambient Water Reporting Limits) consistent with QAPP – WVWA		GBRA Laboratory Analysts/ Technicians GBRA Lab Director and Quality Assurance Officer	GBRA Data Manager
Results, calculations, transcriptions checked – WVWA		GBRA Laboratory Analysts/ Technicians GBRA Lab Director and Quality Assurance Officer	GBRA Data Manager
Laboratory bench-level review performed – WVWA			GBRA Data Manager
All laboratory samples analyzed for all parameters – WVWA		GBRA Laboratory Analysts/ Technicians GBRA Lab Director and Quality Assurance Officer	GBRA Data Manager
Corollary data agree – WVWA			GBRA Data Manager
Nonconforming activities documented - WVWA			GBRA Data Manager
Outliers confirmed and documented; reasonableness check performed – WVWA			GBRA Data Manager
Dates formatted correctly – WVWA			GBRA Data Manager

Data to be Verified	Field Task	Laboratory Task	Lead Organization Data Manager Task
Depth reported correctly – WVWA			GBRA Data Manager
TAG IDs correct – WVWA			GBRA Data Manager
TCEQ ID number assigned – WVWA			GBRA Data Manager
Valid parameter codes – WVWA			GBRA Data Manager
Codes for submitting entity(ies), collecting entity(ies), and monitoring type(s) used correctly – WVWA			GBRA Data Manager
Time based on 24-hour clock- WVWA			GBRA Data Manager
Absence of transcription error confirmed - WVWA			GBRA Data Manager
Absence of electronic errors confirmed - WVWA			GBRA Data Manager
Sampling and analytical data gaps checked (e.g., all sites for which data are reported are on the coordinated monitoring schedule) - WVWA			GBRA Data Manager
Field QC results attached to data review checklist - WVWA			GBRA Data Manager
Verified data log submitted - WVWA			GBRA Data Manager
100% of data manually reviewed - WVWA			GBRA Data Manager

Table D2.4: Data Review Tasks – Hays County

Data to be Verified	Field Task	Laboratory Task	Lead Organization Data Manager Task
Sample documentation complete; samples labeled, sites identified – Hays County	Hays County Field Technicians		GBRA Data Manager
Field QC samples collected for all analytes as prescribed in the TCEQ *SWQM Procedures Manual*- Hays County	Hays County Field Technician		Hays County Data Manager
Standards and reagents traceable – Hays County	Hays County Field Technician		
Chain of custody complete/acceptable – Hays County	Hays County Field Technician	GBRA Laboratory Analysts/ Technicians	
Sample preservation and handling acceptable – Hays County	Hays County Field Technicians	GBRA Laboratory Analysts/ Technicians	
Holding times not exceeded – Hays County	Hays County Field Technicians	GBRA Laboratory Analysts/ Technicians	GBRA Data Manager
Collection, preparation, and analysis consistent with SOPs and QAPP – Hays County	Hays County Field Technicians	GBRA Laboratory Analysts/ Technicians	GBRA Data Manager
Field documentation (e.g., biological, stream habitat) complete – Hays County	Hays County Field Technicians		GBRA Data Manager
Instrument calibration data complete – Hays County	Hays County Field Technicians	GBRA Laboratory Analysts/ Technicians GBRA Quality Assurance Officer	GBRA Data Manager
Bacteriological records complete – Hays County		GBRA Laboratory Analysts/ Technicians	GBRA Data Manager
QC samples analyzed at required frequency - Hays County	Hays County Field Technicians	GBRA Water Quality Investigator/Field Technician	
QC results meet performance and program specifications - Hays County	Hays County Field Technicians	GBRA Water Quality Investigator/Field Technician	GBRA Data Manager

Data to be Verified	Field Task	Laboratory Task	Lead Organization Data Manager Task
Analytical sensitivity (Minimum Analytical Levels/Ambient Water Reporting Limits) consistent with QAPP – Hays County		GBRA Laboratory Analysts/ Technicians GBRA Lab Director and Quality Assurance Officer	GBRA Data Manager
Results, calculations, transcriptions checked – Hays County		GBRA Laboratory Analysts/ Technicians GBRA Lab Director and Quality Assurance Officer	GBRA Data Manager
Laboratory bench-level review performed – Hays County			GBRA Data Manager
All laboratory samples analyzed for all parameters – Hays County		GBRA Laboratory Analysts/ Technicians GBRA Lab Director and Quality Assurance Officer	GBRA Data Manager
Corollary data agree – Hays County			GBRA Data Manager
Nonconforming activities documented - Hays County			GBRA Data Manager
Outliers confirmed and documented; reasonableness check performed – Hays County			GBRA Data Manager
Dates formatted correctly – Hays County			GBRA Data Manager
Depth reported correctly – Hays County			GBRA Data Manager
TAG IDs correct – Hays County			GBRA Data Manager
TCEQ ID number assigned – Hays County			GBRA Data Manager
Valid parameter codes – Hays County			GBRA Data Manager
Codes for submitting entity(ies), collecting entity(ies), and monitoring type(s) used correctly – Hays County			GBRA Data Manager
Time based on 24-hour clock- Hays County			GBRA Data Manager

Data to be Verified	Field Task	Laboratory Task	Lead Organization Data Manager Task
Absence of transcription error confirmed – Hays County			GBRA Data Manager
Absence of electronic errors confirmed – Hays County			GBRA Data Manager
Sampling and analytical data gaps checked (e.g., all sites for which data are reported are on the coordinated monitoring schedule) – Hays County			GBRA Data Manager
Field QC results attached to data review checklist – Hays County			GBRA Data Manager
Verified data log submitted – Hays County			GBRA Data Manager
100% of data manually reviewed – Hays County			GBRA Data Manager

D3 RECONCILIATION WITH USER REQUIREMENTS

Data produced in this project, and data collected by other organizations (e.g., USGS, TCEQ, etc.), will be analyzed and reconciled with project data quality requirements. Data meeting project requirements will be used by the TCEQ for the *Texas Water Quality Integrated Report* in accordance with TCEQ's *Guidance for Assessing Texas Surface and Finished Drinking Water Quality Data*, and for TMDL development, water quality standards development, and permit decisions as appropriate. Data which do not meet requirements will not be submitted to SWQMIS nor will be considered appropriate for any of the uses noted above.

APPENDIX A:
MEASUREMENT PERFORMANCE SPECIFICATIONS (TABLE A7.1)

GBRA CLEAN RIVERS PROGRAM

APPENDIX
B
TASK 3 WORK PLAN & SAMPLING PROCESS DESIGN AND MONITORING SCHEDULE (PLAN)

APPENDIX B SAMPLING PROCESS DESIGN AND MONITORING SCHEDULE (PLAN)

TASK 3: WATER QUALITY MONITORING

Objectives: Water quality monitoring will focus on collecting information to characterize water quality in a variety of locations and conditions. These efforts will include a combination of:

- planning and coordinating basin-wide monitoring,
- routine, regularly-scheduled monitoring to collect long-term information and support statewide assessment of water quality,
- systematic, regularly-scheduled short-term monitoring to screen water bodies for issues,
- permit support monitoring to provide information for setting permit effluent limits, and
- special study, intensive monitoring targeted to:
- identify sources and causes of pollution,
- assess priority water quality issues,
- obtain background water quality information,
- provide information for setting site-specific permit effluent limits, and
- evaluate statewide, regional, and site-specific water quality standards.

Task Description:

Monitoring Description – GBRA will conduct water quality monitoring and provide details in the Progress Report format as prescribed in the FY 2012-13 CRP Guidance, Exhibit 1C. In FY 2013, GBRA will monitor at a similar level of effort as in FY 2012. The actual number of sites, location, frequency, and parameters collected for FY 2013 will be based on priorities identified at the basin Steering Committee and Coordinated Monitoring meetings and included in the amended Appendix B schedule of the QAPP.

Routine Monitoring: GBRA will conduct routine monitoring at up to 20 sites monthly and up to 7 sites quarterly for field, conventional, flow (at stream sites), and bacteria parameter groups. In addition, 10 sites will be monitored quarterly in Kerr County by the Upper Guadalupe River Authority for the same parameter groups. Additionally, UGRA will monitor nine sites for bacteria and field parameters under the CRP QAPP until the CWA Section 319(h) grant is initiated and that QAPP is signed, at which time, the monitoring will be done under the QAPP for the implementation grant.

Biological Assessments: Biological and habitat assessments will be conducted annually at 4 sites, 1 in Kerr County and 3 in the GBRA district.

Metals and Organic Parameters: Two sites in the GBRA district will be sampled for metals in water and one site for metals in sediment, one time each year. GBRA will monitor organics in sediment at five sites in the GBRA district in 2012. GBRA will monitor organics in water at two sites in the GBRA district, one time each year.

All monitoring procedures and methods will follow the guidelines prescribed in the *GBRA* QAPP, the TCEQ *Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods for Water, Sediment, and Tissue (RG-415)* and the TCEQ *Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Community and Habitat Data (RG-416).*

Coordinated Monitoring Meeting - GBRA will hold annual coordinated monitoring meetings. Qualified monitoring organizations will be invited to attend the working meeting in which monitoring needs and purposes will be discussed segment by segment and station by station. Information from participants and

stakeholders will be used to select stations and parameters that will enhance overall water quality monitoring coverage, eliminate duplication of effort, and address basin priorities. The changes to the monitoring schedule will be entered into the statewide database on the Internet (http://cms.lcra.org) and communicated to meeting attendees. Changes to monitoring that occur during the course of the year will be entered into the statewide database on the Internet and communicated to meeting attendees.

Progress Report - Each Progress Report will indicate the number of sampling events and the types of monitoring conducted in the quarter, to include all types of monitoring.

Biological Data Reports - Biological/habitat data collected under an approved QAPP will be submitted in a pdf document using the Biological Data Reporting Packet outlined in Exhibit 3D in the CRP Guidance.

Deliverables & Dues Dates:

September 1, 2011 through August 31, 2012

A. Conduct water quality monitoring, summarize activities, and submit with Progress Report - December 15, 2011; March 15 and June 15, 2012
B. Coordinated Monitoring Meeting - between March 15 and April 30, 2012
C. Coordinated Monitoring Meeting Summary of Changes - May 15, 2012
D. Email notification that Coordinated Monitoring Schedule updates are complete - May 31, 2012
E. Biological Data Reports for data collected through October 2011 – March 31, 2012

September 1, 2012 through August 31, 2013

A. Conduct water quality monitoring, summarize activities, and submit with Progress Report - September 15 and December 15, 2012; March 15 and June 15 and August 31, 2013
B. Coordinated Monitoring Meeting - between March 15 and April 30, 2013
C. Coordinated Monitoring Meeting Summary of Changes – May 15, 2013
D. Email notification that Coordinated Monitoring Schedule updates are complete - May 31, 2013
E. Biological Data Reports for data collected through October 2012 – March 31, 2013

Sample Design Rationale FY 2012

The sample design is based on the legislative intent of the Clean Rivers Program. Under the legislation, the Basin Planning Agencies have been tasked with providing data to characterize water quality conditions in support of the Texas Water Quality Integrated Report, and to identify significant long-term water quality trends. Based on Steering Committee input, achievable water quality objectives and priorities and the identification of water quality issues are used to develop work plans which are in accord with available resources. As part of the Steering Committee process, the GBRA coordinates closely with the TCEQ and other participants to ensure a comprehensive water monitoring strategy within the watershed. A discussion of past or ongoing water quality issues should be provided here to justify the monitoring schedule.

1. It was the opinion of the staffs at the meeting that it is not necessary to continue the 24-hour diurnal monitoring at the Guadalupe River Tidal.
2. Organics in sediment was removed from the schedule for San Marcos at Luling.
3. Hays County Development Services Department will begin monitoring five sites on the Blanco River and one site in the upper San Marcos watersheds. Monitoring will be conducted on the Blanco River at Five Mile Dam and the San Marcos River at Old Bastrop Road for field parameters monthly. Monitoring at the Blanco River sites (at Lime Kiln Road, at Little Arkansas, at CR 1492 and at Fisher Store Road) will be monitored for field parameters, bacteria and flow monthly and conventional parameters (*E. coli*, Total Kjeldahl Nitrogen, Nitrate-Nitrogen, Ammonia-Nitrogen, Total Phosphorus and Total Suspended Solids) quarterly. The GBRA Regional Laboratory will perform the conventional analyses.
4. Total dissolved solids were added to the list of conventional parameters analyzed at the San Marcos at IH35. TDS and specific conductance will be used to calculate a site-specific correction factor that can be used to determine TDS from specific conductance. The site was listed as impaired due to elevated TDS calculated using the standard 0.65 correction factor.
5. The metals in sediment will be discontinued at the Guadalupe River at Kerriville State Park in FY2012.
6. Diurnal monitoring will be done with each biological assessment.

Site Selection Criteria

This data collection effort involves monitoring routine water quality, using procedures that are consistent with the TCEQ SWQM program, for the purpose of data entry into the SWQMIS database maintained by the TCEQ. To this end, some general guidelines are followed when selecting sampling sites, as basically outlined below, and discussed thoroughly in the TCEQ *Surface Water Quality Monitoring Procedures, Volume 1 (RG-415)*. Overall consideration is given to accessibility and safety. All monitoring activities have been developed in coordination with the CRP Steering Committee and with the TCEQ.

1. Locate stream sites so that samples can be safely collected from the centroid of flow. Centroid is defined as the midpoint of that portion of stream width which contains 50 percent of the total flow. If few sites are available for a stream segment, choose one that would best represent the water body, and not an unusual condition or contaminant source. Avoid backwater areas or eddies when selecting a stream site.

2. At a minimum for reservoirs, locate sites near the dam (reservoirs) and in the major arms. Larger reservoirs might also include stations in the middle and upper (riverine) areas. Select sites that best represent the water body by avoiding coves and back water areas. A single monitoring site is considered representative of 25 percent of the total reservoir acres, but not more than 5,120 acres.

3. Routine monitoring sites are selected to maximize stream coverage or basin coverage. Very long segments may require more stations. As a rule of thumb, stream segments between 25 and 50 miles long require two stations, and longer than 50 miles require three or more depending on the existence of areas with significantly different sources of contamination or potential water quality concerns. Major hydrological features, such as the confluence of a major tributary or an instream dam, may also limit the spatial extent of an assessment based on one station.

4. Because historical water quality data can be very useful in assessing use attainment or impairment, it may be best to use sites that are on current or past monitoring schedules.

5. All classified segments (including reservoirs) should have at least one routine monitoring site that adequately characterizes the water body, and should be coordinated with the TCEQ or other qualified monitoring entities reporting routine data to TCEQ.

6. Routine monitoring sites may be selected to bracket sources of pollution, influence of tributaries, changes in land uses, and hydrological modifications.

7. Sites should be accessible. When possible, stream sites should have a USGS or IBWC stream flow gauge. If not, it should be possible to conduct flow measurement during routine visits.

Monitoring Sites

Monitoring Tables for fiscal year 2012 are presented on the following page.

Monitoring Sites for FY 2012

Table B1.1 Sample Design and Schedule, FY 2012

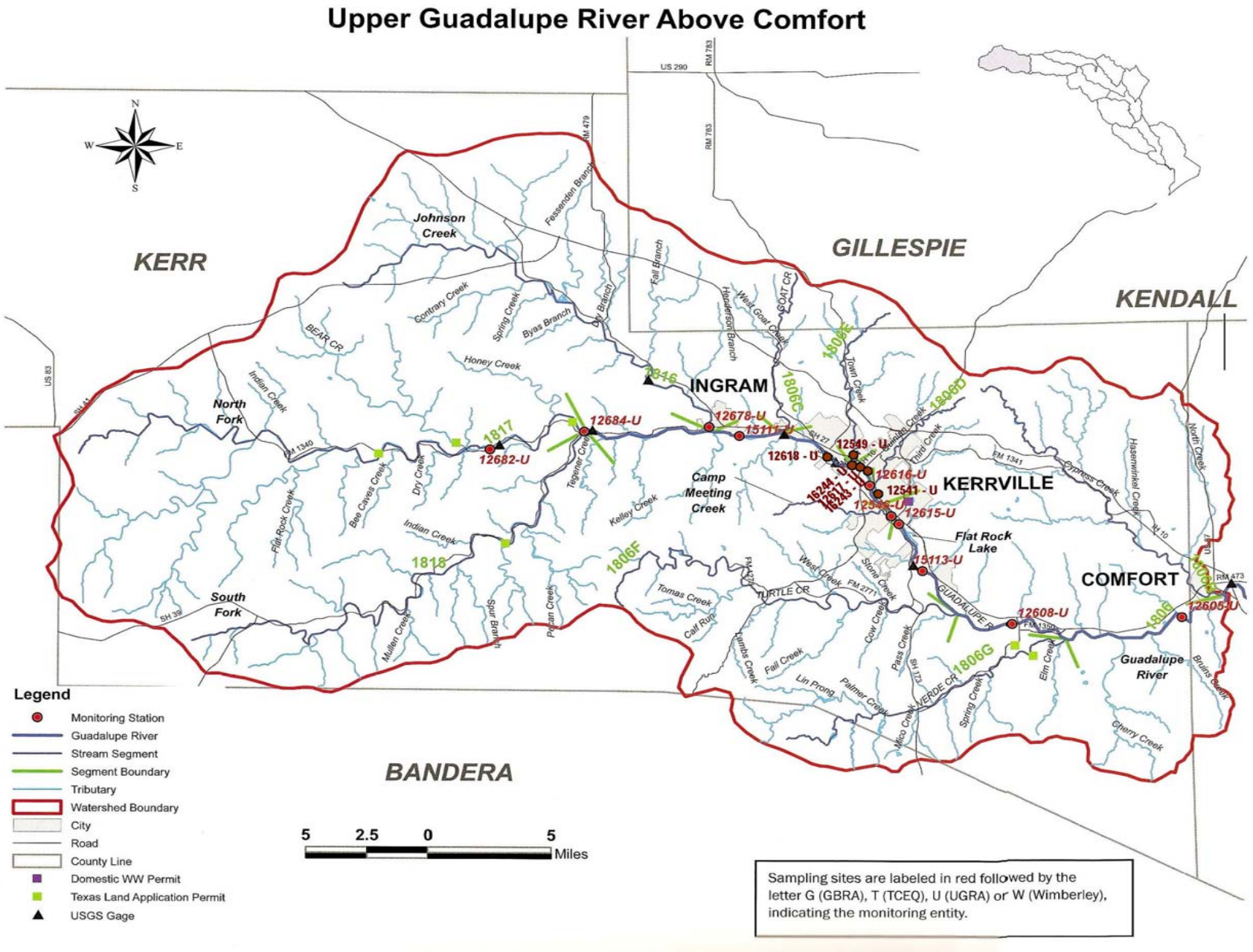
Site Description	Stat ID	Waterbody ID	Basin	Reg	SE	CE	MT	Field	Conv	Bact	Flow	24 hr DO	AqHab	Bent	Nekt	Metal Water	Org Water	Metal Sed	Org Sed	Fish Tiss	Amb Tox Wat	Amb Tox Sed	Comments
GUADALUPE RIVER AT LOWER GUADALUPE DIVERSION DAM AND SALT WATER BARRIER	12578	1802	18	14	GB	GB	RT	12	12	12	12					1							NH3 and TKN will be done bimon
GUADALUPE RIVER AT FM 447 WEST OF NURSERY AND UPSTREAM OF SOUTH TEXAS ELECTRIC	12590	1803	18	14	GB	GB	RT	4	4	4	4	5											
GUADALUPE RIVER AT OLD SAN ANTONIO ROAD/FM766 WEST OF CUERO	12592	1803	18	14	GB	GB	RT	12	12	12	12												NH3 and TKN will be done bimon
GUADALUPE RIVER AT US 183 IN HOCHHEIM IN DEWITT COUNTY	20470	1803	18	14	GB	GB	RT	4	4	4	4												
SANDIES CREEK 100 FT DOWNSTREAM OF COUNTY HIGHWAY 1.9 MI UPSTREAM FROM BIRDS CREEK 2.0 MI NE OF WESTHOFF	13657	1803B	18	14	GB	GB	RT	12	12	12	12												NH3 and TKN will be done bimon
PEACH CREEK AT GONZALES CR 353 14.0KM EAST OF GONZALES	14937	1803C	18	14	GB	GB	RT	12	12	12	12					1							NH3 and TKN will be done bimon
GUADALUPE RIVER IMMEDIATELY DOWNSTREAM OF H-5 DAM AT WOOD LAKE SW OF GONZALES TX	15110	1804	18	14	GB	GB	RT	12	12	12	12												NH3 and TKN will be done bimon
LAKE DUNLAP-GUADALUPE RIVER NORTH BANK AT ACS PLACE AT MID POINT OF LONE STAR DRIVE	12596	1804	18	13	GB	GB	RT	12	12	12	12												NH3 and TKN will be done bimon
LAKE MCQUEENEY 1154 METERS UPSTREAM OF MCQUEENEY DAM ON SOUTHEAST BANK	15149	1804	18	13	GB	GB	RT	12	12	12	12												NH3 and TKN will be done bimon
GERONIMO CREEK AT HABERLE ROAD/CR 1103 MILES SOUTH OF GERONIMO	12576	1804A	18	13	GB	GB	RT	12	12	12	12	1	1	1	1			1	1				ecoregion reference site NH3 and TKN will be done bimonthly

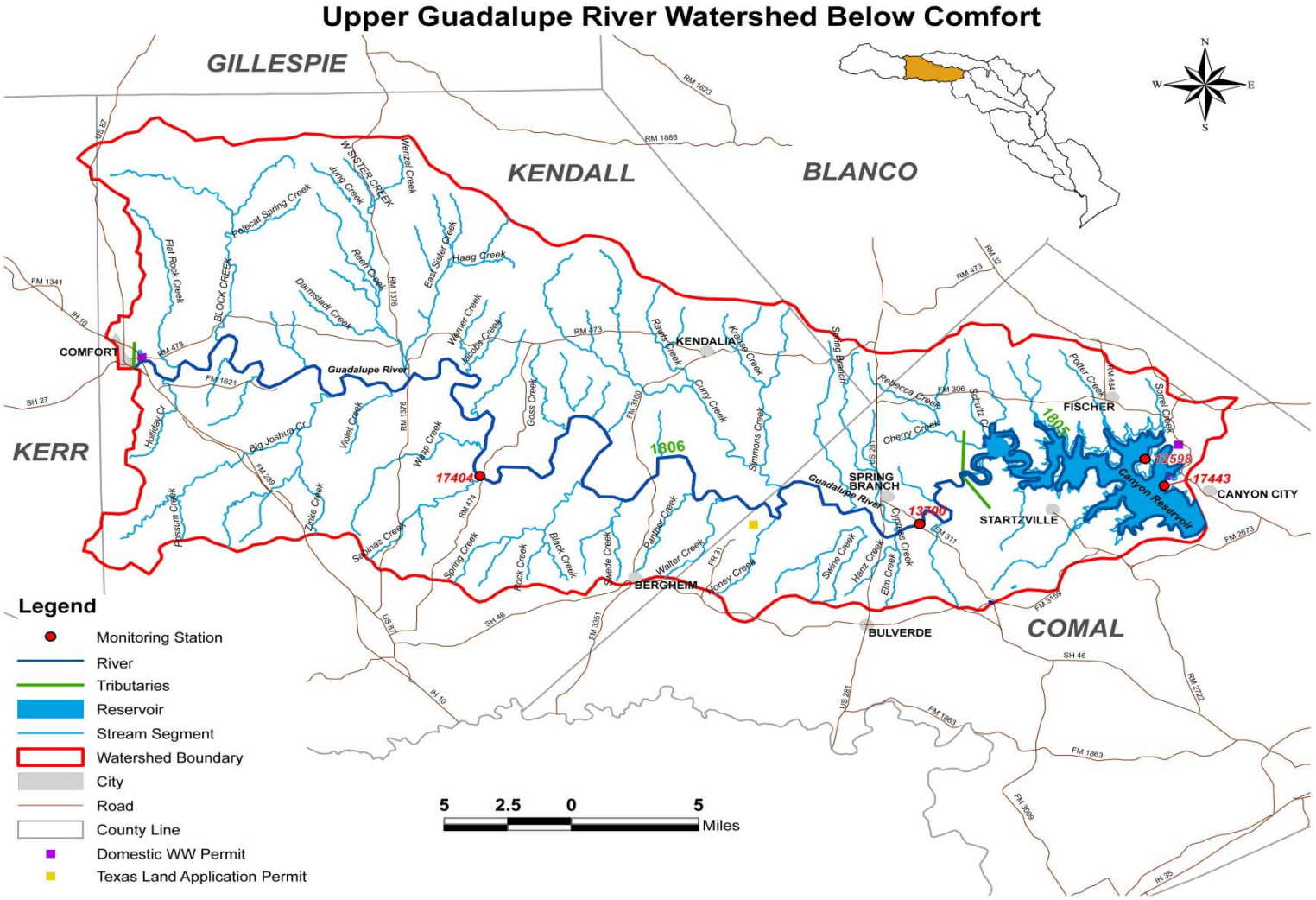
Site Description	Stat ID	Waterbody ID	Basin	Reg	SE	CE	MT	Field	Conv	Bact	Flow	24 hr DO	AqHab	Bent	Nekt	Metal Water	Org Water	Metal Sed	Org Sed	Fish Tiss	Amb Tox Wat	Amb Tox Sed	Comments
CANYON LAKE AT JACOBS CREEK PARK BOAT RAMP	17443	1805	18	13	GB	GB	RT	4	4	4													
CANYON LAKE SOUTH OF JACOBS CREEK PARK 500 YARDS EAST OF PENINSULA	12598	1805	18	13	GB	GB	RT	12	12	12													NH3 and TKN will be done bimon
GUADALUPE RIVER AT FM 474 AT AMMANS CROSSING NE OF BOERNE	17404	1806	18	13	GB	GB	RT	4	4	4	4												
GUADALUPE RIVER AT FOOTBRIDGE IN LOUISE HAYS PARK APPROX 100M UPSTREAM OF SH16	16244	1806	18	13	GB	UG	RT	12		12													CRP will fund until TMDL QAPP approved
GUADALUPE RIVER AT G STREET/FORMERLY OLD MEDINA RD IN KERRVILLE SEGMENT KM 177.9	12616	1806	18	13	GB	UG	RT	12	4	12	4												CRP will fund monthly bacteria and field until TMDL QAPP approved
GUADALUPE RIVER AT HERMANN SONS RD ADJACENT TO HERMANN SONS HOME WEST OF COMFORT	12605	1806	18	13	GB	UG	RT	4	4	4	4												Flow estimate only
GUADALUPE RIVER AT KERRVILLE STATE PARK SEGMENT KM 174.4	12615	1806	18	13	GB	UG	RT	12	4	12	4												CRP will fund monthly bacteria and field until TMDL QAPP approved. Flow estimate only
GUADALUPE RIVER AT LOUISE HAYS PARK DAM APPROX 50M DOWNSTREAM OF SH16	16243	1806	18	13	GB	UG	RT	12		12													CRP will fund until TMDL QAPP approved
GUADALUPE RIVER AT RIVERVIEW RD IN INGRAM TX	15111	1806	18	13	GB	UG	RT	4	4	4	4												
GUADALUPE RIVER AT RR 311 1.9 MI SE OF SPRING BRANCH 7.5 MI DOWNSTREAM FROM CURRY CREEK	13700	1806	18	13	GB	GB	RT	12	12	12	12												NH3 and TKN will be done bimon
GUADALUPE RIVER AT SH 16 IN KERRVILLE	12617	1806	18	13	GB	UG	RT	12		12													CRP will fund until TMDL QAPP approved
GUADALUPE RIVER AT SPLIT ROCK RD OFF SH 27 2.6 KM DOWNSTREAM OF FLATROCK DAM	15113	1806	18	13	GB	UG	RT	4	4	4	4	1	1	1	1								

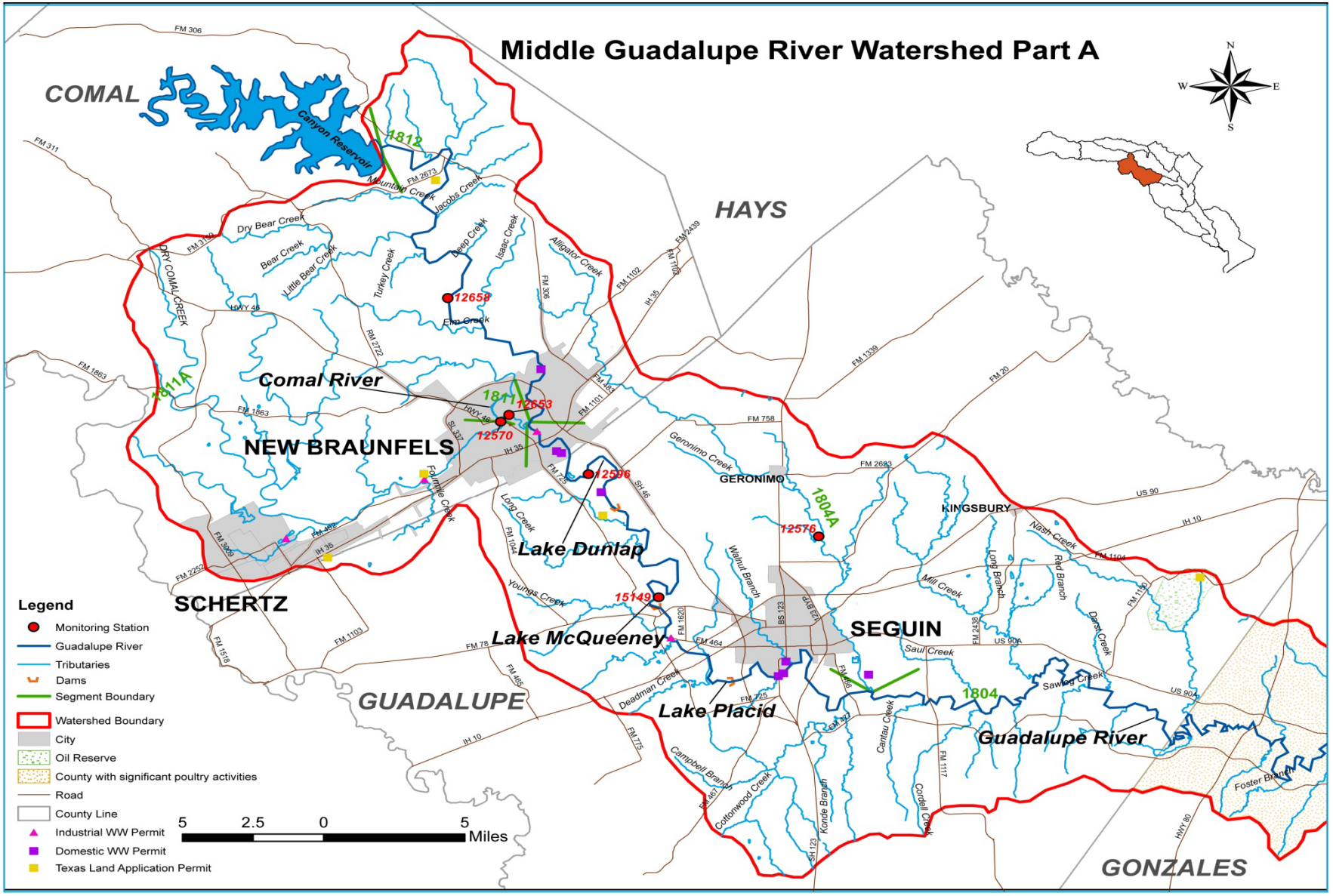
Site Description	Stat ID	Waterbody ID	Basin	Reg	SE	CE	MT	Field	Conv	Bact	Flow	24 hr DO	AqHab	Bent	Nekt	Metal Water	Org Water	Metal Sed	Org Sed	Fish Tiss	Amb Tox Wat	Amb Tox Sed	Comments
GUADALUPE RIVER AT UGRA LAKE DAM	12618	1806	18	13	GB	UG	RT	12		12	12												CRP will fund until TMDL QAPP approved
GUADALUPE RIVER CENTER POINT LAKE	12608	1806	18	13	GB	UG	RT	4	4	4													Flow estimate only
CAMP MEETING CREEK 0.1 KM UPSTREAM CONFLUENCE WITH GUADALUPE IN KERRVILLE	12546	1806A	18	13	GB	UG	RT	12	4	12	12												CRP will fund monthly bacteria, field and flow until TMDL QAPP approved
QUINLAN CREEK AT TRAVIS STREET IN KERRVILLE	12541	1806D	18	13	GB	UG	RT	12		12	12												CRP will fund until TMDL QAPP approved
TOWN CREEK AT HAMILTON STREET IN KERRVILLE	12549	1806E	18	13	GB	UG	RT	12		12	12												CRP will fund until TMDL QAPP approved
COLETO CREEK RESERVOIR AT MID POINT OF DAM ON COLETO CREEK PARK ROAD	20827	1807	18	14	GB	GB	RT	12	12	12													depth profiles will be completed quarterly; nh3 and tkn bimonthly
LOWER SAN MARCOS RIVER AT COUNTY LINE ROAD/COUNTY ROAD 101/OLD BASTROP HIGHWAY	12628	1808	18	11	GB	HZ	RT	12		12	12												
LOWER SAN MARCOS RIVER AT SH 80 SOUTH OF LULING	12626	1808	18	11	GB	GB	RT	12	12	12	12												
SAN MARCOS RIVER AT US90A 3.3KM WEST OF INTERSECTION OF US90A AND US183 IN GONZALES 7KM UPSTREAM OF CONFL. WITH GUADALUPE RIVER	16578	1808	18	14	GB	GB	RT	4	4	4	4												
BLANCO RIVER AT POST RD 2.0 MILES UPSTREAM FROM BRIDGE ON US 81/IH 35	12635	1809	18	11	GB	HZ	RT	12		12	12												
PLUM CREEK AT CR 202 SE OF LOCKHART	12647	1810	18	11	GB	GB	RT	12	12	12	12	1	1	1	1				1				coordinate w. region 11
PLUM CREEK AT OLD WOODEN BRIDGE ON CALDWELL CR 135 SE OF LULING	12640	1810	18	11	GB	GB	RT	12	12	12	12												NH3 and TKN will be done bimon

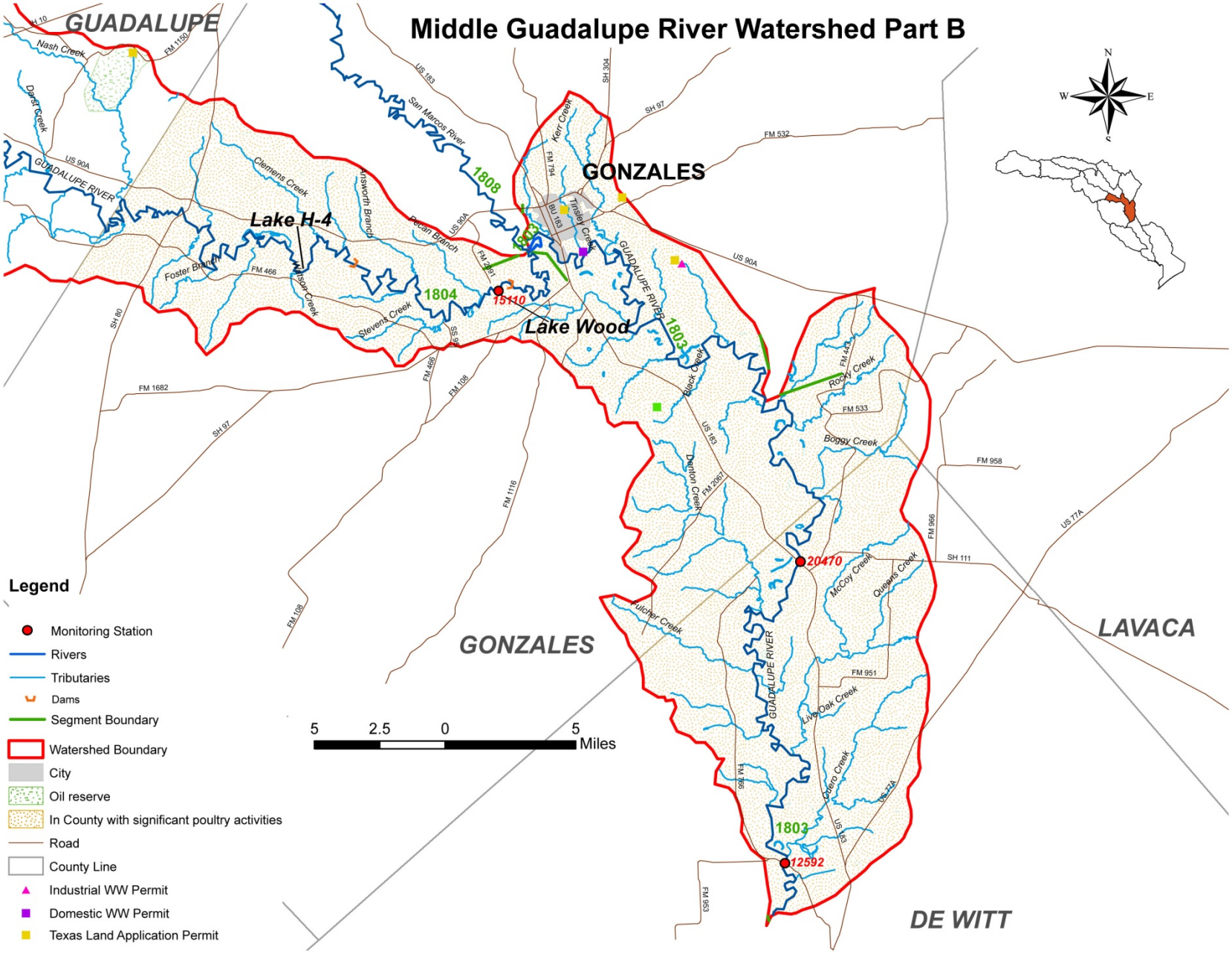
Site Description	Stat ID	Waterbody ID	Basin	Reg	SE	CE	MT	Field	Conv	Bact	Flow	24 hr DO	AqHab	Bent	Nekt	Metal Water	Org Water	Metal Sed	Org Sed	Fish Tiss	Amb Tox Wat	Amb Tox Sed	Comments
PLUM CREEK AT PLUM CREEK ROAD NORTH OF UHLAND	17406	1810	18	11	GB	GB	RT	12	12	12	12												NH3 and TKN will be done bimon
COMAL RIVER DOWNSTREAM CLEMONS DAM IN NEW BRAUNFELS	12653	1811	18	13	GB	GB	RT	12	12	12	12												NH3 and TKN will be done bimon
DRY COMAL CREEK AT MISSOURI-KANSAS-TEXAS RAILROAD CROSSING IN NEW BRAUNFELS	12570	1811A	18	13	GB	GB	RT	12	12	12	12						1		1				NH3 and TKN will be done bimon
GUADALUPE RIVER AT RIVER RD 2ND CROSSING UPSTREAM OF NEW BRAUNFELS	12658	1812	18	13	GB	GB	RT	12	12	12	12												NH3 and TKN will be done bimon
BLANCO RIVER AT BRIDGE ON SH 12 AT WIMBERLEY	12661	1813	18	11	GB	WV	RT	8	8	8	8												7 samples collected Mar-Oct.;
BLANCO RIVER AT FM 165 1/2 MILE EAST OF BLANCO	12668	1813	18	11	GB	GB	RT	12	12	12	12												NH3 and TKN will be done bimon diurnals will be done in critical period
BLANCO RIVER AT LOW WATER CROSSING AT CR 173/FULTON RANCH RD	12660	1813	18	11	GB	HZ	RT	12	4	4	12												Conventionals-TN, TotP, TSS
BLANCO RIVER AT LOW WATER CROSSING CR1492 AT PIONEER TOWN	12663	1813	18	11	GB	HZ	RT	12	4	4	12												Conventionals-TN, TotP, TSS
BLANCO RIVER AT LIME KILN ROAD	GB001	1813	18	11	GB	HZ	RT	12	4	4	12												Conventionals-TN, TotP, TSS
BLANCO RIVER AT PLEASANT VALLEY CROSSING ON FISHER STORE RD	12665	1813	18	11	GB	HZ	RT	12	4	4	12												Conventionals-TN, TotP, TSS
UPPER SAN MARCOS RIVER IMMEDIATELY UPSTREAM OF IH 35 BRIDGE AT SAN MARCOS	12672	1814	18	11	GB	GB	RT	4	4	4	4								1				samples collected downstream o
CYPRESS CREEK AT CONFLUENCE WITH THE BLANCO RIVER	12673	1815	18	11	GB	GB	RT										1		1				
CYPRESS CREEK AT CONFLUENCE WITH THE BLANCO RIVER	12673	1815	18	11	GB	WV	RT	8	8	8	8												seven samples collected from M
CYPRESS CREEK AT DOWNSTREAM END IN BLUE HOLE CAMPGROUND	12675	1815	18	11	GB	WV	BS					1											

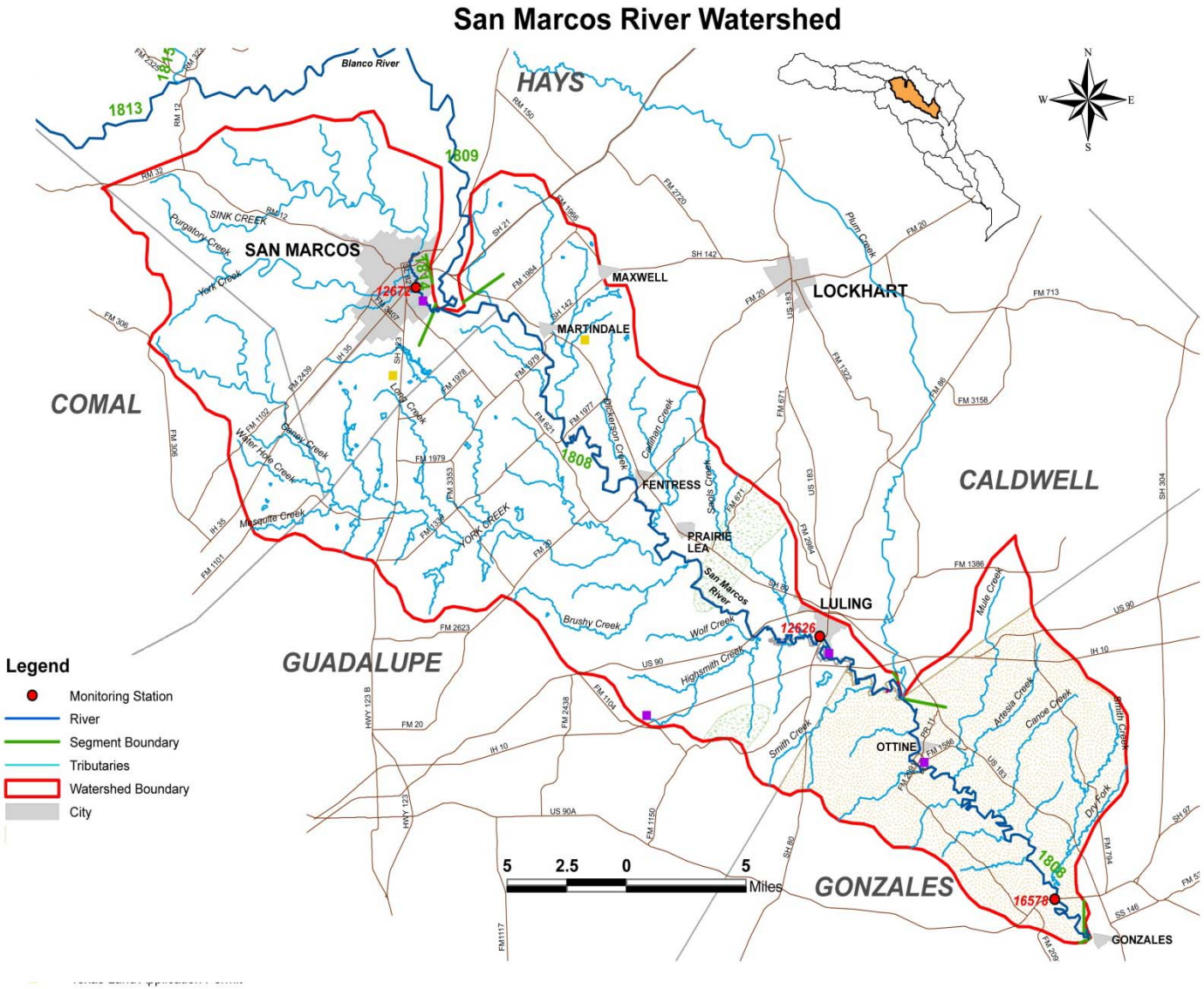
Site Description	Stat ID	Waterbody ID	Basin	Reg	SE	CE	MT	Field	Conv	Bact	Flow	24 hr DO	AqHab	Bent	Nekt	Metal Water	Org Water	Metal Sed	Org Sed	Fish Tiss	Amb Tox Wat	Amb Tox Sed	Comments
CYPRESS CREEK AT DOWNSTREAM END IN BLUE HOLE CAMPGROUND	12675	1815	18	11	GB	WV	RT	8	8	8	8												7 samples collected Mar-Oct.;
CYPRESS CREEK AT FM 12 AT WIMBERLEY	12674	1815	18	11	GB	GB	RT	4	4	4	4	1	1	1	1								
CYPRESS CREEK AT JACOBS WELL SPRING APPROXIMATELY 670 METERS UPSTREAM OF HAYS CR 220/JACOBS WELL ROAD NORTH OF WIMBERLEY CAMS 0745	12677	1815	18	11	GB	WV	RT	8	8	8	8												seven samples collected Mar.-O
CYPRESS CREEK AT RR 12 1 MILE NORTH OF WIMBERLEY	12676	1815	18	11	GB	WV	RT	8	8	8	8												seven samples collected in Mar
JOHNSON CREEK AT SH 39 IN INGRAM	12678	1816	18	13	GB	UG	RT	4	4	4	4												
NORTH FORK GUADALUPE AT RIVER GAGING STATION NEAR CAMP WALDEMAR	12682	1817	18	13	GB	UG	RT	4	4	4	4												
SOUTH FORK GUADALUPE ADJACENT TO HUNT LIONS PARK	12684	1818	18	13	GB	UG	RT	4	4	4	4												
SAN ANTONIO RIVER FM 2506 EAST OF FANNIN	12790	1901	19	14	GB	GB	RT	12	12	12	12												NH3 and TKN will be done bimon

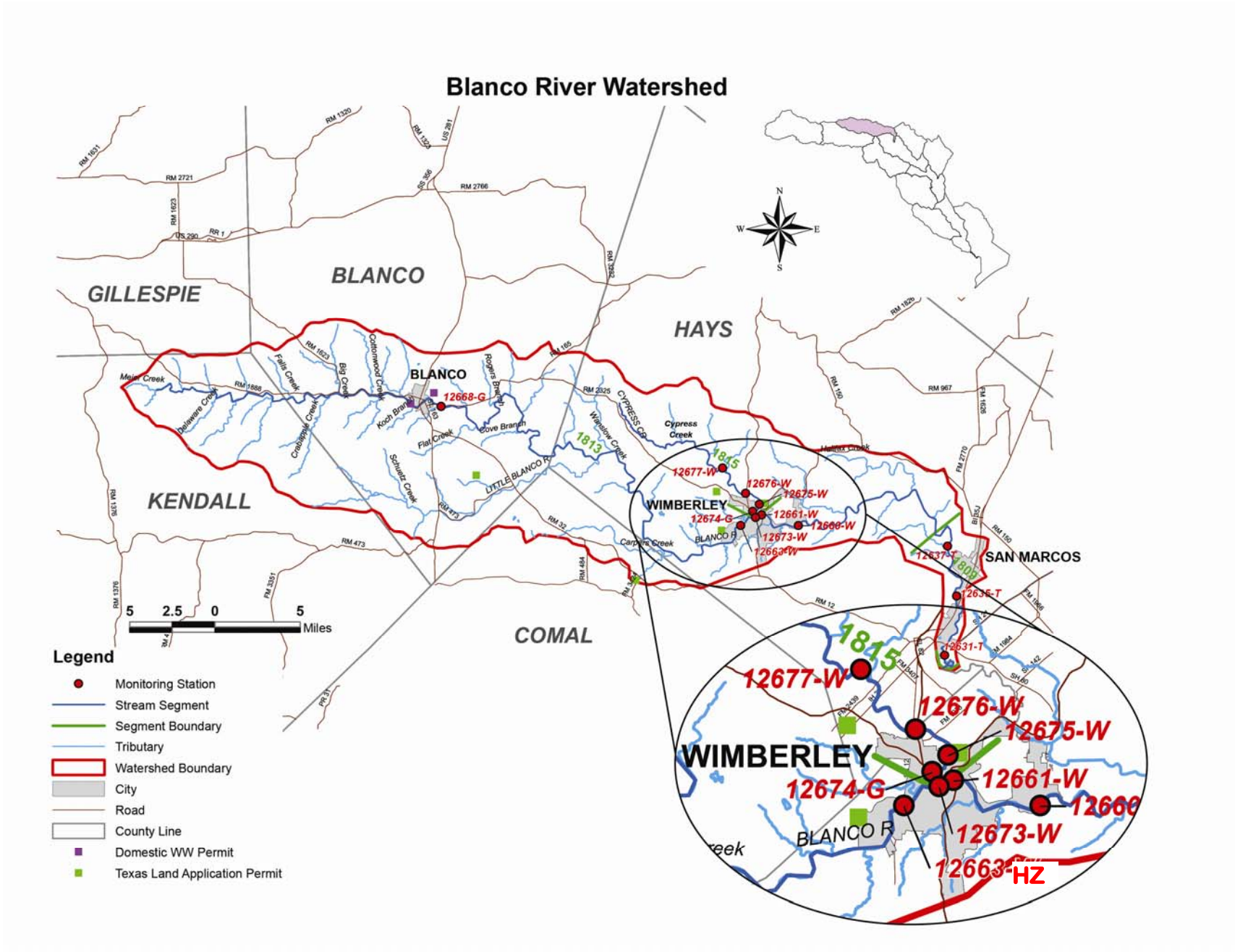

Upper Guadalupe River Above Comfort
KERR
GILLESPIE
KENDALL
BANDERA
INGRAM
KERRVILLE
COMFORT
Johnson Creek
North Fork
South Fork
Camp Meeting Creek
Flat Rock Lake
Guadalupe River
12684-U
12678-U
15111-U
12682-U
12549 - U
12618 - U
12616-U
12541 - U
12615-U
15113-U
12608-U
12605-U
1817
1818
1806C
1806D
1806E
1806F
1806G
1806H
Legend
Monitoring Station
Guadalupe River
Stream Segment
Segment Boundary
Tributary
Watershed Boundary
City
Road
County Line
Domestic WW Permit
Texas Land Application Permit
USGS Gage
5 2.5 0 5
Miles
Sampling sites are labeled in red followed by the letter G (GBRA), T (TCEQ), U (UGRA) or W (Wimberley), indicating the monitoring entity.

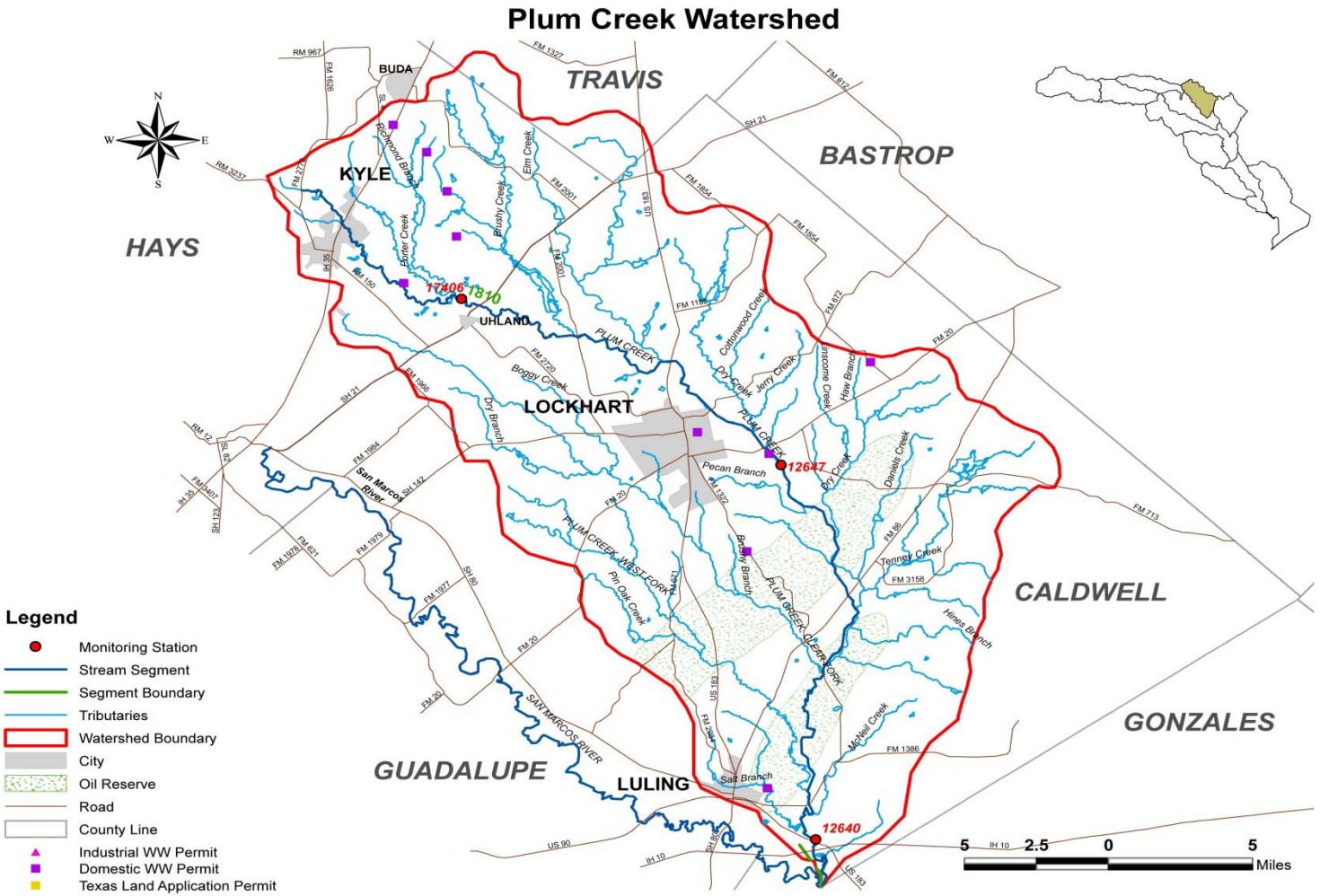

Upper Guadalupe River Watershed Below Comfort
GILLESPIE
KENDALL
BLANCO
KERR
COMAL
COMFORT
KENDALIA
FISCHER
SPRING BRANCH
STARTZVILLE
CANYON CITY
BERGHEIM
BULVERDE
Canyon Reservoir
Guadalupe River
17404
1806
13500
1805
12598
17443
Legend
Monitoring Station
River
Tributaries
Reservoir
Stream Segment
Watershed Boundary
City
Road
County Line
Domestic WW Permit
Texas Land Application Permit
5 2.5 0 5
Miles

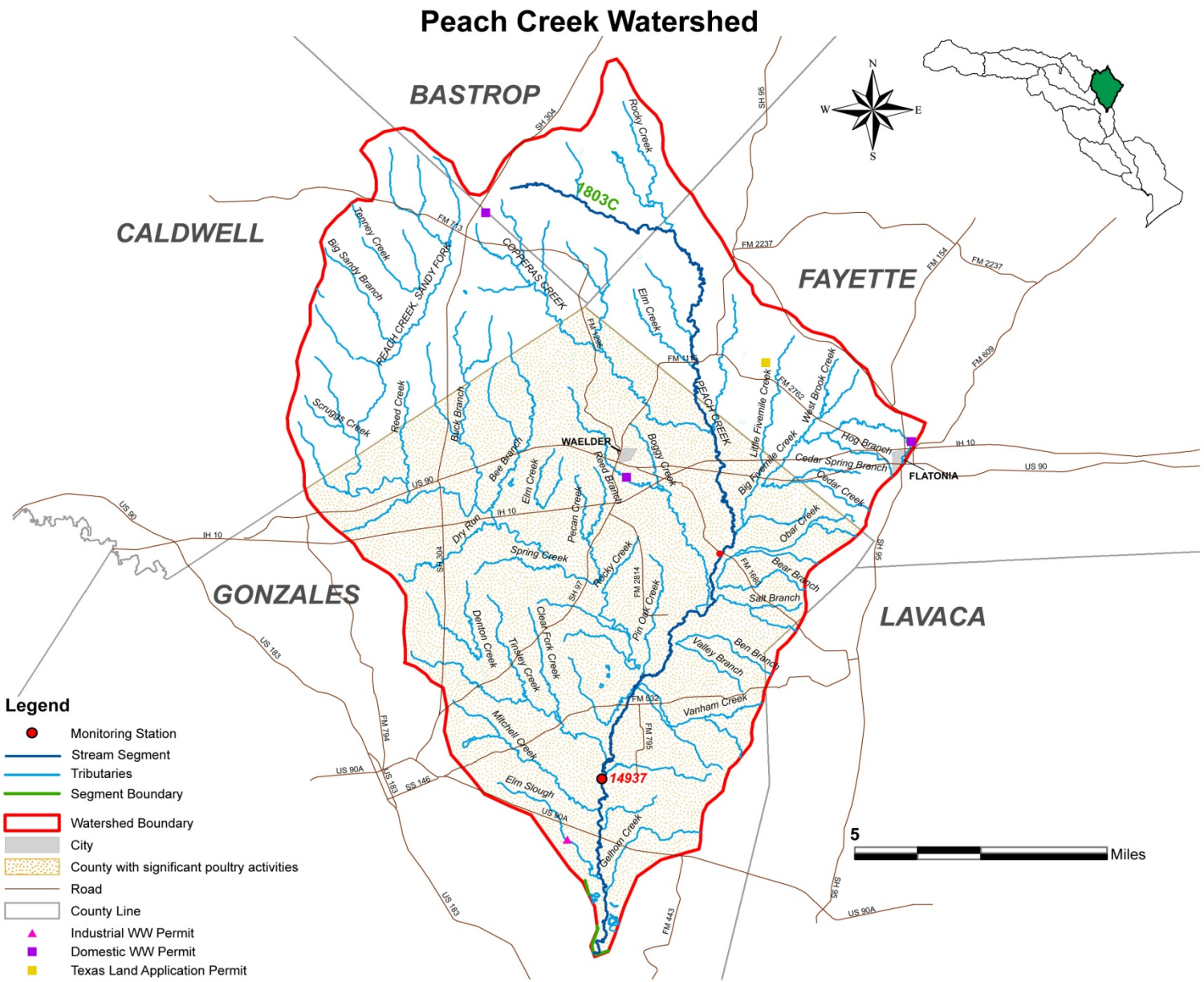

Middle Guadalupe River Watershed Part A
COMAL
HAYS
GUADALUPE
GONZALES
Canyon Reservoir
Comal River
NEW BRAUNFELS
SCHERTZ
GERONIMO
KINGSBURY
SEGUIN
Lake Dunlap
Lake McQueeney
Lake Placid
Guadalupe River
1812
1811A
1811
1804A
1804
12658
12653
12570
12596
12576
15149
Legend
Monitoring Station
Guadalupe River
Tributaries
Dams
Segment Boundary
Watershed Boundary
City
Oil Reserve
County with significant poultry activities
Road
County Line
Industrial WW Permit
Domestic WW Permit
Texas Land Application Permit
5 2.5 0 5 Miles


Middle Guadalupe River Watershed Part B
GUADALUPE
GONZALES
GONZALES
LAVACA
DE WITT
Lake H-4
Lake Wood
1808
1803
1804
1803
1803
15110
20470
12592
Legend
Monitoring Station
Rivers
Tributaries
Dams
Segment Boundary
Watershed Boundary
City
Oil reserve
In County with significant poultry activities
Road
County Line
Industrial WW Permit
Domestic WW Permit
Texas Land Application Permit
5 2.5 0 5
Miles
N
W
E
S


San Marcos River Watershed
Blanco River
1813
1809
1808
HAYS
SAN MARCOS
MAXWELL
LOCKHART
MARTINDALE
COMAL
FENTRESS
CALDWELL
PRAIRIE LEA
LULING
GUADALUPE
OTTINE
GONZALES
12672
12626
16578
SINK CREEK
Purgatory Creek
York Creek
Long Creek
Dickerson Creek
Cadman Creek
Sandy Creek
Water Hole Creek
Mesquite Creek
YORK CREEK
Brushy Creek
Wolf Creek
Highsmith Creek
San Marcos River
Plum Creek
Mule Creek
Artesia Creek
Canoe Creek
Smith Creek
Dry Fork
Legend
Monitoring Station
River
Segment Boundary
Tributaries
Watershed Boundary
City
5 2.5 0 5
Miles
N
S
E
W


Blanco River Watershed
GILLESPIE
BLANCO
HAYS
KENDALL
COMAL
BLANCO
WIMBERLEY
SAN MARCOS
12668-G
12677-W
12676-W
12675-W
12674-G
12661-W
12660-W
12673-W
12663-W
12637-T
12636-T
12631-T
1813
1815
1805
Cypress Creek
Flat Creek
Cove Branch
Rogers Branch
Cottonwood Creek
Big Creek
Falls Creek
Cedar Creek
Koch Branch
Schultz Creek
Waterlow Creek
Purgatory Creek
Cahpera Creek
Main Creek
Delaware Creek
LITTLE BLANCO R.
BLANCO R.
5 2.5 0 5
Miles
Legend
Monitoring Station
Stream Segment
Segment Boundary
Tributary
Watershed Boundary
City
Road
County Line
Domestic WW Permit
Texas Land Application Permit
HZ


Plum Creek Watershed
TRAVIS
BASTROP
HAYS
CALDWELL
GUADALUPE
GONZALES
BUDA
KYLE
UHLAND
LOCKHART
LULING
PLUM CREEK
PLUM CREEK WEST FORK
PLUM CREEK EAST FORK
SAN MARCOS RIVER
San Marcos River
Richmond Branch
Brushy Creek
Elm Creek
Porter Creek
Cottonwood Creek
Jerry Creek
Dry Creek
Boggy Creek
Dry Branch
Pecan Branch
Dry Creek
Daniels Creek
Haw Branch
Sycamore Creek
Tennys Creek
Brushy Branch
Hines Branch
McNeil Creek
Salt Branch
Pin Oak Creek
17406
1810
12647
12640
Legend
Monitoring Station
Stream Segment
Segment Boundary
Tributaries
Watershed Boundary
City
Oil Reserve
Road
County Line
Industrial WW Permit
Domestic WW Permit
Texas Land Application Permit
5 2.5 0 5
Miles


Peach Creek Watershed
BASTROP
CALDWELL
FAYETTE
GONZALES
LAVACA
1803C
14937
WAELDER
FLATONIA
Rocky Creek
Elm Creek
COPPERAS CREEK
REACH CREEK
SANDY FORK
Big Sandy Branch
Tenney Creek
Reed Creek
Scruggs Creek
Buck Branch
Bee Branch
Boggy Creek
Road Branch
Pecan Creek
Dry Run
Spring Creek
Rocky Creek
Pin Oak Creek
Little Fivemile Creek
Big Fivemile Creek
West Brook Creek
Hog Branch
Cedar Spring Branch
Cedar Creek
Obar Creek
Bear Branch
Salt Branch
Ben Branch
Valley Branch
Vanham Creek
Denton Creek
Tinsley Creek
Clear Fork Creek
Mitchell Creek
Elm Slough
Gelhorn Creek
FM 713
FM 1295
FM 1115
FM 2762
FM 2237
FM 154
FM 609
FM 1680
FM 2814
FM 532
FM 795
FM 794
FM 443
SH 304
SH 95
SH 96
US 90
US 90A
US 183
SS 146
IH 10
Legend
Monitoring Station
Stream Segment
Tributaries
Segment Boundary
Watershed Boundary
City
County with significant poultry activities
Road
County Line
Industrial WW Permit
Domestic WW Permit
Texas Land Application Permit
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W
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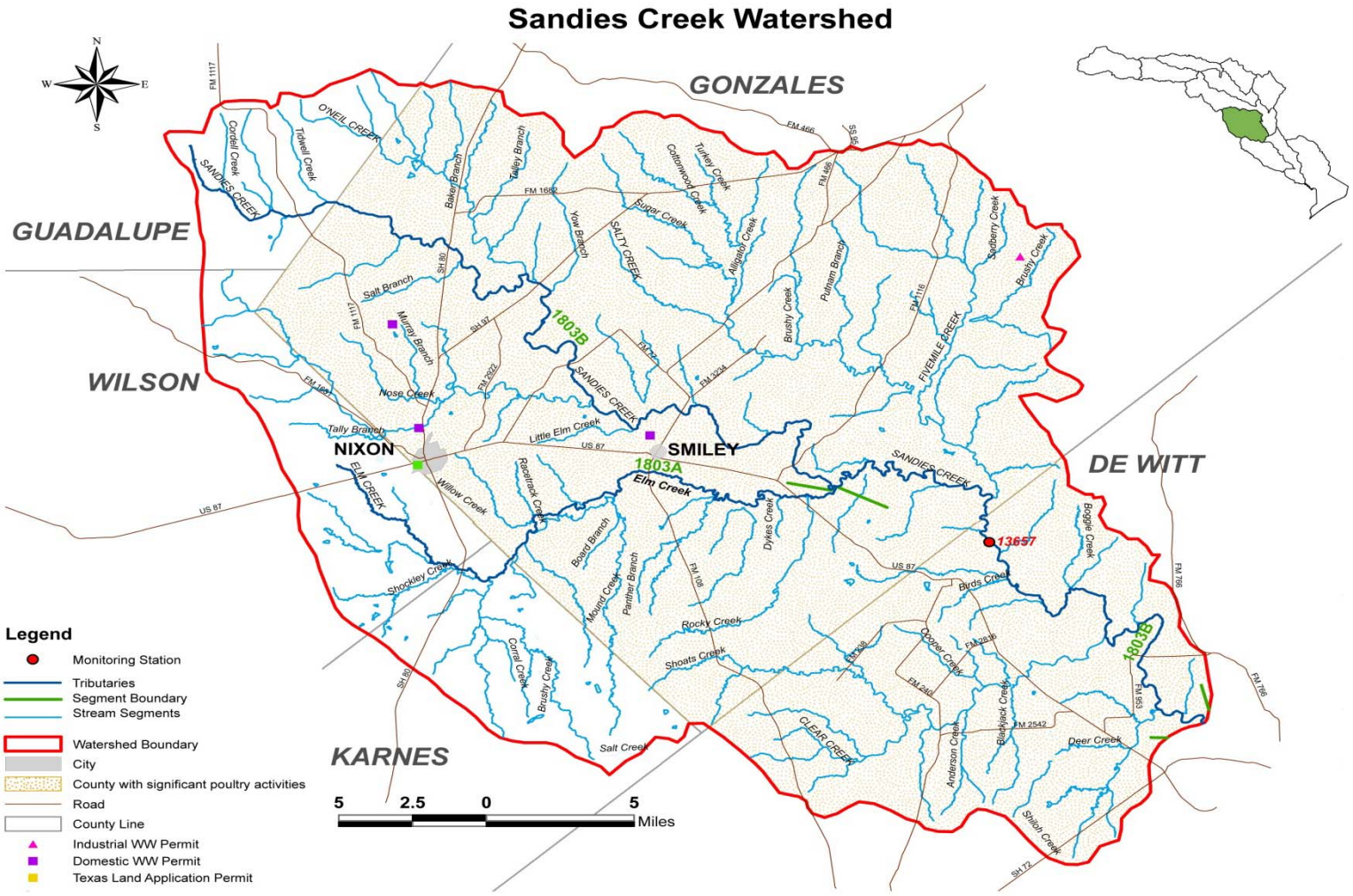
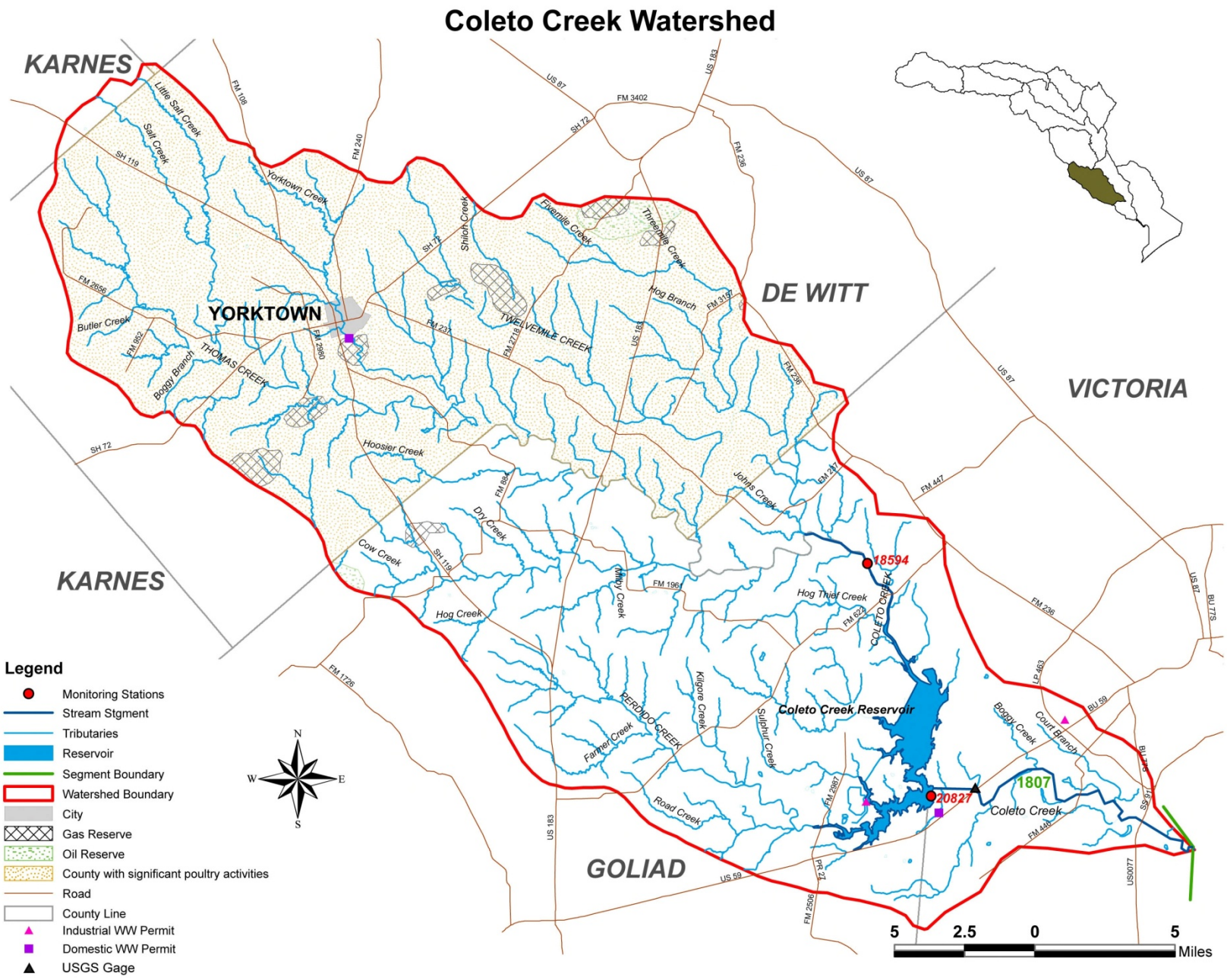
Miles


Sandies Creek Watershed
GONZALES
GUADALUPE
WILSON
KARNES
DE WITT
NIXON
SMILEY
1803B
1803A
1803C
13657
SANDIES CREEK
Elm Creek
Legend
Monitoring Station
Tributaries
Segment Boundary
Stream Segments
Watershed Boundary
City
County with significant poultry activities
Road
County Line
Industrial WW Permit
Domestic WW Permit
Texas Land Application Permit
5 2.5 0 5
Miles


Coleto Creek Watershed
KARNES
DE WITT
VICTORIA
GOLIAD
YORKTOWN
Little Salt Creek
Salt Creek
Yorktown Creek
Shiloh Creek
Fivemile Creek
Threemile Creek
Hog Branch
TWELVEMILE CREEK
THOMAS CREEK
Butler Creek
Boggy Branch
Hoosier Creek
Dry Creek
Cow Creek
Hog Creek
Johns Creek
Hog Thief Creek
COLETO CREEK
Kinkler Creek
PERDIDO CREEK
Kilgore Creek
Sulphur Creek
Farmer Creek
Road Creek
Coleto Creek Reservoir
Boggy Creek
Court Branch
Coleto Creek
18594
20821
1807
US 87
US 183
FM 3402
SH 72
FM 240
SH 119
FM 2656
FM 862
FM 2980
FM 237
FM 2218
FM 3131
FM 236
FM 447
FM 884
FM 1961
FM 622
FM 1726
FM 2987
FM 2506
US 59
PR 21
LP 463
BU 59
BU 77S
SS 471
US0077
FM 446
Legend
Monitoring Stations
Stream Stgment
Tributaries
Reservoir
Segment Boundary
Watershed Boundary
City
Gas Reserve
Oil Reserve
County with significant poultry activities
Road
County Line
Industrial WW Permit
Domestic WW Permit
USGS Gage
N
W
E
S
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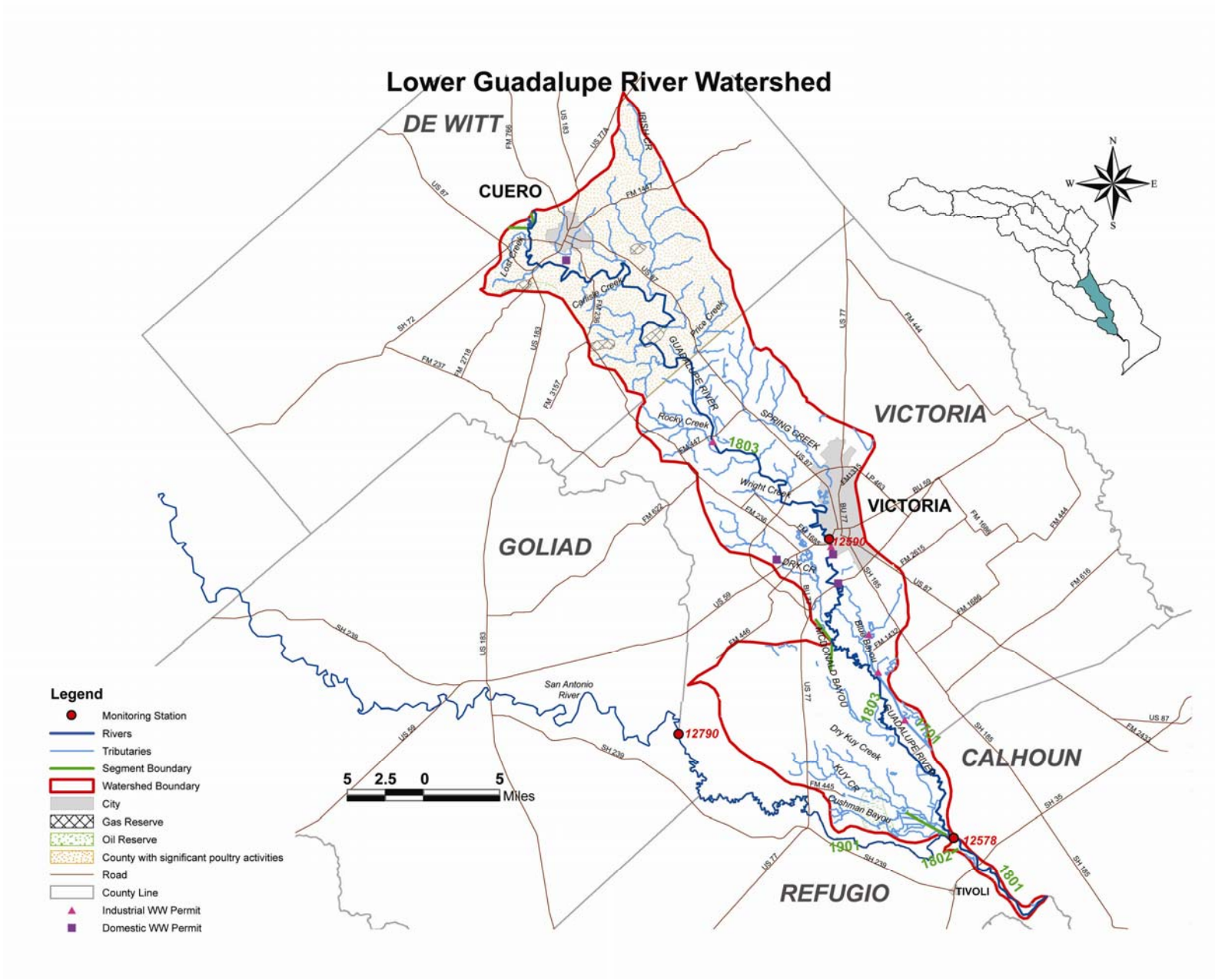
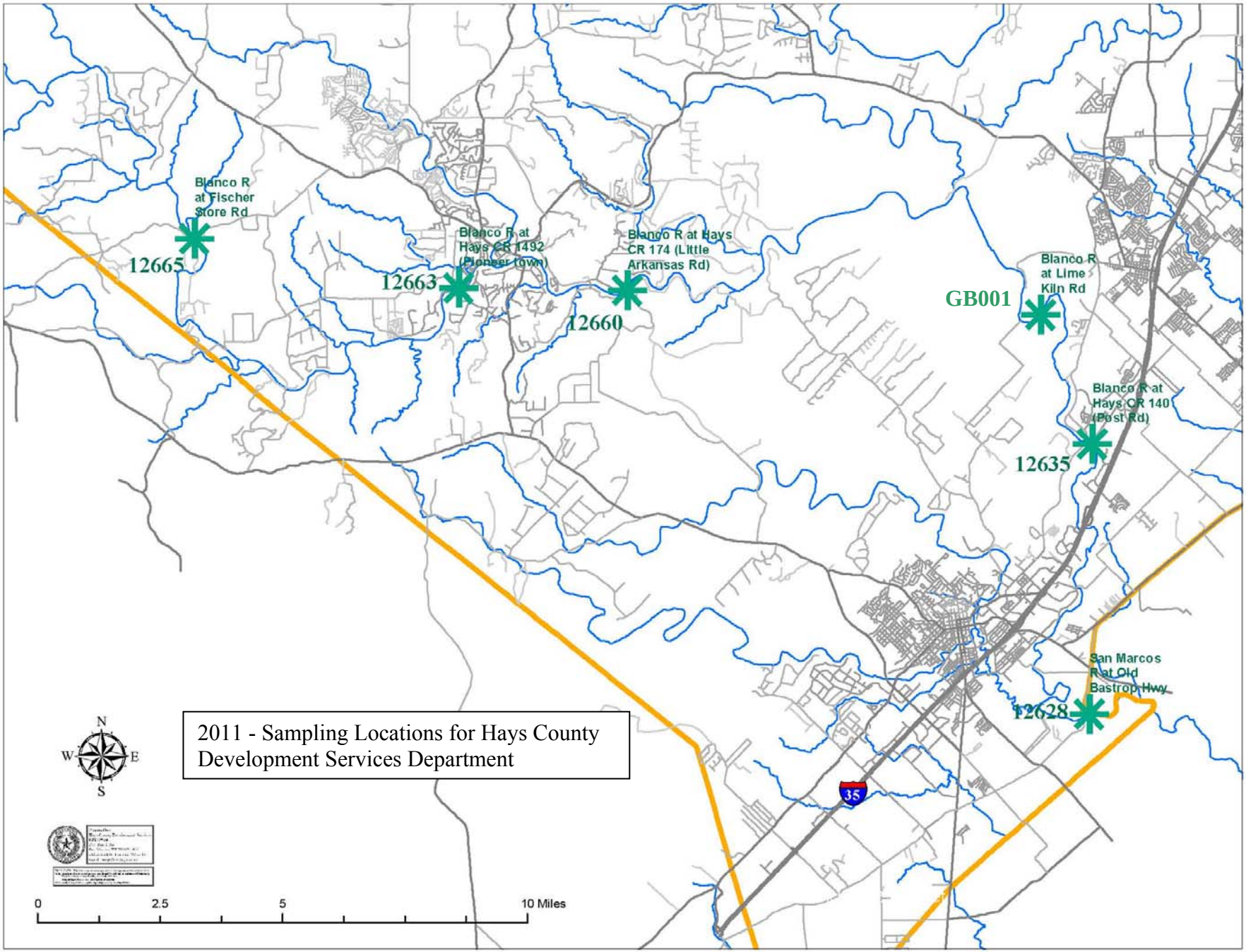
2.5
0
5
Miles


Lower Guadalupe River Watershed
DE WITT
CUERO
VICTORIA
VICTORIA
GOLIAD
CALHOUN
REFUGIO
TIVOLI
GUADALUPE RIVER
SPRING CREEK
Rocky Creek
Wright Creek
Price Creek
Coletos Creek
Lone Creek
IRISH CR
PARK CR
KUY CR
Dry Kuy Creek
Cushman Bayou
MOCKINGBIRD BAYOU
Bull Creek
San Antonio River
1803
1802
1801
1901
12590
12790
12578
Legend
Monitoring Station
Rivers
Tributaries
Segment Boundary
Watershed Boundary
City
Gas Reserve
Oil Reserve
County with significant poultry activities
Road
County Line
Industrial WW Permit
Domestic WW Permit
5 2.5 0 5
Miles
N
S
E
W


Blanco R at Fischer Store Rd
12665
Blanco R at Hays CR 1492 (Pioneer Town)
12663
Blanco R at Hays CR 174 (Little Arkansas Rd)
12660
GB001
Blanco R at Lime Kiln Rd
Blanco R at Hays CR 140 (Post Rd)
12635
San Marcos R at Old Bastrop Hwy
12628
35
N
W
E
S
2011 - Sampling Locations for Hays County
Development Services Department
0
2.5
5
10 Miles

Critical vs. non-critical measurements

All data taken for CRP and entered into SWQMIS are considered critical. *An exception to this may be data taken using an experimental procedure or for "research purposes" for which no "standardized" methodology exists. This should be discussed, if applicable.*

APPENDIX C:
FIELD DATA SHEETS

Texas Commission on Environmental Quality
Surface Water Quality Monitoring Program

Field Data Reporting Form

RTAG# | REGION | EMAIL-ID: | COLLECTOR

STATION ID | SEGMENT | SEQUENCE | DATA SOURCE

Station Description_____

GRAB SAMPLE

M M D D Y Y Y Y — DATE
H H M M — TIME
DEPTH
M = meters
F = feet

COMPOSITE SAMPLE

COMPOSITE CATEGORY :
T = TIME
S = SPACE (i.e. Depth)
B = BOTH
F = FLOW WEIGHT

M M D D Y Y Y Y — START DATE
H H M M — START TIME
START DEPTH (SURFACE)
M = Meters
F = Feet

M M D D Y Y Y Y — END DATE
H H M M — END TIME
END DEPTH (DEEPEST)
M = Meters
F = Feet

COMPOSITE TYPE :
= Number of Grabs in Composite
CN = Continuous

00010		WATER TEMP (C° only)		72053		DAYS SINCE LAST SIGNIFICANT PRECIPITATION	
00400		pH (s.u)		01351		FLOW SEVERITY	1-no flow / 2-low / 3-normal / 5-high / 4-flood / 6-dry
00300		D.O. (mg/L)					
00094		SPECIFIC COND (⊙mhos/cm)		00061		INSTANTANEOUS STREAM FLOW (ft³/sec)	
				89835		FLOW MEASUREMENT METHOD 1- Flow Gage Station 2- Electric 3- Mechanical 4- Weir/Flume	
50060		CHLORINE RESIDUAL (mg/L)					
				74069		FLOW ESTIMATE (ft³/sec)	
				82903		TOTAL WATER DEPTH (meters)	

*Parameters related to data collection in perennial pools; i.e., Flow Severity of 1 and Flow of zero reported.

Measurement Comments and Field Observations:

Field Sheet – Specific to WVWA Monitoring Program

Texas Commission on Environmental Quality
Surface Water Quality Monitoring Program

Field Data Reporting Form

RTAG# | REGION | EMAIL-ID: | COLLECTOR

STATION ID | SEGMENT | SEQUENCE | DATA SOURCE

Station Description_____

GRAB SAMPLE

M M D D Y Y Y Y — DATE
H H M M — TIME
DEPTH
M = meters
F = feet

COMPOSITE SAMPLE

COMPOSITE CATEGORY : T = TIME S = SPACE (i.e. Depth) B = BOTH F = FLOW WEIGHT

M M D D Y Y Y Y — START DATE
H H M M — START TIME
START DEPTH (SURFACE)
M = Meters F = Feet

M M D D Y Y Y Y — END DATE
H H M M — END TIME
END DEPTH (DEEPEST)
M = Meters F = Feet

COMPOSITE TYPE : ## = Number of Grabs in Composite CN = Continuous

00010		WATER TEMP (C° only)		72053		DAYS SINCE LAST SIGNIFICANT PRECIPITATION		
00400		pH (s.u)		01351		FLOW SEVERITY	1-no flow	2-low
00300		D.O. (mg/L)				3-normal 5-high	4-flood	6-dry
00094		SPECIFIC COND (⊙mhos/cm)		00061		INSTANTANEOUS STREAM FLOW (ft^3/sec)		
				89835		FLOW MEASUREMENT METHOD 1- Flow Gage Station 2- Electric 3- Mechanical 4- Weir/Flume		
				74069		FLOW ESTIMATE (ft^3/sec)		
				82903		TOTAL WATER DEPTH (meters)		

*Parameters related to data collection in perennial pools; i.e., Flow Severity of 1 and Flow of zero reported.

Measurement Comments and Field Observations:

Field Sheet – Specific to Hays County Monitoring Program

Texas Commission on Environmental Quality
Surface Water Quality Monitoring Program

Field Data Reporting Form

RTAG# | REGION | EMAIL-ID: | COLLECTOR

STATION ID | SEGMENT | SEQUENCE | DATA SOURCE

Station Description_____

GRAB SAMPLE

M M D D Y Y Y Y — DATE
H H M M — TIME
DEPTH
M = meters
F = feet

COMPOSITE SAMPLE

COMPOSITE CATEGORY :
T = TIME
S = SPACE (i.e. Depth)
B = BOTH
F = FLOW WEIGHT

M M D D Y Y Y Y — START DATE
H H M M — START TIME
START DEPTH (SURFACE)
M = Meters
F = Feet

M M D D Y Y Y Y — END DATE
H H M M — END TIME
END DEPTH (DEEPEST)
M = Meters
F = Feet

COMPOSITE TYPE :
= Number of Grabs in Composite
CN = Continuous

00010		WATER TEMP (C° only)	72053		DAYS SINCE LAST SIGNIFICANT PRECIPITATION		
00400		pH (s.u)	01351		FLOW SEVERITY	1-no flow	2-low
00300		D.O. (mg/L)			3-normal 5-high	4-flood	6-dry
00094		SPECIFIC COND (⊙mhos/cm)	00061		INSTANTANEOUS STREAM FLOW (ft^3/sec)		
			89835		FLOW MEASUREMENT METHOD 1- Flow Gage Station 2- Electric 3- Mechanical 4- Weir/Flume		
			74069		FLOW ESTIMATE (ft^3/sec)		

*Parameters related to data collection in perennial pools; i.e., Flow Severity of 1 and Flow of zero reported.

Measurement Comments and Field Observations:

APPENDIX D:
CHAIN OF CUSTODY FORMS

Upper Guadalupe River Authority Environmental Laboratory
Chain of Custody Record

Report To:			Invoice To:	E-mail: PLEASE PRINT CLEARLY	Fax To: ($3 fee)
Customer			Same? Y N		Name
Address			Info:		Fax#
City	State	Zip			
Attn:	Phone #				

Sample Information:	Hardcopy Report? Y N (Hardcopy: $3 fee. Emailed Report: Free)	Requested Analysis:
Project Name:	Comments:	
Sampled By:		

System Name: and Public Water ID # (if applicable)	Sample Location	Collected		Sample Type	Source	Cl_2 residual	#of containers	Chemical Preservative	Requested Analysis	Work Order number (Lab use only)
		Date	Time							
				Distribution / Construction / Raw / Repeat / Effluent / ______	Groundwater / Surface water / Wastewater					
				Distribution / Construction / Raw / Repeat / Effluent / ______	Groundwater / Surface water / Wastewater					
				Distribution / Construction / Raw / Repeat / Effluent / ______	Groundwater / Surface water / Wastewater					
				Distribution / Construction / Raw / Repeat / Effluent / ______	Groundwater / Surface water / Wastewater					
				Distribution / Construction / Raw / Repeat / Effluent / ______	Groundwater / Surface water / Wastewater					
				Distribution / Construction / Raw / Repeat / Effluent / ______	Groundwater / Surface water / Wastewater					
				Distribution / Construction / Raw / Repeat / Effluent / ______	Groundwater / Surface water / Wastewater					
				Distribution / Construction / Raw / Repeat / Effluent / ______	Groundwater / Surface water / Wastewater					
				Distribution / Construction / Raw / Repeat / Effluent / ______	Groundwater / Surface water / Wastewater					
				Distribution / Construction / Raw / Repeat / Effluent / ______	Groundwater / Surface water / Wastewater					

Condition of Sample(s):	Temperature:		Send out:			
Relinquished by:	Date	Time	Received by:	Date	Time
Relinquished by:	Date	Time	Received by:	Date	Time

UGRA use only: $__________ ☐ Paid

Cash CC Check ref.#__________

UGRA Form 101a Rev 0

125 Lehmann Drive, Suite 100 Kerrville, TX 78028 (830) 896 5445 - Fax (830) 257 2621

GBRA Doc. # 3019-C

Rev. 11 Eff. 02/20/09 by: JL

Chain of Custody

Guadalupe Blanco River Authority- Regional Laboratory
933 E. Court Street, Seguin, Texas 78155
(830) 379-5822 fax: (830) 379-7478

Account #: _____

Customer Info. Name: _____ Phone #: _____
Address: _____ Cell #: _____ Email: _____
_____ Fax #: _____

Sample Collected By: _____ _____
Signature Printed Name

Thermometer #_____

Temp C	Date Collected	Time Collected	Matrix WW=Wastewater DW=Drinking Water SW=Surface Water S=soil/sludge	Sx Vol. P=Plastic G=Glass	Sample Name/Description	TCEQ I.D. #	Grab / Comp.	Analysis Requested	GBRA Sample I.D.	Bottle I.D.#	pH	Preservation

Delivered By: _____ Date/Time: _____ Received By: _____ Date/Time: _____

Delivered By: _____ Date/Time: _____ Received By: _____ Date/Time: _____

**Special Notes/Ship to: _____

_____

Ice: _____(y or n) Number of containers_____ Condition of Container(s): (intact)_____

APPENDIX E:
DATA REVIEW CHECKLIST AND SUMMARY

Data Review Checklist

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

Data Format and Structure	**✓, ✘, or N/A**
A. Are there any duplicate Tag Id numbers in the Events file?	
B. Do the Tag prefixes correctly represent the entity providing the data?	
C. Have any Tag Id numbers been used in previous data submissions?	
D. Are TCEQ station location (SLOC) numbers assigned?	
E. Are sampling Dates in the correct format, MM/DD/YYYY with leading zeros?	
F. Are sampling Times based on the 24 hr clock (e.g. 09:04) with leading zeros?	
G. Is the Comments field filled in where appropriate (e.g. unusual occurrence, sampling problems, unrepresentative of ambient water quality)?	
H. Are submitting Entity, Collecting Entity, and Monitoring Type codes used correctly?	
I. Do sampling dates in the Results file match those in the Events file for each Tag Id?	
J. Are values represented by a valid parameter code with the correct units?	
K. Are there any duplicate parameter codes for the same Tag Id?	
L. Are there any invalid symbols in the Greater Than/Less Than (GT/LT) field?	
M. Are there any Tag Ids in the Results file that are not in the Events file or vice versa?	
Data Quality Review	**✓, ✘, or N/A**
A. Are "less-than" values reported at the LOQ? If no, explain in Data Summary.	
B. Have the outliers been verified and a "1" placed in the Verify_flg field?	
C. Have checks on correctness of analysis or data reasonableness been performed? e.g., Is ortho-phosphorus less than total phosphorus? Are dissolved metal concentrations less than or equal to total metals? Is the minimum 24 hour DO less than the maximum 24 hour DO? Do the values appear to be consistent with what is expected for site?	
D. Have at least 10% of the data in the data set been reviewed against the field and laboratory data sheets?	
E. Are all parameter codes in the data set listed in the QAPP?	
F. Are all stations in the data set listed in the QAPP?	
Documentation Review	**✓, ✘, or N/A**
A. Are blank results acceptable as specified in the QAPP?	
B. Were control charts used to determine the acceptability of duplicates?	
C. Was documentation of any unusual occurrences that may affect water quality included in the Event files 's Comments field?	
D. Were there any failures in sampling methods and/or deviations from sample design requirements that resulted in unreportable data? If yes, explain in Data Summary.	
E. Were there any failures in field and/or laboratory measurement systems that were not resolvable and resulted in unreportable data? If yes, explain in Data Summary.	
F. Was the laboratory's NELAP Accreditation current for analysis conducted?	

Data Summary

Data Set Information

Data Source: _____

Date Submitted: _____

Tag_id Range: _____

Date Range: _____

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

Planning Agency Data Manager: _____Date:_____

Comments

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

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

Parameter	Tag Ids Affected	Type of Problem	Reason for Problem	Percent Loss*	Corrective Action (Y/N/SOP)
pH	XL12345	Post calibration	Equipment failure	4%	SOP
pH	XL12346	Post calibration	Forgot to write in log	4%	N
TKN	XL12351-XL12353	Laboratory analysis	LOQ Check Sample failed	10%	Y
TOC	XL12345-XL12350	Exceeded hold time	Sample received late in day and not set up next day.	10%	Y
Zinc	XL12365	Field equipment blank	Possible contamination	4%	N

* Percent Loss = # Data Points Lost / # Data Points Expected for that parameter in the data set.

APPENDIX F:
DATA MANAGEMENT BY NON-GBRA/UGRA ENTITIES

Lower Colorado River Authority Environmental Laboratory Services

The Sample Custodian or designee performs sampling receiving and login in accordance with specified procedures. In general the process can be described as follows:

Upon receiving the samples, proper sample bottles, preservation, temperature, and holding times are checked and verified and the customer is made aware of any discrepancies. The Sample Custodian verifies that the forms are correctly filled out including any notations regarding sample condition. Any headspace in VOA vials greater than 6mm is reported to the customer and documented on the COC. Any other sample condition (i.e., insufficient sample volume, improper preservation, broken container, etc.) is also reported to the customer and documented on the COC. The Sample Custodian enters information into the LIMS regarding the sample, project or client information, any sample conditions noted and any other pertinent information. The LIMS auto-generates a unique identification number for each sample and creates a work order for the analyses. In addition, the LIMS automatically prints out labels for all sample bottle(s) which contains the unique identification number, sample date and time, any preservatives, and test codes. The Sample Custodian then ensures that the samples are placed in proper storage at ELS. Samples are placed in a refrigerated environment as required. Internal reports, such as forecast, worklists and holding time reports, are generated from the LIMS on a routine basis to determine the work schedule and for sample tracking.

All work performed on each sample is documented in the LIMS or logbooks as described above. It is expected that all digits in a reported result be known definitely, except for the last digit, which may be in doubt. Therefore, when reporting final data, the proper number of significant figures is used. A maximum of three significant figures is reported for analyses. Results are not reported when detected lower than the documented sensitivity of an instrument/method, the established limit, or ELS management approved reliable quantitation limits. Under special circumstances, when results that are lower than normal detection limits are to be reported, the ELS Operations Manager / or Supervisors and the QAO must be notified and the limits recorded on the chain-of-custody record or the Case Narrative for notification on the Final Analysis Report. Once analytical data is generated by the instrument/analysis, the analyst reviews the data per method requirements. ELS utilizes QA/QC Case Narrative forms for proper documentation of any interference, failure to meet holding times, improper preservatives or containers, out-of-control quality data or other notations needed concerning the parameters analyzed. The analytical and QC data are then entered into the LIMS by the analyst or down loaded directly from certain analytical instruments, and the test code for that sample in the work order is automatically removed from the worklist.

The data package receives a secondary review by the Supervisors or another qualified data reviewer. Upon approval, the data reviewer signs the QA/QC Case Narrative form and approves the data in the LIMS. Once the data reviewer approves the data in the LIMS, the results may be reported to the client. Upon completion of all analyses for a sample and data review, the data is ready for reporting directly from LIMS. The Project Manager or the assigned Data Reviewer closely scrutinizes the COC record and Final Analysis Report. Raw data of suspicious results are critically reviewed and appropriate action is implemented. All analytical results are proprietary and must be approved and signed by the Project Manager or assigned Data Reviewer prior to reporting or releasing data to clients.

The ELS record control procedures ensure the following:
♦ A process for identifying, collecting, indexing, accessing, filing, storage, maintenance and disposal of all quality and technical records.
♦ All records (hard copy or electronic) are protected and remain confidential.
♦ All observations and calculations are recorded in a permanent manner (such as the LIMS, notebooks, work sheets, or magnetic media) at the time they are generated, including units of measurement in which observations are recorded or stated.
♦ Most analytical work performed is automatically recorded electronically at the time of analysis. Any hand-written records of sample preparations, extractions, digestion, etc. are properly documented in indelible permanent ink that may be photocopied in the notebook assigned for each procedure. The documentation includes the date, analyst signature or initials, procedures performed, and analytical method. Any unused portion of notebook pages are marked through with a "Z'" to fill in the page.
♦ Original records are uniquely identified and traceable to the analysis, sample or item to which they reference. The LIMS automatically records an electronic date and the user identification for entry, approval or corrections of data or results.
♦ Records are traceable, retrievable, legible and include sufficient information and explanation such that staff, other than those responsible for their generation can readily interpret them.
♦ Records contain sufficient information to permit identification of possible sources of error and to permit, where feasible and necessary, satisfactory repetition of the test under the original conditions. Records contain sufficient details of any significant departures from test specifications or other specified procedures including authorizations for such departures.
♦ Records are reviewed for data transcription or calculation errors and the reviews are documented.
♦ Records document the person or persons responsible for their creation and the edit of such creation. Records also document the person(s) reviewing data transcriptions and calculations and the date of their review.
♦ Corrections or amendments to test records are made in a manner that does not obliterate the original data and are signed or initialed and dated by the person responsible. Specifically, ELS notes corrections on hand-written records by drawing a single line through the error and entering the correct value or information, the individual's initials and the date.
♦ For electronic data in the LIMS, corrections or changes are automatically recorded with a notation for the change and an electronic stamp of the date and identification of the person making the change.
♦ ELS maintains hand-written initials and/or signatures of all staff for identification in documents or records such as logbooks, forms, or other hand-written documents and records.
♦ Test records are protected from loss, damage, misuse or deterioration and are retained for an appropriate period in a manner that permits retrieval when required. Test records that are created and/or retained on magnetic media (e.g., computer disks) or photographic media (e.g., microfiche) are stored in a manner which protects them from the hazards that erase such media. Provisions are made for the printing of such records when required. All of these activities are coordinated through the Records Office of LCRA.

Record control procedures associated with the LIMS are as follows:

Sample Login and Tracking
Computerized sample tracking and scheduling procedures begin with the log-in procedure upon receipt of the sample, and ends with a computer-generated final report and invoice. Client and sample information is entered into the LIMS at the

time of sample login. Analyses forecast, worklists and holding time reports are utilized to monitor the workload and for adherence to method holding times and requested turn-around times. Analytical results, including QC data are entered into the LIMS from the raw data (via instrumentation) for computer-generated FinalAnalysis Reports.

Electronic Data Storage

All electronic data is backed up to magnetic tape daily and maintained by the LCRA Information Technologies (IT) group at LCRA's main office complex located on Lake Austin Boulevard in Austin, Texas. This system performs a daily incremental backup and a weekly full backup. The tape backup performed by the IT group serves two main functions: one is to ensure a redundant system in case the ELS data system fails; the second is to ensure that off-site storage of tapes is maintained at the IT system location. All backup tapes are stored for six months (24 weeks). Raw instrument data is maintained by the Supervisors for each section and backed up on a compact computer disk.

Electronic Data Security

All electronic data is secured on both the Local Area Network (LAN) and LIMS. The system requires authorized access and tracks electronic transaction auditing as well as data review procedures.

Data Archiving and Records Retention

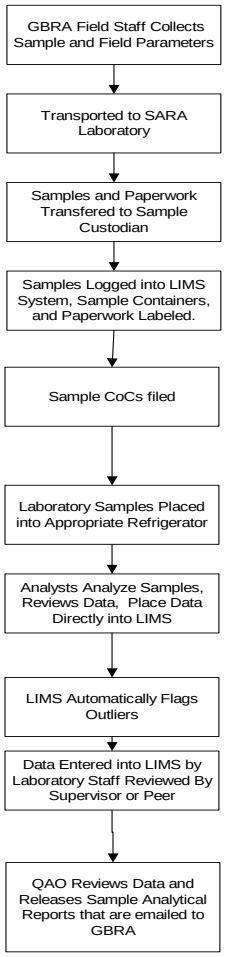
Electronic data is archived in accordance with the LCRA Corporate Records Retention schedule and ELS Records and Document Control procedures.

San Antonio River Authority Laboratory Services

Data Management Process

The figure below is a flow chart identifying how GBRA data moves through the SARA laboratory from the receipt of the sample(s) to the sending of the analytical report(s). Although the flow chart does not identify it, at any point in the review of data, the reviewer can send the data back up to the prior level for additional work, or documentation

Data Flow



Data Errors and Loss

Each step of the data generation by the SARA Regional Environmental Laboratory is reviewed by another analyst, supervisors and/or the QAO. Data is reviewed by a peer analyst prior to analysis validation. A supervisor checks the generation of data on a minimum of 10% basis. The QAO also conducts laboratory inspections (where traceability and calculations are checked) this includes conducting surveillance to ensure proper method, SOP, chemicals and techniques are used in the

generation of data, this is performed on a monthly basis. Required quality control and calculations are clearly shown in each analysis's SOP. Generalized procedures are covered by the Laboratories QM or General Laboratory SOPs. The Laboratory Supervisor and the QAO are provided with the CRP QAPP, so they are familiar with the program specific criteria. A system is in place that identifies non-conformance and implements corrective actions.

Wimberley Valley Watershed Association

WVWA maintains an Excel-based electronic database to store and retrieve water quality and flow data for Cypress Creek and the Blanco River. After the data is collected in the field, field data is entered (with data from the hard copy data from the SWQM data sheet) into the database. Once the data transfer is received from GBRA, staff check the values and compare them with the field data sheet values to ensure there were no data entry errors. Laboratory-processed chemistry data is imported into the WVWA database. Data analysis is processed by both Excel and SPSS software packages.

The WVWA database is housed within staff computers. Regular back up copies are made routinely and there is off-site storage of data.

Hays County Development Services Department Data Management Process

Hays County data is placed on secure, password protected Development Services Department GIS file server, backed up on a daily basis, with magnetic tape kept offsite. Field data collected by Hays County will be submitted to GBRA Sample Custodian and input into the GBRA Database. The field and laboratory data will be submitted by the GBRA Data Manager to TCEQ in ASCII text format. Upon TCEQ approval of Hays County's submitted data, the Hays County Data Manager will upload data onto their website.

Conventional and field data collected on the Hays County samples will be follow the following path: Field data collected by Hays County →GBRA Sample Custodian → GBRA Database; Laboratory data (GBRA lab) → Laboratory analysis logs → Lab database → Quality control review by GBRA QAO→ Report generation (including field data) → Data checked for reasonableness by GBRA Project Manager → Data transferred to GBRA water quality database → Data verification to analysis logs by GBRA Project Manager → ASCII file format created → TCEQ CRP Project Manager → TCEQ Data Management and Analysis Data Manager→ SWQMIS

ATTACHMENT 1
Example Letter to Document Adherence to the QAPP

TO: (name)
(organization)

FROM: (name)
(organization)

RE: GBRA FY2012-13 CRP QAPP

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

(address)

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

Copies of the signed forms should be sent by the GBRA to the TCEQ CRP Project Manager within 60 days of TCEQ approval of the QAPP.