SURFACE WATER QUALITY MONITORING PROJECT
FOR THE
GUADALUPE RIVER BASIN

Quality Assurance Project Plan
Revision I

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

Clean Rivers Program
Technical Analysis Division
Texas Commission on Environmental Quality
P.O. Box 13087, MC-147
Austin, Texas 78711-3087

Effective Period: September 1, 2003 through August 31, 2005

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

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

May 6, 2003

A1 APPROVAL PAGE

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Technical Analysis Division

Jim Thomas, Director Date
Technical Analysis Division

Charles Dvorsky, Manager Date
Water Quality Planning & Assessment Section

Linda Brookins Date
Program Manager, Clean Rivers Program

Allison Woodall Date
Project Manager, Clean Rivers Program

Compliance Support Division

Jose A. "Tony" Franco, Director Date
Compliance Support Division

Stephen Stubbs Date
TCEQ Quality Assurance Manager

Sharon Coleman Date
CRP Quality Assurance Specialist
Quality Assurance Section

GUADALUPE-BLANCO RIVER AUTHORITY

Debbie Magin Date
GBRA Project Manager

Josephine Longoria Date
GBRA Quality Assurance Officer

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

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Figures:

LIST OF ACRONYMS

AWRL	**Ambient Water Reporting Limit**
BMP	**Best Management Practices**
CAR	**Corrective Action Report**
COC	**Chain-of Custody**
CRP	**Clean Rivers Program**
DOC	**Demonstration of Capability**
DQO	**Data Quality Objective**
FY	**Fiscal Year**
MDMA	**Monitoring Data Management & Analysis**
QA	**Quality Assurance**
QAM	**Quality Assurance 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**
RL	**Reporting Limit**
RWA	**Receiving Water Assessment**
SOP	**Standard Operating Procedure**
SWQM	**Surface Water Quality Monitoring**
TMDL	**Total Maximum Daily Load**
TCEQ	**Texas Commission on Environmental Quality**
TRACS	**TCEQ Regulatory Activities and Compliance System**
TSWQS	**Texas Surface Water Quality Standards**
VOA	**Volatile Organic Analytes**
WMT	**Watershed Management Team**

A3 DISTRIBUTION LIST

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

Allison Woodall, Project Manager
Clean Rivers Program
MC-147
(512) 239-4628

Sharon Coleman
CRP Lead Quality Assurance Specialist
MC-176
(512) 239-1976

Dr. David W. Sullivan
Manager, Monitoring Data Management and Analysis Section
MC-165
(512) 239-1623

GBRA
933 E. Court St.
Seguin, Texas 78155

Debbie Magin, Project Manager
(830) 379-5822

Josephine Longoria, Quality Assurance Officer
(830) 379-5822

UGRA
125 Lehman
Kerrville, TX 78028

Gretchen Reutzel
(830) 896-5445

VILLAGE OF WIMBERLEY
1405 Mt. Sharp Rd.
Wimberley, TX. 78676

David Baker
512-847-9391

ALBION ENVIRONMENTAL
College Station, TX 77845

Dr. Paul Boothe
(979) 268-2677

GBRA will provide copies of this project plan and any amendments or revisions of this plan to each person on this list and to each sub-tier project participant, e.g., subcontractors, other units of government, laboratories. 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 be available for review.

A4 PROJECT/TASK ORGANIZATION

Description of Responsibilities

TCEQ

Linda Brookins
CRP Program Manager

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, nonconformances, 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 program QMP. Enforces corrective action, as required, where QA protocols are not met. Ensures CRP personnel are fully trained.

Sharon Coleman
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 stop 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 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 Planning Agency audits. Verifies QAPPs are being followed by contractors and that projects are producing data of known quality. Coordinates project planning with GBRA 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.

Eric Reese
CRP Data Manager

Responsible for coordination and tracking of CRP data from initial submittal through CRP Project Manager review and approval. Performs automated data validation routines and coordinates error correction. Provides quality assured data sets to TCEQ Information Resources in compatible formats for uploading to the statewide database. Generates reports to assist CRP Project Managers' data review. Provides training and guidance to CRP and Planning Agencies on technical data issues. Reviews and approves data-related portions of program QMP and project-specific QAPPs. Develops and maintains Standard Operating Procedures for CRP data management.

Laurie Curra
CRP Project Quality Assurance Specialist

Serves as liaison between CRP management and agency 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. Coordinates documentation and implementation of corrective action for the CRP.

GBRA

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 nonconformances, 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.

Josephine 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 GBRA Project Manager of particular circumstances which may adversely affect the quality of data. Coordinates and monitors deficiencies, nonconformances and corrective action. 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 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 the SWQM portion of the TRACS database. Maintains quality-assured data on GBRA internet sites.

Brian Lyssy
GBRA Laboratory Technician III/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.

Juan Carmona
GBRA Laboratory Analyst

Performs laboratory analysis for inorganic constituents, nutrients, etc.; assists in collection of field data and samples for stream monitoring and chemical sampling of environmental sites.

Lee Gudgell
GBRA Laboratory Technician III

Performs laboratory analysis for inorganic constituents, nutrients, etc.; assists in collection of field data and samples for stream monitoring and chemical sampling of environmental sites.

Jonathan Bode
GBRA Laboratory Technician I

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

Albion Laboratories

Dr. Paul N. Boothe
Albion 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. The Albion 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 measurement performance specifications listed in Tables A7.1.

Dr. Paul N. Boothe
Albion Quality Assurance Officer

Maintains operating procedures that are in compliance with the QAPP, amendments and appendices. Assists with monitoring systems audits for CRP projects. Additionally, the Albion QAO 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 Tables A7.1.

UGRA

Gretchen Reutzel
UGRA CRP 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.

Darren Keith Marquart
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. Additionally, the UGRA QAO 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 A7.2.

Gretchen Reutzel
UGRA CRP 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 compatible format. Maintains quality-assured data on GBRA internet site.

Darren Keith Marquart
UGRA Water Quality Specialist

Assists with data management; performs lab and field analysis of inorganic constituents, nutrients, etc.; analyzes bioassessment samples. Primary work responsibilities are wet chemistry and bacteriological analyses.

Peggy Penny
UGRA Secretary/Receptionist

Responsible for sample receipt from field personnel and initiating sample tracking within the laboratory.

Nadine Starks
UGRA Water Quality Analyst

Performs laboratory analysis for inorganic constituents, nutrients, etc.; assists in collection of field data and samples for stream monitoring and chemical sampling of environmental sites, including data input.

Staff Temporaries
UGRA

Perform laboratory analysis and/or collect field data and samples as directed by senior water quality specialist.

Village of Wimberley

David Baker
Village of Wimberley Project Manager

Responsible for directing CRP activities for the Wimberley Valley Watershed Association and the Village of Wimberley 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.

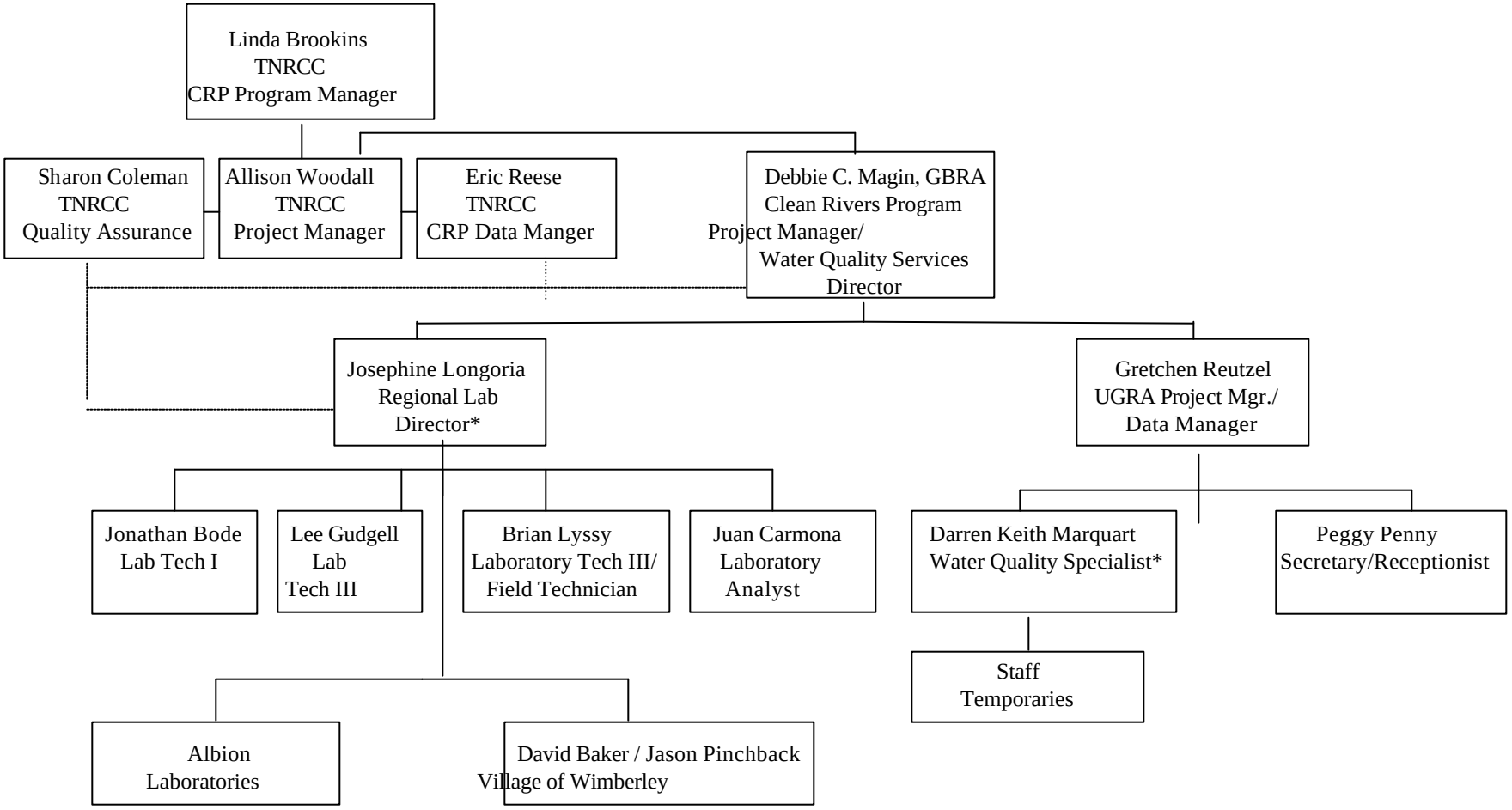
Jason Pinchback
Village of Wimberley Field Technician

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.

David Baker
Village of Wimberley Field Technician

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.

Figure A4.1 CRP Organizational Chart-- Lines of Communication**



* Serve as Quality Assurance Officers for each River Authority

** See Project/Task Organization in this section for a description of each position's responsibilities.

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 complies with commission rules for 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 *Quality Management Plan for the Clean Rivers Program* (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 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 the statewide database have been collected and managed in a way that guarantees its reliability and therefore can be used in water quality assessments and 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 2004 -2005.

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 2004-2005 includes continuation of the existing monitoring program, including biological monitoring and annual sampling for trace metals concentrations at selected sites. The systematic site monitored in the 2002-2003 biennium will become a routine monitoring site and will be visited monthly. One systematic site will be added in 2004-2005 and will be monitored for the duration of the biennium.

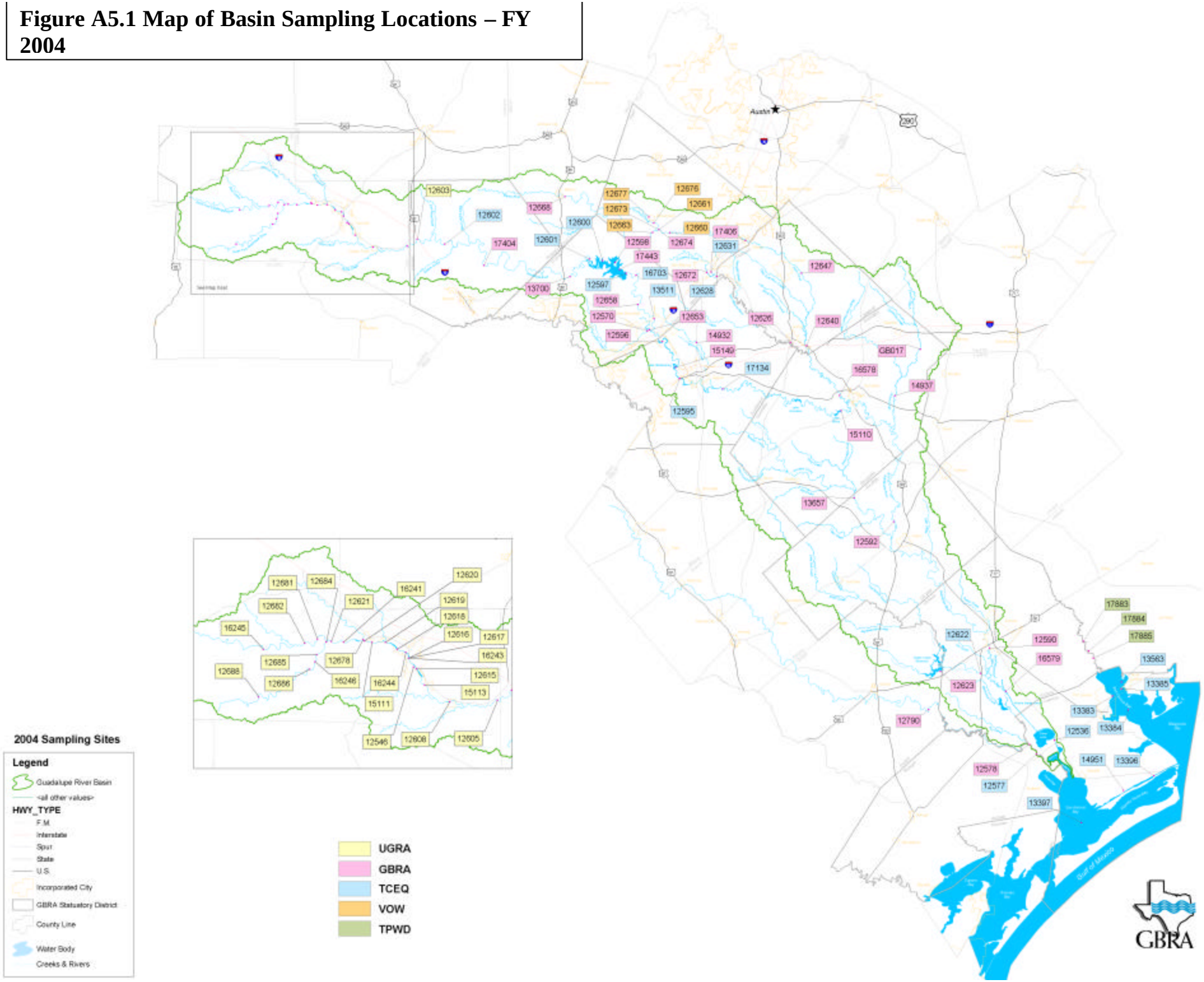
The monitoring goals for the CRP program in the Guadalupe River Basin are

- to verify that the overall health of the stream is and remains in good condition,
- to provide data necessary for satisfying legal mandates including Clean Water Act Section 305(b) reporting,
- to provide data for standards setting, and where appropriate, attainment determinations, and
- to provide data to address particular needs as they are defined.

In addition to UGRA, the Village of Wimberley is a monitoring entity in the Guadalupe River Basin that contributes data collected under the GBRA QAPP. The Village will collect data at sites on the Blanco River and Cypress Creek monthly. These sites and the sites monitored by the UGRA in Kerr County are

coordinated with the GBRA and TCEQ monitoring schedule annually. Figure A5.1 is a map of the sampling locations for FY 2004.

Figure A5.1 Map of Basin Sampling Locations – FY 2004



A6 PROJECT/TASK DESCRIPTION

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

See Appendix B for sampling design and monitoring to be conducted under this QAPP.

Amendments to the QAPP

Revisions to the QAPP may be necessary to reflect changes in project organization, tasks, schedules, objectives, and methods; to improve operational efficiency; and to accommodate unique or unanticipated circumstances. Requests for amendments are directed from the GBRA Project Manager to the CRP Project Manager in writing. They are effective immediately upon approval by the GBRA Project Manager, the GBRA QAO, the CRP Project Manager, the CRP Lead QA Specialist, and the CRP Project QA Specialist. They will be distributed by the GBRA Project Manager and incorporated into the QAPP by way of attachment and distributed to personnel on the distribution list.

Appendices to the QAPP

Projects requiring QAPP appendices will be planned in consultation with 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 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 monitoring activities are commenced.

A7 QUALITY OBJECTIVES AND CRITERIA

The purpose of fixed/routine water quality monitoring is to collect surface water quality data needed for conducting water quality assessments in accordance with TCEQ's *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. The purpose of the 2004-05 systematic monitoring will be used to investigate whether water quality conditions are being impacted due to observed water quality issues related to a CAFO activity or municipal wastewater treatment. At the end of the period, the systematic site will be evaluated to determine if there is a water quality concern and if there is the nee d to include it as a part of the routine monitoring program.

The measurement performance specifications to support the project objectives for a minimum data set are specified in Tables A7.1 through A7.3, and in the text following (footnotes and references for all three tables at end of Table A7.3).

Table A7.1 GBRA Measurement Performance Specifications

PARAMETER	UNITS	MATRIX	METHOD	STORET	AWRL	Lab Reporting Limit (RL)	RECOVERY AT RLs	PRECISION (RPD of LCS/LCS dup)	BIAS (%Rec. of LCS)	Lab
Field Parameters										
pH	pH/ units	water	SM 4500-H^+ B. and TCEQ SOP	00400	NA[1]	NA	NA	NA	NA	Field
DO	mg/L	water	SM 4500-O G. and TCEQ SOP	00300	NA[1]	NA	NA	NA	NA	Field
Conductivity	umhos/cm	water	SM 2510 and TCEQ SOP	00094	NA[1]	NA	NA	NA	NA	Field
Conductivity	umhos/cm	water	SM 2510	00095	NA[1]	NA	NA	NA	NA	GBRA
Temperature	°C	water	SM 2550 and TCEQ SOP	00010	NA[1]	NA	NA	NA	NA	Field
Flow	cfs	water	TCEQ SOP	00061	NA[1]	NA	NA	NA	NA	Field
Flow measurement method	1-gage 2-electric 3-mechanical 4-weir/flume 5-doppler	water	TCEQ SOP	89835	NA[1]	NA	NA	NA	NA	Field
Flow severity	1-no flow, 2-low, 3-normal, 4-flood, 5-high, 6-dry	water	TCEQ SOP	01351	NA[1]	NA	NA	NA	NA	Field
Flow estimate	cfs	water	TCEQ SOP	74069	NA[1]	NA	NA	NA	NA	Field
Conventional and Bacteriological Parameters										
TSS	mg/L	water	SM 2540 D.	00530	4	1	NA	20	NA	GBRA
Turbidity	NTU	water	SM 2130 B	82079	0.5	0.5	NA	20	NA	GBRA
Sulfate	mg/L	water	EPA 300.0	00945	10	1	75-125	20	80-120	GBRA
Sulfate[3]	mg/L	water	SM 4500-SO_4 E.	00945	10	1	75-125	20	80-120	GBRA
Chloride	mg/L	water	EPA 300.0	00940	10	1	75-125	20	80-120	GBRA
Chloride[3]	mg/L	water	SM 4500-Cl C.	00940	10	1	75-125	20	80-120	GBRA
Chlorophyll-a, spectrophotometric method	ug/L	water	SM 10200-H	32211	5	1	75-125	20	NA	GBRA
Pheophytin, spectrophotometric method	ug/L	water	SM 10200-H	32218	3	1	75-125	20	NA	GBRA
E. coli, IDEXX Colilert	MPN/100 mL	water	SM 9223-B	31699	1	1	NA	.5[2]	NA	GBRA
Ammonia-N, total	mg/L	water	SM 4500-NH_3 E.	00610	0.02	0.02	75-125	20	80-120	GBRA

Table A7.1 GBRA Measurement Performance Specifications (cont.)

PARAMETER	UNITS	MATRIX	METHOD	STORET	AWRL	Lab Reporting Limit (RL)	RECOVERY AT RLs	PRECISION (RPD of LCS/LCS dup)	BIAS (%Rec. of LCS)	Lab
Conventional and Bacteriological Parameters (cont.)										
Hardness, total (as CaC03)	mg/L	water	SM 2340 C.	00900	5	5	NA	20	80-120	GBRA
Nitrate-N, total	mg/L	water	EPA 300.0	00620	0.02	0.02	75-125	20	80-120	GBRA
Nitrate/nitrite-N, total[3]	mg/L	water	SM 4500-NO_3 E. + NO_2 B.	00630	0.04	0.02	75-125	20	80-120	GBRA
Total phosphorus	mg/L	water	SM 4500-P B. + E.	00665	0.06	0.05	75-125	20	80-120	GBRA
TSWQS Metals										
Aluminum, dis.	ug/L	water	EPA 200.7	01106	200	2	75-125	20	75-125	Albion
Arsenic, dis.	ug/L	water	EPA 1632 (modified)	01000	5	1	75-125	20	75-125	Albion
Cadmium, dis.	ug/L	water	EPA 1638 and 200.8	01025	0.1 for waters <50 mg/L hardness _____ .3 for waters *50 mg/L hardness	0.1	75-125	20	75-125	Albion
Chromium, dis.	ug/L	water	EPA 200.8	01030	10	1	75-125	20	75-125	Albion
Copper, dis.	ug/L	water	EPA 1638 and 200.8	01040	1 for waters <50 mg/L hardness _____ 3 for waters *50 mg/L hardness	0.3	75-125	20	75-125	Albion
Lead, dis.	ug/L	water	EPA 1638 and 200.8	01049	0.1 for waters <85 mg/L hardness _____ 1 for waters >85 mg/L hardness	0.1	75-125	20	75-125	Albion
Mercury, total	ug/L	water	EPA 1631	71960	0.006	0.0005	75-125	20	75-125	Albion
Nickel, dis.	ug/L	water	EPA 1638 and 200.8	01065	10	1.0	75-125	20	75-125	Albion
Selenium, total	ug/L	water	EPA 1632 (modified)	01147	2	0.1	75-125	20	75-125	Albion
Silver, dis.	ug/L	water	EPA 1638 and 200.8	01075	0.5	0.1	75-125	20	75-125	Albion
Zinc, dis.	ug/L	water	EPA 1638 and 200.8	01090	5	0.5	75-125	20	75-125	Albion

Table A7.1 GBRA Measurement Performance Specifications (cont.)

PARAMETER	UNITS	MATRIX	METHOD	STORET	LABORATORY PERFORMING ANALYSIS
Benthics - Freshwater – Qualitative					
Biological Data Reporting Units	1= number of individuals from sub-sample; 2 = number of individuals/ft^2; 3 = number of individuals/m^2; 4 = total number in kicknet	water	TNRCC RWA SOP	89899	GBRA
Kicknet Effort, area kicked	m^2	water	TNRCC RWA SOP	89903	GBRA
Kicknet Effort, minutes kicked	minutes	water	TNRCC RWA SOP	89904	GBRA
Snags and Shoreline Sampling Effort, minutes picked	minutes	water	TNRCC RWA SOP	89905	GBRA
Number of individuals in benthic RBA sub-sample ($\forall$ 100)	#	water	TNRCC RWA SOP	89906	GBRA
Benthic Sampler	1=Surber, 2=Ekman, 3=kicknet, 4=Petersen, 5=Hester-Dendy	water	TNRCC RWA SOP	89950	GBRA
Undercut bank at sample point	%	water	TNRCC RWA SOP	89921	GBRA
Overhanging brush at sample point	%	water	TNRCC RWA SOP	89922	GBRA
Gravel substrate at sample point	%	water	TNRCC RWA SOP	89923	GBRA
Sand substrate at sample point	%	water	TNRCC RWA SOP	89924	GBRA
Soft bottom at sample point	%	water	TNRCC RWA SOP	89925	GBRA
Macrophyte bed at sample point	%	water	TNRCC RWA SOP	89926	GBRA
Snags and brush at sample point	%	water	TNRCC RWA SOP	89927	GBRA
Ecoregion (Texas Ecoregion Code)	#	NA	TNRCC RWA SOP	89961	GBRA
Total Taxa (Taxa Richness)	#	water	TNRCC RWA SOP	90055	GBRA
EPT Taxa	#	water	TNRCC RWA SOP	90008	GBRA
Biotic Index (HBI)	NA	water	TNRCC RWA SOP	90007	GBRA
Chironomidae	#	water	TNRCC RWA SOP	92491	GBRA
Dominant Taxon	%	water	TNRCC RWA SOP	90042	GBRA
Dominant FFG	%	water	TNRCC RWA SOP	90010	GBRA
Predators	%	water	TNRCC RWA SOP	90036	GBRA
Ratio of Intolerant:Tolerant taxa	NA	water	TNRCC RWA SOP	90050	GBRA
Total Trichoptera as Hydropsychidae	%	water	TNRCC RWA SOP	90069	GBRA
Non-insect taxa	#	water	TNRCC RWA SOP	90052	GBRA

PARAMETER	UNITS	MATRIX	METHOD	STORET	LABORATORY PERFORMING ANALYSIS
Benthics - Freshwater – Qualitative (cont.)					
Collector-gatherers	%	water	TNRCC RWA SOP	90025	GBRA
Total number as Elmidae	%	water	TNRCC RWA SOP	90054	GBRA
Nekton- Freshwater					
Nekton, none captured	NA	water	TNRCC RWA SOP	98005	GBRA
Electrofishing effort, duration of shocking	Seconds	water	TNRCC RWA SOP	89944	GBRA
Seining effort	# of Hauls	water	TNRCC RWA SOP	89947	GBRA
Combined length of seine hauls	meters	water	TNRCC RWA SOP	89948	GBRA
Seining effort, duration	minutes	water	TNRCC RWA SOP	89949	GBRA
Minimum Seine Mesh Size, net average bar	inches	water	TNRCC RWA SOP	89930	GBRA
Maximum Seine Mesh Size, net average bar	inches	water	TNRCC RWA SOP	89931	GBRA
Net length	m	water	TNRCC RWA SOP	89941	GBRA
Electrofishing method	1 = boat, 2 = backpack, 3=tote barge	water	TNRCC RWA SOP	89943	GBRA
Area seined	m^2	water	TNRCC RWA SOP	89976	GBRA
Stream Order	#	NA	TNRCC RWA SOP	84161	GBRA
Ecoregion (Texas Ecoregion Code)	#	NA	TNRCC RWA SOP	89961	GBRA
Total fish species (richness)	#	water	TNRCC RWA SOP	98003	GBRA
Total darter species	#	water	TNRCC RWA SOP	98004	GBRA
Total sunfish species (except bass)	#	water	TNRCC RWA SOP	98008	GBRA
Total sucker species	#	water	TNRCC RWA SOP	98009	GBRA
Total intolerant species	#	water	TNRCC RWA SOP	98010	GBRA
Tolerant individuals	%	water	TNRCC RWA SOP	98016	GBRA
Omnivore individuals	%	water	TNRCC RWA SOP	98017	GBRA
Insectivore individuals	%	water	TNRCC RWA SOP	98021	GBRA
Piscivore individuals	%	water	TNRCC RWA SOP	98022	GBRA
Total individuals	#	water	TNRCC RWA SOP	98023	GBRA
Hybrid individuals	%	water	TNRCC RWA SOP	98024	GBRA
Individuals w/ disease/anomalies	%	water	TNRCC RWA SOP	98030	GBRA

Table A7.1 GBRA Measurement Performance Specifications (cont.)

PARAMETER	UNITS	METHOD	STORET	LABORATORY PERFORMING ANALYSIS
Physical Habitat				
Streambed slope over evaluated reach (from USGS map)	NA	TNRCC RWA SOP	72052	GBRA
Approximate drainage area above the most downstream transect from USGS map	km^2	TNRCC RWA SOP	89859	GBRA
Length of stream	km	TNRCC RWA SOP	89860	GBRA
Lateral transects made	#	TNRCC RWA SOP	89832	GBRA
Average stream width	m	TNRCC RWA SOP	89861	GBRA
Average stream depth	m	TNRCC RWA SOP	89862	GBRA
Instantaneous stream flow	cfs	TNRCC RWA SOP	00061	GBRA
Flow measurement method	1=gage 2= electric 3= mechanical 4=weir/flume	TNRCC RWA SOP	89835	GBRA
Channel Flow Status	1=no flow 2=low 3=moderate 4=high	TNRCC RWA SOP	89848	GBRA
Maximum pool width at time of study	m	TNRCC RWA SOP	89864	GBRA
Maximum pool depth in study area	m	TNRCC RWA SOP	89865	GBRA
Total stream bends	#	TNRCC RWA SOP	89839	GBRA
Moderately defined stream bends	#	TNRCC RWA SOP	89841	GBRA
Well-defined stream bends	#	TNRCC RWA SOP	89840	GBRA
Poorly defined stream bends	#	TNRCC RWA SOP	89842	GBRA
Riffles	#	TNRCC RWA SOP	89843	GBRA
Dominant substrate	1 = clay, 2 = silt, 3 = sand, 4 = gravel, 5 = cobble, 6 = boulder, 7 = bedrock, 8 = other	TNRCC RWA SOP	89844	GBRA
Avg. % of substrate gravel >2mm	%	TNRCC RWA SOP	89845	GBRA
Avg. % instream cover	%	TNRCC RWA SOP	84159	GBRA
Stream Cover Types	#	TNRCC RWA SOP		
Avg. % stream bank erosion potential	%	TNRCC RWA SOP	89846	GBRA
Avg. stream bank angle	degrees	TNRCC RWA SOP	89847	GBRA
Avg. width natural riparian vegetation	m	TNRCC RWA SOP	89866	GBRA
Avg. % trees as riparian vegetation	%	TNRCC RWA SOP	89849	GBRA
Avg. % shrubs as riparian vegetation	%	TNRCC RWA SOP	89850	GBRA
Avg. % grasses and forbes as riparian vegetation	%	TNRCC RWA SOP	89851	GBRA

Table A7.1 GBRA Measurement Performance Specifications (cont.)

PARAMETER	UNITS	METHOD	STORET	LABORATORY PERFORMING ANALYSIS
Physical Habitat (con.t)				
Avg. % cultivated fields as riparian vegetation	%	TNRCC RWA SOP	89852	GBRA
Avg. % other as riparian vegetation	%	TNRCC RWA SOP	89853	GBRA
Avg.% tree canopy coverage	%	TNRCC RWA SOP	89854	GBRA
Overall Aesthetics	1= wilderness 2= natural 3= common 4= offensive	TNRCC RWA SOP	89867	GBRA
Stream order	#	TNRCC RWA SOP	84161	GBRA
Texas Ecoregion Code	#	TNRCC RWA SOP	89961	GBRA
Land development impact	1= unimpacted 2= low 3= moderate 4=high	TNRCC RWA SOP	89962	GBRA

PARAMETER	UNITS	MATRIX	METHOD	STORET	AWRL	Lab Reporting Limit (RL)	PRECISION (RPD of LCS/LCS dup)	BIAS (%Rec. of LCS)	Lab
Diurnal monitoring summary statistics									
24-hour average dissolved oxygen	mg/L	water	TNRCC SOP /Calculation	89857	NA	NA	NA	NA	GBRA
Maximum daily dissolved oxygen	mg/L	water	TNRCC SOP /Calculation	89856	NA	NA	NA	NA	GBRA
Minimum daily dissolved oxygen	mg/L	water	TNRCC SOP /Calculation	89855	NA	NA	NA	NA	GBRA
Number of measurements	none	none	TNRCC SOP	89858	NA	NA	NA	NA	GBRA
24-hour average water temperature	^{o}C	water	TNRCC SOP /Calculation	00209	NA	NA	NA	NA	GBRA
Maximum daily water temperature	^{o}C	water	TNRCC SOP /Calculation	00210	NA	NA	NA	NA	GBRA
Minimum daily water temperature	^{o}C	water	TNRCC SOP /Calculation	00211	NA	NA	NA	NA	GBRA
24-hour average conductivity	umhos/cm	water	TNRCC SOP /Calculation	00212	NA	NA	NA	NA	GBRA
Maximum daily conductivity	umhos/cm	water	TNRCC SOP /Calculation	00213	NA	NA	NA	NA	GBRA
Minimum daily conductivity	umhos/cm	water	TNRCC SOP /Calculation	00214	NA	NA	NA	NA	GBRA
Maximum daily pH	s.u.	water	TNRCC SOP /Calculation	00215	NA	NA	NA	NA	GBRA
Minimum daily pH	s.u.	water	TNRCC SOP /Calculation	00216	NA	NA	NA	NA	GBRA
Minimum daily pH	s.u.	water	TNRCC SOP /Calculation	00216	NA	NA	NA	NA	GBRA

Table A7.2 UGRA Measurement Performance Specifications

PARAMETER	UNITS	MATRIX	METHOD	STORET	AWRL	Lab Reporting Limit (RL)	RECOVERY AT RLs	PRECISION (RPD of LCS/LCS dup)	BIAS (%Rec. of LCS)	Lab
Field Parameters										
pH	pH/ units	water	SM 4500-H^+ B. and TCEQ SOP	00400	NA[1]	NA	NA	NA	NA	Field
DO	mg/L	water	SM 4500-O G. and TCEQ SOP	00300	NA[1]	NA	NA	NA	NA	Field
Conductivity	umhos/cm	water	SM 2510 and TCEQ SOP	00094	NA[1]	NA	NA	NA	NA	Field
Temperature	°C	water	SM 2550 and TCEQ SOP	00010	NA[1]	NA	NA	NA	NA	Field
Flow	cfs	water	TCEQ SOP	00061	NA[1]	NA	NA	NA	NA	Field
Flow measurement method	1-gage 2-electric 3-mechanical 4-weir/flume 5-doppler	water	TCEQ SOP	89835	NA[1]	NA	NA	NA	NA	Field
Flow severity	1-no flow, 2-low, 3-normal, 4-flood, 5-high, 6-dry	water	TCEQ SOP	01351	NA[1]	NA	NA	NA	NA	Field
Flow estimate	cfs	water	TCEQ SOP	74069	NA[1]	NA	NA	NA	NA	Field
Conventional and Bacteriological Parameters										
TSS	g/L	water	SM 2540 D.	00530	4	1	NA	20	NA	UGRA
Turbidity	NTU	water	SM 2130 B	82079	0.5	0.5	NA	20	NA	UGRA
Sulfate[3]	mg/L	water	SM 4500-SO_4 E.	00945	10	1	75-125	20	80-120	UGRA
Sulfate	mg/L	water	EPA 300.0	00945	10	1	75-125	20	80-120	UGRA
Chloride[3]	mg/L	water	SM 4500-Cl B.	00940	10	2	75-125	20	80-120	UGRA
Chloride	mg/L	water	EPA 300.0	00940	10	1	75-125	20	80-120	UGRA
Chlorophyll-a, spectrophotometric method	ug/L	water	SM 10200-H	32211	5	2	75-125	20	NA	UGRA
Pheophytin, spectrophotometric method	ug/L	water	SM 10200-H	32218	3	1	75-125	20	NA	UGRA
E. coli, IDEXX Colilert	MPN/100 mL	water	SM 9223-B	31699	1	1	NA	.5[2]	NA	UGRA
Nitrate/nitrite-N, total[3]	mg/L	water	SM 4500-NO_3 E. + NO_2 B.	00630	0.04	0.02	75-125	20	80-120	UGRA
Nitrate, total	mg/L	water	EPA 300.0	00620	0.02	0.02	75-125	20	80-120	UGRA

Table A7.3 Village of Wimberley Measurement Performance Specifications

						Lab	RECOVERY	PRECISION	BIAS	

PARAMETER	UNITS	MATRIX	METHOD	STORET	AWRL	Reporting Limit (RL)	AT RLs	(RPD of LCS/LCS dup)	(%Rec. of LCS)	Lab
Field Parameters										
pH	pH/ units	water	SM 4500-H^+ B. and TCEQ SOP	00400	NA[1]	NA	NA	NA	NA	Field
DO	mg/L	water	SM 4500-O G. and TCEQ SOP	00300	NA[1]	NA	NA	NA	NA	Field
Conductivity	umhos/cm	water	SM 2510 and TCEQ SOP	00094	NA[1]	NA	NA	NA	NA	Field
Temperature	°C	water	SM 2550 and TCEQ SOP	00010	NA[1]	NA	NA	NA	NA	Field
Flow	cfs	water	TCEQ SOP	00061	NA[1]	NA	NA	NA	NA	Field
Flow measurement method	1-gage 2-electric 3-mechanical 4-weir/flume 5-doppler	water	TCEQ SOP	89835	NA[1]	NA	NA	NA	NA	Field
Flow severity	1-no flow, 2-low, 3-normal, 4-flood, 5-high, 6-dry	water	TCEQ SOP	01351	NA[1]	NA	NA	NA	NA	Field
Flow estimate	cfs	water	TCEQ SOP	74069	NA[1]	NA	NA	NA	NA	Field
Conventional and Bacteriological Parameters										
TSS	mg/L	water	SM 2540 D.	00530	4	1	NA	20	NA	GBRA
E. coli, IDEXX Colilert	MPN/100 mL	water	SM 9223-B	31699	1	1	NA	.5[2]	NA	GBRA
Ammonia-N, total	mg/L	water	SM 4500-NH_3 E.	00610	0.02	0.02	75-125	20	80-120	GBRA
Nitrate-N, total	mg/L	water	EPA 300.0	00620	0.02	0.02	75-125	20	80-120	GBRA
Nitrate/nitrite-N, total[3]	mg/L	water	SM 4500-NO_3 E. + NO_2 B.	00630	0.04	0.02	75-125	20	80-120	GBRA
Total phosphorus	mg/L	water	SM 4500-P B. + E.	00665	0.06	0.05	75-125	20	80-120	GBRA
Fecal Coliform, membrane filtration	cfu/100mL	water	SM 9222 D.	31616	1		NA	0.5[2]	NA	GBRA

PARAMETER	UNITS	MATRIX	METHOD	STORET	AWRL	Lab Reporting Limit (RL)	PRECISION (RPD of LCS/LCS dup)	BIAS (%Rec. of LCS)	Lab
Diurnal monitoring summary statistics									
24-hour average dissolved oxygen	mg/L	water	TNRCC SOP /Calculation	89857	NA	NA	NA	NA	GBRA
Maximum daily dissolved oxygen	mg/L	water	TNRCC SOP /Calculation	89856	NA	NA	NA	NA	GBRA

PARAMETER	UNITS	MATRIX	METHOD	STORET	AWRL	Lab Reporting Limit (RL)	PRECISION (RPD of LCS/LCS dup)	BIAS (%Rec. of LCS)	Lab
Diurnal monitoring summary statistics (cont.)									
Minimum daily dissolved oxygen	mg/L	water	TNRCC SOP /Calculation	89855	NA	NA	NA	NA	GBRA
Number of measurements	none	none	TNRCC SOP	89858	NA	NA	NA	NA	GBRA
24-hour average water temperature	°C	water	TNRCC SOP /Calculation	00209	NA	NA	NA	NA	GBRA
Maximum daily water temperature	°C	water	TNRCC SOP /Calculation	00210	NA	NA	NA	NA	GBRA
Minimum daily water temperature	°C	water	TNRCC SOP /Calculation	00211	NA	NA	NA	NA	GBRA
24-hour average conductivity	umhos/cm	water	TNRCC SOP /Calculation	00212	NA	NA	NA	NA	GBRA
Maximum daily conductivity	umhos/cm	water	TNRCC SOP /Calculation	00213	NA	NA	NA	NA	GBRA
Minimum daily conductivity	umhos/cm	water	TNRCC SOP /Calculation	00214	NA	NA	NA	NA	GBRA
Maximum daily pH	s.u.	water	TNRCC SOP /Calculation	00215	NA	NA	NA	NA	GBRA
Minimum daily pH	s.u.	water	TNRCC SOP /Calculation	00216	NA	NA	NA	NA	GBRA

1 Reporting to be consistent with SWQM guidance and based on measurement capability.

2 Based on range statistic as described in Standard Methods, 20th Edition, Section 9020-B, " Quality Assurance/Quality Control – Intralaboratory Quality Control Guidelines."

3 Secondary method listed. To be used in the event that the primary method cannot be used or needs to be confirmed, i.e. automated method cannot be used due to instrument failure.

References for Table A7.1:

United States Environmental Protection Agency (USEPA) "Methods for Chemical Analysis of Water and Wastes," Manual #EPA-600/4-79-020
American Public Health Association (APHA), American Water Works Association (AWWA), and Water Environment Federation (WEF), "Standard Methods for the Examination of Water and Wastewater," 20th Edition, 1999.
TNRCC SOP - TNRCC Surface Water Quality Monitoring Procedures Manual, June, 1999 or subsequent editions.
American Society for Testing and Materials (ASTM) Annual Book of Standards, Vol. 11.02
TNRCC SOP - Receiving Water Assessments Procedures Manual, March, 1999 or subsequent editions.
United States Environmental Protection Agency (USEPA) Manual #EPA-821-R-9S-027

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 Tables A7.1 - 3 are the program-defined reporting specifications for each analyte. The reporting limit is the lowest concentration at which the laboratory will report quantitative data within a specified recovery range. The laboratory will meet two requirements in order to report meaningful results to the Clean Rivers Program:

- The laboratory's reporting limit for each analyte will be at **or below** the AWRL.
- The laboratory will demonstrate and document on an ongoing basis the laboratory's ability to quantitate at its reporting limits.

Acceptance criteria are defined in Section B5.

Precision

Precision is a statistical measure of the variability of a measurement when a collection or an analysis is repeated and includes components of random error. It is strictly defined as the degree of mutual agreement among independent measurements as the result of repeated application of the same process under similar conditions.

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 standards or sample/duplicate pairs in the case of bacterial analysis. Precision results are plotted on quality control charts which are based on historical data and used during evaluation of analytical performance. Program-defined measurement performance specifications for laboratory control standard/laboratory control standard duplicate pairs are defined in Tables A7.1-A7.3.

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 verified through the analysis of laboratory control standards prepared with certified reference materials and by calculating percent recovery. Results are plotted on quality control charts, which are calculated based on historical data and used during evaluation of analytical performance. Program-defined measurement performance specifications for laboratory control standards are specified in Tables A7.1 – A7.3.

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. Fixed/routine data collected under the Clean Rivers Program for water quality assessments are considered to be spatially and temporally representative of fixed/routine water quality conditions. 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) to 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 fixed/routine data sets for this project and for water quality assessments is based on the commitment of project staff to use only approved sampling and analysis methods and QA/QC protocols in accordance with quality system requirements and as described in this QAPP and in TCEQ SOPs. Comparability is also guaranteed by reporting data in standard units, by using accepted rules for rounding figures, and by reporting data in a standard format as specified in Section B10.

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 will 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. Training will be documented and retained in the personnel file and be available during a monitoring systems audit. If new field personnel are employed by UGRA and the Village of Wimberley, GBRA must observe one monitoring event prior to the submittal of data collected by the new employee to confirm the compliance with CRP requirements.

Laboratory analysts have a combination of experience, education, and training to demonstrate a knowledge of their function. Laboratories have documented training records for each test that an analyst performs. Training is performed prior to analyzing samples and annually thereafter.

A9 DOCUMENTS AND RECORDS

The documents and records that describe, specify, report, or certify activities are listed.

Table A9.1 Project Documents and Records

Document/Record	Location	Retention (yrs)	Format
QAPPs, amendments and appendices	TCEQ/GBRA/UGRA	Seven years	Paper/Electronic
QAPP distribution documentation	GBRA	Seven years	Paper
QAPP commitment letters	GBRA	Seven years	Paper
Field notebooks or data sheets	UGRA/GBRA	Two years/ indefinitely	Paper/microfilm
Field equipment calibration/maintenance logs	UGRA/GBRA	Two years/ indefinitely	Paper/microfilm
Chain of custody records	UGRA/GBRA	Two years/ indefinitely	Paper/microfilm
Field SOPs	UGRA/GBRA	Two years/ indefinitely	Paper
Laboratory QA Manuals	GBRA/UGRA/Albion	Indefinitely	Paper
Laboratory SOPs	GBRA/UGRA/Albion	Indefinitely	Paper
Laboratory staff training records	GBRA/UGRA/Albion	Indefinitely	Paper
Laboratory data reports/results	GBRA/UGRA/Albion	One year/indefinitely	Paper/microfilm
Instrument printouts	GBRA/UGRA/Albion	One year/indefinitely	Paper/microfilm

Laboratory equipment maintenance logs	GBRA/UGRA/Albion	One year/indefinitely	Paper/microfilm
Laboratory calibration records	GBRA/UGRA/Albion	One year/indefinitely	Paper/microfilm
Corrective Action Documentation	GBRA/UGRA/Albion	One year/indefinitely	Paper/microfilm

Laboratory Data Reports

Data reports from the laboratory will report the test results clearly and accurately. The test report will include the information necessary for the interpretation and validation of data and will include the following:

- name and address of the laboratory
- name and address of the client
- a clear identification of the sample(s) analyzed
- identification of samples that did not meet QA requirements and why (i.e., holding times exceeded)
- date of sample receipt
- sample results
- field split results (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 LCS sample results (% recovery), LCS duplicate results (%RPD), equipment, trip, and field blank results (as applicable), and RL confirmation (% recovery)
- narrative information on QC failures or deviations from requirements that may affect the quality of results.

Electronic Data

Data will be submitted electronically to the TCEQ in the Event/Result file format described in the CRP Guidance. The Data Summary as contained in Appendix E of this document will be submitted with the data.

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 Manual (2003). Additional aspects outlined in Section B below reflect specific requirements for sampling under the Clean Rivers Program and/or provide additional clarification.

Table B2.1 Sample Storage, Preservation and Handling Requirements

Parameter	Matrix	Container	Preservation*	Sample Volume	Holding Time
Turbidity	Water	Plastic or glass	Cool, 4°C	100 mL	48 hours
Hardness	Water	Plastic or glass	Cool, 4°C, HNO_3 to pH < 2*	1 L	6 months
Solids (TSS,VSS,TDS)	Water	Plastic or glass	Cool, 4°C	1 L	7 days

Nitrate/nitrite-nitrogen	Water	Plastic or glass	Cool, 4°C, H_2SO_4 to pH < 2	1 L	28 days
Nitrate-nitrogen	Water	Plastic or glass	Cool, 4°C	1 L	48 hours
Ammonia-nitrogen	Water	Plastic or glass	Cool, 4°C, H_2SO_4 to pH < 2*	1 L	28 days
Orthophosphate	Water	Plastic or glass	Cool, 4°C	1 L	48 hours
Total phosphorus	Water	Plastic or glass	Cool, 4°C, H_2SO_4 to pH < 2*	1 L	28 days
Sulfate	Water	Plastic or glass	Cool, 4°C	1 L	28 days
Chloride	Water	Plastic or glass	Cool, 4°C	1 L	28 days
Chlorophyll a /Pheophytin	Water	Amber plastic or glass	Cool, 4°C/0°C after filtration	1 L	Filter within 24 hours/28 days at 0°C
E. coli	Water	Sterile, plastic	Cool, 4°C	100 mL	6 hours
Metals, total	Water	Plastic or glass	Cool, 4°C, HNO_3 to pH < 2*	1 L	6 months
Metals, dissolved	Water	Plastic or glass	Cool, 4°C, HNO_3 to pH < 2	1 L	Filtered on site/6 months
Mercury, total	Water	Plastic or glass	Cool, 4°C, HNO_3 to pH < 2	1 L	28 days

*Preservation occurs within 15 minutes of collection.

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 are provided by Albion Laboratories and are new, certified glass or plastic bottles, or glass or plastic bottles cleaned and documented according to EPA method 1669. Amber plastic bottles are used routinely for chlorophyll samples. Sterile bottles are used for bacteriological samples and may have 1% sodium thiosulfate tablets added. Certificates are maintained in a notebook by each laboratory.

Processes to Prevent Contamination

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

Documentation of Field Sampling Activities

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

1. Station ID
2. Location
3. Sampling time
4. Sampling date

5. Sampling depth
6. Sample collector's name/signature
7. Values for all measured field parameters
8. Preservation added
9. Detailed observational data, including:
   - water appearance
   - weather
   - days since last significant rainfall
   - flow severity
10. Other observational data (*as applicable*), including:
   - biological activity
   - 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.)
   - unusual odors
   - 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. Legible writing in indelible ink with no modifications, write-overs or cross-outs;
2. Correction of errors with a single line followed by an initial and date;
3. Close out on incomplete pages with an initialed and dated diagonal line.

Deficiencies, Nonconformances and Corrective Action Related to Sampling Requirements

Deficiencies are defined as unauthorized deviations from procedures documented in the QAPP or other applicable documents. Nonconformances are deficiencies which affect quality and render the data unacceptable or indeterminate. Deficiencies related to sampling methods requirements include, but are not limited to, such things as sample container, volume, and preservation variations, improper/inadequate storage temperature, holding-time exceedances, and sample site adjustments.

Deficiencies are documented in logbooks, field data sheets, etc. by GBRA, UGRA and/or Village of Wimberley field or laboratory staff and reported to the cognizant field or laboratory supervisor who will notify the GBRA Project Manager. The GBRA Project Manager will notify the GBRA or contractor QAO of the potential nonconformance within 24 hours. The GBRA QAO will initiate a Nonconformance Report (NCR) to document the deficiency.

The GBRA Project Manager, in consultation with the GBRA QAO (and other affected individuals/organizations), will determine if the deficiency constitutes a nonconformance. If it is determined the activity or item in question does not affect data quality and therefore, is not a valid nonconformance, the NCR will be completed accordingly and the NCR closed. If it is determined a non-conformance does exist, the GBRA Project Manager in

consultation with the GBRA or UGRA and/or Village of Wimberley QAO will determine the disposition of the non-conforming activity or item and necessary corrective action(s); results will be documented by the GBRA or UGRA and/or Village of Wimberley QAO by completion of a Corrective Action Report.

Corrective Action Reports (CARs) document: root cause(s); impact(s); specific corrective action(s) to address the deficiency; action(s) prevent recurrence; individual(s) responsible for each action; the timetable for completion of each action; and the means by which completion of each corrective action will be documented. CARs 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 both verbally and in writing.

B3 SAMPLE HANDLING AND CUSTODY

Chain-of-Custody

The COC system described in this QAPP replaces the "tag" system as described in the SWQM Manual.

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

A sample is in custody if it is in actual physical possession or in a secured area that is restricted to authorized personnel. The COC form is used to document sample handling during transfer from the field to the laboratory and among subcontract laboratories. The following information concerning the sample is recorded on the COC form (See Appendix D). The Village of Wimberley sampling program will utilize the GBRA COC.

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

Sample Labeling

Samples are labeled on the container with an indelible marker. Label information includes:

1. Site identification
2. Date and time of sampling
3. Preservative added, if applicable
4. Designation of "field-filtered" *(for metals)* as applicable
5. Sample type (e.g., conventional water parameters, organics, etc. as defined in the monitoring schedule in Appendix B*)*

Sample Handling

After collection of samples are complete, sample containers are immediately stored in an ice chest for transport to the laboratories (GBRA, UGRA and/or Albion), 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 lab. After receipt at the 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. Trace metal samples are filtered in the field. Samples for dissolved metals are shipped by common carrier, along with the chain of custody, to the Albion Laboratory in College Station, Texas.

Deficiencies, Nonconformances and Corrective Action Related to Chain-of-Custody

Deficiencies are defined as unauthorized deviations from procedures documented in the QAPP or other applicable documents. Nonconformances are deficiencies which affect quality and render the data unacceptable or indeterminate. Deficiencies related to chain-of-custody include but are not limited to delays in transfer, resulting in holding time violations; incomplete documentation, including signatures; possible tampering of samples; broken or spilled samples, etc.

Deficiencies are documented in logbooks, field data sheets, etc. by the GBRA, UGRA and/or Village of Wimberley field or laboratory staff and reported to the cognizant field or laboratory supervisor who will notify the GBRA Project Manager. The GBRA Project Manager will notify the GBRA QAO of the potential nonconformance within 24 hours. The GBRA QAO will initiate a Nonconformance Report (NCR) to document the deficiency.

The GBRA Project Manager, in consultation with GBRA QAO (and other affected individuals/organizations), will determine if the deficiency constitutes a nonconformance. If it is determined the activity or item in question does not affect data quality and therefore, is not a valid nonconformance, the NCR will be completed accordingly and the NCR closed. If it is determined a nonconformance does exist, the GBRA Project Manager in consultation with the GBRA QAO will determine the disposition of the nonconforming activity or item and necessary corrective action(s); results will be documented by the GBRA QAO by completion of a Corrective Action Report.

Corrective Action Reports (CARs) document: root cause(s); impact(s); specific corrective action(s) to address the deficiency; action(s) prevent recurrence; individual(s) responsible for each action; the timetable for completion of each action; and the means by which completion of each corrective action will be documented. CARs 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 both verbally and in writing.

B4 ANALYTICAL METHODS

The analytical methods, associated matrices, and performing laboratories are listed in Tables A7.1 - 7.3 of Section A7. 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 will be in accordance with the most recently published edition of *Standard Methods for the Examination of Water and Wastewater*, the latest version of the *TCEQ Surface Water Quality Monitoring Procedures Manual*, 40 CFR 136, or other reliable procedures acceptable to the Agency."

Laboratories collecting data under this QAPP are compliant with ISO/IEC Guide 25, at a minimum. Copies of laboratory Quality Assurance Manuals (QAMs) 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 Modification

Only data generated using approved analytical methodologies as specified in this QAPP will be submitted to the TCEQ. Requests for method modifications will be documented on form TCEQ-10364, the TCEQ Application for Analytical Method Modification, and submitted for approval to the TCEQ Quality Assurance Section. Work will begin only after the modified procedures have been approved.

Deficiencies, Nonconformances and Corrective Action Related to Analytical Methods

Deficiencies are defined as unauthorized deviations from procedures documented in the QAPP or other applicable documents. Nonconformances are deficiencies which affect quality and render the data unacceptable or indeterminate. Deficiencies related to field and laboratory measurement systems include but are not limited to instrument malfunctions, blank contamination, quality control sample failures, etc.

Deficiencies are documented in logbooks, field data sheets, etc. by the GBRA, UGRA and/or Village of Wimberley field or laboratory staff and reported to the cognizant field or laboratory supervisor who will notify the GBRA Project Manager. The GBRA Project Manager will notify the GBRA, UGRA and/or Village of Wimberley QAO of the potential nonconformance within 24 hours. The QAOs will initiate a Nonconformance Report (NCR) to document the deficiency.

The GBRA Project Manager, in consultation with GBRA QAO (and other affected individuals/organizations), will determine if the deficiency constitutes a nonconformance. If it is determined the activity or item in question does not affect data quality and therefore, is not a valid nonconformance, the NCR will be completed accordingly and the NCR closed. If it is determined a nonconformance does exist, the GBRA Project Manager in consultation with the GBRA QAO will determine the disposition of the non-conforming activity or item and necessary corrective action(s); results will be documented by the GBRA QAO by completion of a Corrective Action Report.

Corrective Action Reports (CARs) document: root cause(s); impact(s); specific corrective action(s) to address the deficiency; action(s) prevent recurrence; individual(s) responsible for each action; the timetable for completion of each action; and, the means by which completion of each corrective action will be documented. CARs 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 both verbally and in writing.

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 Manual*. 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). 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. The analysis of field blanks should yield values lower than the reporting limit. When target analyte concentrations are high, blank values should be lower than 5% of the lowest value of the batch. Field blanks are collected when sampling for total mercury and total selenium as per the coordinated monitoring schedule.

Field Equipment Blank - Field equipment blanks are required for metals-in-water samples when collected using sampling equipment. 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. The analysis of equipment blanks should yield values lower than the reporting limit, 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 equipment blanks are collected when sampling for dissolved metals as per Appendix B.

Field Split - A field split is a single sample subdivided by field staff immediately following collection and submitted to the laboratory as two separate, identified samples according to procedures specified in the SWQM Procedures Manual. 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. The precision of field split results is calculated by relative percent difference (RPD) using the following equation:

$$RPD = (X1-X2)/((X1+X2)/2))$$

A 30% RPD criteria will be used to screen field split results as a possible indicator of excessive variability in the collection and analytical system. If it is determined that meaningful quantities of constituent (i.e., >AWRL) 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 sample results or batches of samples may be invalidated based on the examination of all extenuating information. Professional judgement 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 Deficiencies, Nonconformances, and Correction Action related to Quality Control.

Laboratory Measurement Quality Control Requirements and Acceptability Criteria

Detailed laboratory QC requirements and corrective action procedures are contained within the individual laboratory quality assurance manuals (QAMs). The minimum requirements that all participants abide by are stated below. Lab QC sample results are submitted with the laboratory data report (see Section A9.).

AWRL/Reporting Limit Verification

The laboratory's reporting limit for each analyte will be at or below the AWRL. To demonstrate ongoing ability to recover at the reporting limit, the laboratory will analyze a calibration standard (if applicable) at or below the reporting limit on each day Clean Rivers Program samples are analyzed. Two acceptance criteria will be met or corrective action will be implemented. First, calibrations including the standard at the reporting limit will meet the calibration requirements of the analytical method. Second, the instrument response (e.g., absorbance, peak area, etc.) for the standard at the reporting limit will be treated as a response for a sample by use of the calibration equation (e.g., regression curve, etc.) in calculating an apparent concentration of the standard. The calculated and reference concentrations for the standard will then be used to calculate percent recovery (%R) at the reporting limit using the equation:

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

where CR is the calculated result and SA is reference concentration for the standard. Recoveries must be within 75-125% of the reference concentration.

When daily calibration is not required (e.g., EPA Method 624), or a method does not use a calibration curve to calculate results, the laboratory will analyze a check standard at the reporting limit on each day Clean Rivers Program samples are analyzed. The check standard does not have to be taken through sample preparation, but must be recovered within 75-125% of the reference concentration for the standard. The percent recovery of the check standard is calculated using the following equation in which %R is percent recovery, SR is the sample result, and SA is the reference concentration for the check standard:

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

If the calibration (when applicable) or the recovery of the calibration or control standard is not acceptable, corrective actions (e.g., re-calibration) will be taken to meet the specifications before proceeding with analyses of CRP samples.

The laboratory will report records of quantitation checks with the data.

Laboratory Control Standard (LCS) - A LCS consists of analyte-free water spiked with the analyte of interest prepared from standardized reference material. The LCS is spiked into laboratory-pure water at a level less than or equal to the mid-point of the calibration curve for each analyte. The LCS is carried through the complete preparation and analytical process. The LCS is used to document the bias of the analytical process. LCSs are run at a rate of one per 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; SA is the true result

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

Performance limits and control charts are used to determine the acceptability of LCS analyses. Project control limits are specified in Tablea A7.1 – A.7.3.

Laboratory Duplicates - A laboratory duplicate is prepared in the laboratory by splitting aliquots of an LCS. Both samples are carried through the entire preparation and analytical process. LCS duplicates are used to assess precision and are performed on 10% of samples analyzed.

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

$$RPD = (X_1 - X_2)/\{(X_1+X_2)/2\} * 100$$

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

Performance limits and control charts are used to determine the acceptability of duplicate analyses. Project control limits are specified in Table A7.1. The specifications for bacteriological duplicates in Table A7.1 apply to samples with concentrations > 10 org./100mL.

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 reporting limit. Otherwise, the equipment should not be used.

Matrix Spike (MS) - A matrix spike is an aliquot of sample spiked with a known concentration of the analyte of interest. Percent recovery of the known concentration of added analyte is used to assess accuracy of the analytical process. The spiking occurs prior to sample preparation and analysis. Spiked samples are routinely prepared and analyzed at a rate of 10% of samples processed, or one per batch whichever is greater. The MS is spiked at a level less than or equal to the midpoint of the calibration or analysis range for each analyte. Percent recovery (%R) is defined as 100 times the observed concentration, minus the sample concentration, divided by the true concentration of the spike.

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

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

MS recoveries are plotted on control charts and used to control analytical performance. Measurement performance specifications for matrix spikes are not specified in this document.

Method Blank - A method blank is an analyte-free matrix to which all reagents are added in the same volumes or proportions as used in the sample processing and analyzed with each batch. The method blank is carried through the

complete sample preparation and analytical procedure. The method blank is used to document contamination from the analytical process. The analysis of method blanks should yield values less than the reporting limit. 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.

Additional Method-Specific QC Requirements - Additional QC samples are run (e.g., sample duplicates, surrogates, internal standards, continuing calibration samples, interference check samples) as specified in the methods. The requirements for these samples, their acceptance criteria, and corrective actions are method-specific.

Deficiencies, Nonconformances and Corrective Action Related to Quality Control

Deficiencies are defined as unauthorized deviations from procedures documented in the QAPP. Non-conformances are deficiencies which affect quality and render the data unacceptable or indeterminate. Deficiencies related to quality control include but are not limited to field and laboratory quality control sample failures.

Deficiencies are documented in logbooks, field data sheets, etc. by the GBRA, UGRA and/or Village of Wimberley field or laboratory staff and reported to the cognizant field or laboratory supervisor who will notify the GBRA Project Manager. The GBRA Project Manager will notify the GBRA, UGRA and/or Village of Wimberley QAO of the potential nonconformance within 24 hours. The QAOs will initiate a Nonconformance Report (NCR) to document the deficiency.

The GBRA Project Manager, in consultation with GBRA QAO (and other affected individuals/organizations), will determine if the deficiency constitutes a nonconformance. If it is determined the activity or item in question does not affect data quality and therefore, is not a valid nonconformance, the NCR will be completed accordingly and the NCR closed. If it is determined a nonconformance does exist, the GBRA Project Manager in consultation with the GBRA QAO will determine the disposition of the nonconforming activity or item and necessary corrective action(s); results will be documented by the GBRA QAO by completion of a Corrective Action Report.
Corrective Action Reports (CARs) document: root cause(s); impact(s); specific corrective action(s) to address the deficiency; action(s) prevent recurrence; individual(s) responsible for each action; the timetable for completion of each action; and, the means by which completion of each corrective action will be documented. CARs 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 both verbally and in writing.

B6 INSTRUMENT/EQUIPMENT TESTING, INSPECTION AND MAINTENANCE

All sampling equipment testing and maintenance requirements are detailed in the *TCEQ Surface Water Quality Monitoring Procedures Manual*. 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 QAM(s). Testing and maintenance records are maintained and are available for inspection by the TCEQ. Instruments requiring daily or in-use testing include, but are not limited to, water baths, ovens, autoclaves, incubators,

refrigerators, and laboratory-pure water. Critical spare parts for essential equipment are maintained to prevent downtime. Maintenance records are available for inspection by the TCEQ.

B7 INSTRUMENT CALIBRATION AND FREQUENCY

Field equipment calibration requirements are contained in the *TCEQ Surface Water Quality Monitoring Procedures Manual*. 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 QAM(s). The laboratory QAM identifies all tools, gauges, instruments, and other sampling, measuring, and test equipment used for data collection activities affecting quality that must be controlled and, at specified periods, calibrated to maintain bias within specified limits. Calibration records are maintained, are traceable to the instrument, and are available for inspection by the TCEQ. Equipment requiring periodic calibrations include, but are not limited to, thermometers, pH meters, balances, incubators, turbidity meters, and analytical instruments.

B8 INSPECTION/ACCEPTANCE OF SUPPLIES AND CONSUMABLES

No special requirements for acceptance are specified for field sampling supplies and consumables. All field supplies and consumables are accepted upon inspection for breaches in shipping integrity.

B9 NON-DIRECT MEASUREMENTS

This QAPP does not include the use of data obtained from non-direct measurement sources.

B10 DATA MANAGEMENT

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 field technician logs the sample in the Microsoft Access Lab Samples Database. Each sample is assigned a separate and distinct sample number. The sample is accompanied by a chain of custody. The field technician 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.

Data generated by lab technicians are logged permanently in analysis logs. 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. 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 Director of Water Quality Services 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. Again, 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(QAO) feels 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 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 Project Manager. If at any time errors are identified, the laboratory and water quality databases are corrected. The GBRA 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 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 → Report generation→ Quality control review by GBRA QAO → 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

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

Laboratory data → Laboratory analysis logs → Lab database → Report generation→ Quality control review by GBRA QAO → 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

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. Again, 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(QAO) feels 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 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 Project Manager. If at any time errors are identified, the laboratory and water quality databases are corrected. The Project Manager is responsible for transmitting the data to TCEQ. If errors are found after the TCEQ review, those errors are corrected by the 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 inserted in a three-ring notebook for review and use later. These notebooks are kept in paper form for a minimum of one year and then microfilmed for permanent record.

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

The data reports that are generated are reviewed by the laboratory director and signed. They are then given to the GBRA 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. 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 microfilming.

The laboratory database is housed on the laboratory computer and is backed up on the network server nightly. A back up copy of the network server files is made every Monday and that copy is stored off-site at a protected location. 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 microfilm generated is stored in the GBRA vault. The GBRA records manager is the custodian of these files.

Data Handling, Hardware, and Software Requirements

The laboratory database is housed in the laboratory and backed up each evening. The laboratory database uses Microsoft Access 2000 software. The systems are operating in Windows 2000 and any additional software needed for word processing, spreadsheet or presentations uses Microsoft Office 2000.

C1 ASSESSMENTS AND RESPONSE ACTIONS

The following table presents the types of assessments and response action 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	Continuous	GBRA	Monitoring of the project	Report to TCEQ in

Oversight, etc.			status and records to ensure requirements are being fulfilled	Quarterly Report
Monitoring Systems Audit	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 Sub-participants	Dates to be determined by the GBRA	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	Requirements appearing in lab SOPs and QAPP, ISO/IEC Guide 25, applicable EPA methods and Standard Methods, 40 CFR 136, and other documents applicable to CRP programs including portions of the Texas Administrative Code and the Code of Federal Regulations.	30 days to respond in writing to the TCEQ to address corrective actions

Corrective Action

The GBRA Project Manager is responsible for implementing and tracking corrective action procedures as a result of audit findings. Record of audit findings and corrective actions are maintained by both the CRP and GBRA Project Managers. The laboratory has 30 days to respond in writing to the GBRA Project Manager of the actions taken by the laboratory to correct deficits found in the lab audit. All communications are a part of the permanent record and are maintained by the GBRA Project Manager. Data supplied by the laboratory will be scrutinized by the GBRA Project Manager and QAO to determine if it should be transmitted to TCEQ. Failure by the laboratory to respond to audit findings with corrective actions or explanations may result in discontinuation of lab services. 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 is specified in the CRP QMP and in agreements in contracts between participating organizations.

C2 REPORTS TO MANAGEMENT

Reports to GBRA Project Management

Laboratory data reports contain QC information so that this information can be reviewed by the GBRA Project Managers After review, the GBRA Project Manager marks the lab report as "QA Reviewed" and begins process of data transmittal to TCEQ. Project status, assessments and significant QA issues will be dealt with by the GBRA Project Manager who will determine whether it will be included in reports to the TCEQ Project Management.

Reports to TCEQ Project Management

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

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

Monitoring Systems Audit Report and Response - Following any audit performed by the GBRA, a report of findings, recommendations and response is sent to the TCEQ in the quarterly progress report.

Reports by TCEQ Project Management

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

D1 DATA REVIEW, VERIFICATION, AND VALIDATION

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

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 information to be reviewed, verified, and validated (listed by task and responsible party in Table D2.1) is evaluated against technical and project specifications and checked for errors, especially errors in calculations, data reduction, and transcription. 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 that 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 will be documented.

Data validation tasks to be addressed by the GBRA include, but are not limited to, the confirmation of lab 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. Any suspected errors or anomalous data must be addressed by the manager of the task associated with the data before data validation can be completed. A second element of the validation process is consideration of any findings identified during the annual monitoring systems audit conducted by the TCEQ Quality Assurance Specialist assigned to the project. Any issues requiring corrective action must be addressed, and the potential impact of these issues on previously collected data will be assessed. Finally, the GBRA Project Manager validates that the data meet the data

quality objectives of the project and are suitable for reporting to TCEQ. Pertinent information having to do with inconsistencies with reporting limit specifications; failures in sampling methods and/or laboratory procedures resulting in unavailable data; etc. will be provided on the Data Summary when the data are submitted to the TCEQ.

Table D2.1 Data Review, Verification, and Validation Tasks

Task	Verification	Validation	Responsibility
Field data reviewed for conformance with data collection, sample handling and chain of custody, analytical and QC requirements	Y		GBRA Field Technicians/UGRA Field Technicians/Wimberley Field Technicians
Post-calibrations checked to ensure compliance with error limits	Y		GBRA Field Technicians/UGRA Field Technicians/Wimberley Field Technicians
Field data calculated, reduced, and transcribed correctly	Y		GBRA Project Manager/UGRA Project Manager/Wimberley Project Manager
Laboratory data reviewed for conformance with data collection, sample handling and chain of custody, and analytical and QC requirements to include documentation, holding times, sample receipt, sample preparation, sample analysis, project and program QC results, and reporting	Y		GBRA Laboratory Director(QAO)/UGRA QAO/Albion QAO
Laboratory data calculated, reduced, and transcribed correctly	Y		GBRA Project Manager/UGRA Project Manager/Albion QAO
Reporting limits consistent with requirements for "Ambient Water Reporting Limits."	Y	Y	GBRA Project Manager/UGRA Project Manager/Albion QAO
Analytical data documentation evaluated for consistency and/or improper practices	Y	Y	GBRA Project Manager/UGRA Project Manager/Albion QAO
Analytical QC information evaluated to determine impact on individual analyses	Y	Y	GBRA Laboratory Director(QAO)/UGRA QAO/Albion QAO
All laboratory samples analyzed for all parameters	Y	Y	GBRA Laboratory Director(QAO)/UGRA QAO/Albion QAO
Data set (to include field and laboratory data) evaluated for reasonableness and if corollary data agree	Y	Y	GBRA Project Manager/UGRA Project Manager
Data review, verification, and validation performed and deviations documented		Y	GBRA Data Manager/UGRA Project Manager
Outliers confirmed and documented		Y	GBRA Project Manager/UGRA Project Manager
Field QC acceptable (e.g., field splits and trip, field and		Y	GBRA Laboratory Director(QAO)/UGRA

equipment blanks)			QAO/GBRA Project Manager
Sampling and analytical data gaps checked and documented		Y	GBRA Project Manager/UGRA Project Manager
Verification and validation confirmed. Data meets conditions of end use and are reportable		Y	GBRA Project Manager/UGRA Project Manager

D3 RECONCILIATION WITH USER REQUIREMENTS

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

Amendment # 1
to the Guadalupe-Blanco River Authority
Clean Rivers Program FY 2004/2005 QAPP

Prepared by the Guadalupe-Blanco River Authority
In Cooperation with the
Texas Commission on Environmental Quality (TCEQ)

Questions concerning this QAPP should be directed to:

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Effective: 1/22/04

Amendment # 2
to the Guadalupe-Blanco River Authority
Clean Rivers Program FY 2004/2005 QAPP

Prepared by the Guadalupe-Blanco River Authority
In Cooperation with the
Texas Commission on Environmental Quality (TCEQ)

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Effective: 2/4/04

Amendment # 3
to the Guadalupe-Blanco River Authority
Clean Rivers Program FY 2004/2005 QAPP

Prepared by the Guadalupe-Blanco River Authority
In Cooperation with the
Texas Commission on Environmental Quality (TCEQ)

Questions concerning this QAPP should be directed to:

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Effective: 9/1/04

Amendment # 4
to the Guadalupe-Blanco River Authority
Clean Rivers Program FY 2004/2005 QAPP

Prepared by the Guadalupe-Blanco River Authority
In Cooperation with the
Texas Commission on Environmental Quality (TCEQ)

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Amendment # 5
to the Guadalupe-Blanco River Authority
Clean Rivers Program FY 2004/2005 QAPP

Prepared by the Guadalupe-Blanco River Authority
In Cooperation with the
Texas Commission on Environmental Quality (TCEQ)

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