Amendment # 2

FAILING SEPTIC SYSTEM INITIATIVE:

ON-SITE SEWAGE FACILITY RISK ASSESSMENT AND OUTREACH PHASE II
Quality Assurance Project Plan
Westfield Estates Watershed

Contract
EPA Agreement

Houston-Galveston Area Council
3555 Timmons Lane, Suite 120
Houston, Texas 77227

Funding Source:

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

Effective Period: Three years from date of final approval with annual review.

Questions concerning this QAPP should be directed to:

Dr. Kathleen Ramsey, DABT
Project Manager
Houston-Galveston Area Council
3555 Timmons Lane, Suite 120
Houston, TX 77027-6748
(713) 499-6653
kathleen.ramsey@h-gac.com

A1 APPROVAL PAGE

Texas Commission on Environmental Quality

Compliance Support Division

Stephen Stubbs, QA Manager Date	Kyle Girten, QA Specialist Date
Quality Assurance Section	Quality Assurance Team

Water Quality Planning Division

Katherine Nelson, Manager Date	Name, Manager Date
Water Quality Planning and Implementation Section	Nonpoint Source Program
Name Date	Anju Chalise Date
Project QA Specialist Nonpoint Program	Project Manager, Nonpoint Source Program

Contractor

H-GAC	
Kathleen Ramsey, PhD Date	TBD, QA Officer Date
Project Manager	

Contractor Laboratory Name

TBD, Laboratory Director Date	TBD, Laboratory QA Officer Date

The H-GAC will secure written documentation from additional project participants (e.g., subcontractors, laboratories) stating the organization's awareness of and commitment to requirements contained in this quality assurance project plan and any amendments or revisions of this plan. The contractor will maintain this documentation as part of the project's quality assurance records. This documentation will be available for review. (See sample letter in Attachment 1 of this document

A2 TABLE OF CONTENTS

Page

A1 Approval Page ……..2
A2 Table of Contents ……..3
List of Acronyms …….. ...5
A3 Distribution List …….. 6
A4 Project/Task Organization …….....7
A5 Problem Definition/Background 13
A6 Project/Task Description 16
A7 Quality Objectives and Criteria.....17
A8 Special Training/Certification 20
A9 Documents and Records 21
B1 Sampling Process Design 23
B2 Sampling Methods.....24
B3 Sample Handling and Custody.....27
B4 Analytical Methods 29
B5 Quality Control 30
B6 Instrument/Equipment Testing, Inspection, and Maintenance.....32
B7 Instrument Calibration and Frequency 32
B8 Inspection/Acceptance for Supplies and Consumables 32
B9 Non-Direct Measurements.....33
B10 Data Management 33
C1 Assessment and Response Actions 34
C2 Reports to Management 35
D1 Data Review, Verification and Validation 36
D2 Verification and Validation Methods 37
D3 Reconciliation with User Requirements.....39

Appendix A: Work Plan.....40
Appendix B: Sampling Process Design and Monitoring Schedule (Plan).....44
Appendix C: Field Data Sheet(s) 51
Appendix D: Chain of Custody Form(s) 54
Appendix E: Data Management Plan ...…… .55
Appendix F: Data Submittal and Review Check List… ……..……..60
Appendix G: Letter to document adherence to the project QAPP ……65
Appendix H: Possible Sampling Locations ……...66

Table 1: A7.1 Measurement Performance Specifications 18
Table 2: A9.1 Project Documents and Records for Review During Audits 21
Table 3 A9.2 Project Documents and Records for supplemental purposes …… . 22
Table 4: B2.1 Sample Storage, Preservation and Handling Requirements.....24
Table 5: B2.2. Sample handling references for subcontractor monitoring entities…… 25
Table 6: C1.1 Assessments and Response Requirements.....35
Table 7: D2.1 Data Verification Tasks 38

Figure 1: A4.1 Project Organization Chart ..... …12
Figure 2: A5.1 Westfield Estates Sampling Sites ……..……..14
Figure 3: A5.2 Harris County Precinct 2 Septic System Violations ……15
Figure 4: A5.3 Westfield Estates Watershed

LIST OF ACRONYMS

AWRL	Ambient Water Reporting Limit
BMP	Best Management Practices
CAR	Corrective Action Report
COC	Chain-of Custody
CWA	Clean Water Act
DOC	Demonstration of Capability
DMP	Data Management Plan
DMRG	Data Management Reference Guide
DQO	Data Quality Objective
E. Coli	*Escherichia coli*
EPA	Environmental Protection Agency
FSSI	Failing Septic System Initiative
FY	Fiscal Year
GIS	Geographic Information System
GPS	Global Positioning Systems
H-GAC	Houston-Galveston Area Council
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
LOD	Level of Detection
LOQ	Limit of Quantitation
MDMA	Monitoring Data Management & Analysis
MS	Microsoft Corporation
NCR	Nonconformance Report
NELAC	National Environmental Laboratories Accreditation Conference
NPDES	National Pollution Discharge Elimination System
NPS	Nonpoint Source
OSSF	On-Site Sewer Facility
PO	Project Officer
QA	Quality Assurance
QAM	Quality Assurance Manual
QAO	Quality Assurance Officer
QA/QC	Quality Assurance/Quality Control
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
SLOC	Station Location Form
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
Watershed	Westfield Estates watershed
WEWPP	Westfield Estates Watershed Protection Plan
WMT	Watershed Management Team
WQI	Water Quality Inventory
WPP	Watershed Protection Plan
WQMP	Water Quality Management Plan
WWTP	Wastewater Treatment Plant

A3 DISTRIBUTION LIST

The H-GAC will provide copies of this project plan and any amendments or revisions of this plan to each project participant defined in the list below. The H-GAC will document receipt of the plan by each participant and maintain this documentation as part of the project's quality assurance records. This documentation will be available for review.

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

Kyle Girten, Quality Assurance Specialist
MC-176
(512) 239-0425

Anju Chalise, NPS Project Manager
MC-147
(512) 239-1259

Contractor Address

Houston-Galveston Area Council
P.O. Box 22777
3555 Timmons Lane
Houston, Texas 77227-2777

Kathleen Ramsey, PhD, Project Manager
(713)-499-6653

TBD, Quality Assurance Officer
(xxx)-xxx-xxxx

TBD, Laboratory Supervisor
(xxx) xxx-xxxx

TBD, Laboratory Quality Assurance Officer
(xxx) xxx-xxxx

The TCEQ Project Manager will provide copies of this project plan and any amendments or revisions of this plan to the EPA Project Manager within two weeks of approval. The TCEQ Project Manager will document receipt of the plan and maintain this documentation as part of the project's quality assurance records. This documentation will be available for review.

U.S. Environmental Protection Agency Region 6
Section Name
1445 Ross Avenue
Suite # 1200
Dallas, TX 75202-2733
Randall Rush, Project Officer
(214) 665-7107

A4 PROJECT/TASK ORGANIZATION

Texas Commission on Environmental Quality (TCEQ)

Compliance Support Division

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

Water Quality Planning Division

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

Anju Chalise, TCEQ NPS Project Manager
Maintains a thorough knowledge of work activities, commitments, deliverables, and time frames associated with projects. Develops lines of communication and working relationships between the contractor, the TCEQ, and the EPA. Tracks deliverables to ensure that tasks are completed as specified in the contract. Responsible for ensuring that the project deliverables are submitted on time and are of acceptable quality and quantity to achieve project objectives. Serves on planning team for NPS projects. Participates in the development, approval, implementation, and maintenance of the QAPP. Assists the TCEQ QAS in technical review of the QAPP. Responsible for verifying that the QAPP is followed by the contractor. Notifies the TCEQ QAS of particular circumstances which may adversely affect the quality of data derived from the collection and analysis of samples. Enforces corrective action.

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

Nancy Ragland
TCEQ NPS Data Manager
Responsible for ensuring the Data Management and Analysis Group perform the following functions: Tracks and verifies NPS data. Maintains data storage system for NPS quality assured datasets.

Coordinates correction of data errors with TCEQ NPS Project Managers and contractor Data Managers. Provides training and guidance to contractors on technical data issues. Serves on planning team for NPS projects. Reviews and approves data-related portions of project-specific QAPPs. Performs technical reviews of project-specific Data Management Plans. Develops and maintains Standard Operating Procedures for NPS data management.

Houston-Galveston Area Council (H-GAC)

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

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

Bruce Ridpath, H-GAC Data Manager,
Responsible for the acquisition, verification, and transfer of data to the TCEQ. Oversees data management for the study. Performs data quality assurances prior to transfer of data to TCEQ. Responsible for transferring data to the TCEQ in the acceptable format. Ensures data are submitted according to work plan specifications. Provides the point of contact for the TCEQ Data Manager to resolve issues related to the data.

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

TBD, Hygeia Laboratory, Laboratory QAO
Monitors the implementation of the QAM and the QAPP within the laboratory to ensure complete compliance with QA objectives as defined by the contract and in the QAPP. Conducts internal audits to identify potential problems and ensure compliance with written SOPs. Responsible for supervising and verifying all aspects of the QA/QC in the laboratory. Performs validation and verification of data before the report is sent to the contractor. Insures that all QA reviews are conducted in a timely manner from real-time review at the bench during analysis to final pass-off of data to the QA officer.

TBD, Hygeia Laboratories, Field Supervisor
Responsible for supervising all aspects of the sampling and measurement of surface waters and other parameters in the field. Responsible for the acquisition of water samples and field data measurements in a timely manner that meet the quality objectives specified in Section A7 (Table A.1), as well as the requirements of Sections B1 through B8. Responsible for field scheduling, staffing, and ensuring that staff are appropriately trained as specified in Sections A6 and A8.

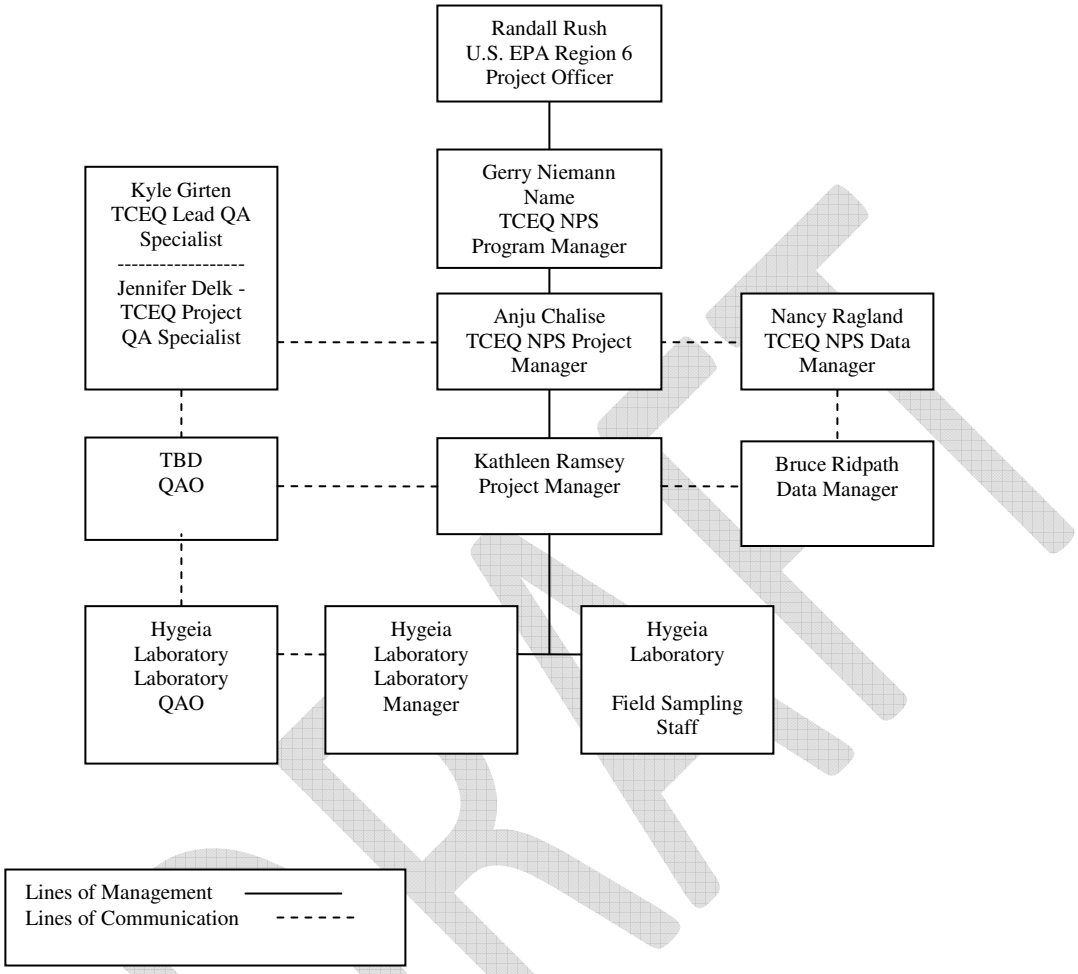
Randall Rush, EPA Project Officer
Responsible for managing the CWA Section 319 funded grant on the behalf on EPA. Assists the TCEQ in approving projects that are consistent with the management goals designated under the State's NPS management plan and meet federal guidance. Coordinates the review of project workplans, draft deliverables, and works with the State in making these items approvable. Meets with the State at least semi-annually to evaluate the progress of each project and when conditions permit, participate in a site visit on the project. Fosters communication within EPA by updating management and others, both verbally and in writing, on the progress of the State's program and on other issues as they arise. Assists the regional NPS coordinator in tracking a State's annual progress in its management of the NPS program. Assists in grant close-out procedures ensuring all deliverables have been satisfied prior to closing a grant.

Intentional Blank Page

Intentional Blank Page

PROJECT ORGANIZATIONAL CHART

Figure A4.1. Organization Chart - Lines of Communication



A5 PROBLEM DEFINITION

Individual On-Site Sewage Treatment Facilities (OSSFs) are prone to failure, releasing inadequately treated sewage and wastewater into surface and ground waters. EPA estimates that as much as 17% of the stream pollution in some states is related to OSSF problems versus 13% associated with wastewater treatment plants, and 10% related to storm water pollution. Common reasons for OSSF failure include age and design of the system, soil type, small lot size, improper installation, lack of proper operation, and/or maintenance. Communities that lack access to reliable sanitary sewer services are often a collection of residences in low income and/or minority areas.

Malfunctioning OSSFs have the potential to create human health and environmental water quality problems. Health problems may include gastrointestinal infections, infectious hepatitis, cholera, and typhoid fever. In 2001, it was estimated that 12% (17,800) of the H-GAC region's OSSFs were chronically malfunctioning. In a 2005 report, H-GAC estimated potentially 60,000 people could be affected directly by illness plus hundreds of thousands, indirectly, through decreased water quality. In many cases owners, developers, officials, and the judiciary are unaware of the magnitude of potential adverse health and environmental effects of untreated OSSF sewage. While anecdotal estimates have been made concerning the magnitude of potential problems (e.g. A survey in 1998 indicated 40 % of the OSSFs examined on the Dickinson Bayou watershed in Galveston County were probably failing), there is little hard evidence of the actual presence of water borne pathogens.

Escherichia coli (*E. coli*) is a predictive indicator for water borne pathogens in freshwater. This project will obtain sampling data from an OSSF community, Westfield Estates, and determine if *E. coli* are present in the water pooled on site and/or in adjacent water bodies. Westfield Estates has the highest need for sanitary sewer services in Harris County (Harris County Precinct 2 Study, 2007) and in the H-GAC 13-county region. The community, located in the Westfield Estates watershed adjacent to Halls Bayou in northern Harris County, Texas, is comprised of approximately 700 homes served entirely by private septic systems. Westfield Estates has a disproportionate number of minorities, disabled, under-educated, foreign-born, non-English-speaking, lower income and higher average family size than Houston as a whole, Texas, or the United States.

High numbers of septic system violations occur in the community. Stagnant black-colored water is found in ditches during dry weather from which a strong "sewer" odor emanates. In 2007, Elevated levels of bacteria (>100,000 MPN/100 ml) were found at most of the 20 sites examined in Phase I of the Westfield Estates WPP. Bacteria flow through street ditches in the watershed into Halls Bayou, especially during rain events (11,800 to 141,000 MPN/100 ml). Presumably, the majority of the contamination comes from failing septic systems. However, FSSI-I also indicates that a significant amount of bacterial impairment comes from non-human sources (65-70%), primarily chickens and dogs, with a component(s) still unknown. Bacteria levels 6 to 600 times the Water Quality Standards both in the Community and in the Bayou pose a potential for human illness.

A permanent solution to the human bacterial source problem (municipal sewer service) is unlikely to occur in the foreseeable future because of logistics and funding requirements ($16 million).

Interim solutions, which include remediation or replacement of existing septic systems, and best management practices for decreasing bacterial contamination from both human and non-human sources, coupled with a watershed protection, plan pose a viable option.

Westfield Estates WPP proposes bacterial impairment management using structural septic system construction or modification and behavioral BMP components. Education and public outreach are critical to the success of this project. In a historically underserved, low-income, minority community where services were promised before but not delivered, credibility must be established and maintained.

Resident's participation in the Phase I Town Meeting was excellent and interest was high. A stakeholder's advisory group (SAG), which includes elected officials with jurisdiction over the watershed, is a driving force for the Westfield Estates WPP. After funding is confirmed, residents will be actively engaged in project process/progress and in the development of a community-based watershed protection plan.

In the Westfield Estates WPP, the primary benefit from inspection, repair, remediation, installation, and/or replacement of failing systems is a direct reduction of human source bacteria entering the bayou. To monitor progress, bacteria levels will be determined at locations in the watershed, beginning with Phase I locations, before implementation and at its conclusion. Monitoring in Halls Bayou above and below the Westfield Estates watershed is conducted under the Clean Rivers Program (CRP) currently.

Additional sites, where drainage from the watershed into the Bayou occurs, will be monitored pre- and post-implementation. H-GAC will repeat watershed and Halls Bayou sampling for bacteria at previously examined sites (Phase I) to quantify the amount and source of bacteria reduction leading to quantifiable load reduction at the end of the project.

Some sites may be changed from the Phase I study. For example it is possible that some residents have repaired failing OSSFs and 2007 standing water is not present in 2009. New standing water locations may occur and need to be added to the study. Another measure of success may be a decrease in septic system violations. Absence of standing water in watershed ditches may also be a measurement.

BMPs to reduce the non-human impairment (bacteria) will be developed and implemented. Additional sampling will confirm and identify remaining non-human sources determined in Phase I. Education of residents on the proper maintenance of septic systems is also important as is involving them in the development and implementation of BMPs for non-human bacteria sources.

Project Outcomes:

- Repair, install, replace, or provide maintenance to 150 - 200 septic system depending on available funds;
- Develop and implement BMPs for non-human bacterial sources (e.g. dogs and chickens);
- Town Meetings three times per year to share progress;
- Final Town Meeting "Wrap-Up" and transfer of the Watershed Protection Plan to permanent stakeholder advisory group;
- Education for care of septic systems, including maintenance agreements with FWSD; and
- Estimate of human health issues associated with failing septic systems before/after project.

Secondary Benefits:

- Drainage ditch maintenance in flood prone area previously hindered by presence of bacteria;
- Development of Impairment (Bacteria) Reduction Plan

- Broad-based acceptance of a community-based watershed protection plan

13A

Funding for the project is provided by the CWA 319(h) program with match provided by Harris County Precinct 2 Commissioner's Office, Harris County Public Infrastructure, East Aldine Management District, Sunbelt Freshwater Supply District – Oakwilde, and H-GAC. Data collected as a result of the project will be used to demonstrate the effectiveness of the BMP as required by EPA guidelines. This demonstration will be accomplished by evaluating the efficiency of pollutant removal by the BMP and comparing post BMP watershed water quality data to historical watershed water quality data.

Possible monitoring sites are identified in Figure 2: A5.1, Figure 3: A5.2, Figure 4 A5.3

This QAPP will be reviewed and approved by the TCEQ (NPS and TMDL) programs to ensure that data generated for the purposes described are scientifically valid and legally defensible.

Figure 2: A5.1. Westfield Estates Phase I Sampling Locations

Figure 3 A5.2. Harris County Precinct 2, Septic Violations
Westfield Estates is located in the yellow rectangle in the upper left corner of the map.

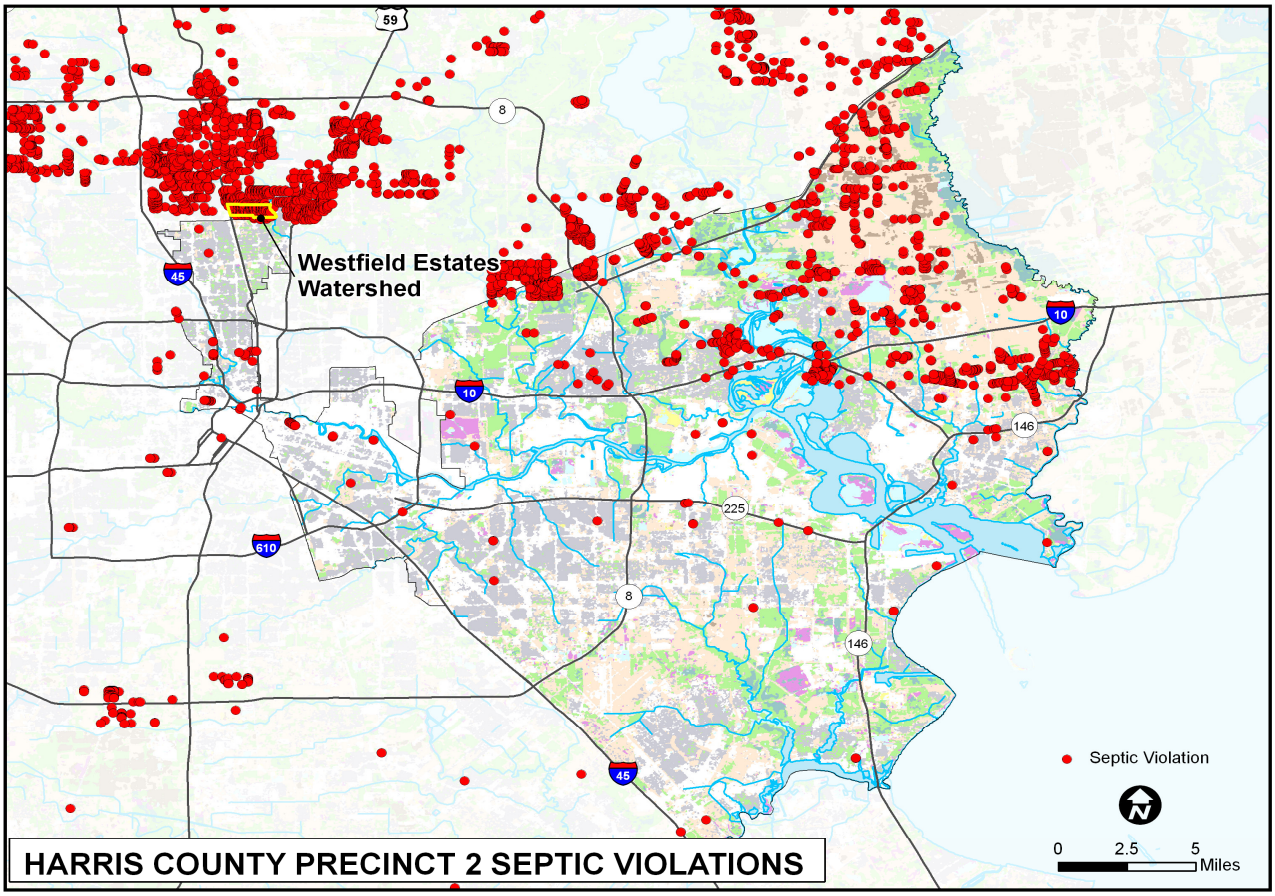


Figure 4 A5.3. Westfield Estates Septic system Violations

ensure that all project data have been collected, managed, analyzed, and handled in ways that guarantee its reliability and are consistent with existing protocol to ensure data quality compatibility. Because sample site locations are neither random nor representative of all OSSFs; this data will not be entered into the state ambient water database.

A6 PROJECT/TASK DESCRIPTION

The overall goal in Phase I of this project was to determine the presence and source of *E. coli* bacteria around/near malfunctioning OSSF facilities in selected locations in the GBEP region. These include sites in violation of county standards in Harris County Precinct 2 along Halls Bayou. The project's goal was accomplished by sampling visible pools of water thought to be related to the malfunction of the OSSF at the site. In addition, since the violation sites in the watershed were immediately adjacent to a larger water body, samples collected from the water body determined whether bacteria affected water quality. Samples also were collected from the water body at the outfall of the OSSF from the Westfield Estate watershed, and up stream of it.

In Phase II of this work, the overall goal is to provide pre- and post-implementation bacteria loads in the Westfield Estates watershed in order to determine BMP success. Another goal is to determine the source of bacteria found in the watershed. Since the bulk of septic system violations occur in the Westfield Estates community proper, samples will be collected at Phase I sites in 2007 and additional sites that meet the 2007 criteria as identified in 2009.

Tasks include

1. Sample identified sites pre-implementation and post-implementation. beginning with Phase I sites and adding possible new 2009 sites. Potential contribution of bacterial contamination to overall water quality in the watershed will be assessed by collecting bacterial samples from ditches, pooled water, outfalls, and other sources of non-point runoff in the Westfield Estates watershed and other possible sampling sites.

2. Quantitation of non-point source contamination from failing septic systems will aid in improvement plans for water quality improvement in the watershed and provide a pre-implementation base line and post-implementation assessment.

3. Manage, quality assure, and analyze data; and

4. Present results of study in electronic data report format and final report format, publish data in an H-GAC Report, make presentations as needed, and post the report on the H-GAC Westfield Estates WPP website.

See **Appendix A for the project-related work plan** tasks related to data collection, sampling site location from Phase I, and schedule of deliverables for a description of work defined in this QAPP.

See **Appendix B for** monitoring to be conducted under this QAPP.

Revisions to the QAPP

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

Amendments

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

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

A7 QUALITY OBJECTIVES AND CRITERIA

The measurement performance specifications to support the project objectives for a minimum data set for bacterial analysis, bacterial source tracking and other parameters are specified in Table 1: A7.1 and in the text following. Alternative methods, other than those in the following table, may be used with written permission of the H-GAC and TCEQ Project Managers and will be appended to this QAPP as an amendment. Procedures for laboratory analysis must be in accordance with the most recently published edition of Standard Methods for the Examination of Water and Wastewater, 40 CFR 136 and American Society for Testing and Materials (ASTM) Annual Book of Standards or *US EPA Methods for Chemical Analysis of Water and Wastewater*, Manual #EPA-600/4-79-020.

The following method for bacteria source identification were utilized in Phase I and will be used in Phase II studies. Additional methods (DNA fingerprinting) will be utilized. Additional SOP information may be found in the Appendix J.

Identification of Individual Isolates:
Catabolic Utilization Profiles and Biolog identification require using Microlog 1 System (Model 41401), Gram Negative Database (22601D) and GN2 Microplates, Gram Positive Database (22604D) and GP2 Microplates, and a Microplate 96-well Reader. For bacterial source identification, an additional, duplicate grab sample was taken and analysis performed to determine enumeration of total fecal coliform and fecal streptococcus. The second sample aliquot was plated and the plates stored under refrigeration for up to 2 – 3 weeks pending the results of initial fecal coliform and streptococcus analysis. The laboratory used the stored plates to identify individual isolates according to the method of Hagedorn and Crozier et.al. [Hagedorn et.al. J. Applied Microbiol. 2003. 94(5):792-9]. Isolates from the stored fecal streptococci plates identified species and carbon utilization profiles (CUP) were generated for each. CUP profiles generated a limited host-specific library and categorized isolates to source. A minimum of 100 isolates will be used for each specific library (human, cow, and bird), with the exact number determined by H-GAC following sampling, assessment of the total FSSI site samples collected, and funds available.

DNA fingerprinting of E. coli and Enterococcus spp. bacteria
The DNA fingerprinting method horizontal, fluorophore-enhanced repetitive extragenic palindromic PCR (HFERP) will be used to compare genetic relatedness of E. coli and Enterococcus spp. bacteria collected in drainage ditches and Hall's Bayou with human and animal sources (Johnson et al., 2004). HFERP which uses fluorescently labeled primers reduces within gel grouping of DNA fingerprints and improves alignment of DNA fingerprints between gels, relative to fingerprints achieved by rep-PCR alone. This method exhibits higher rate of correct classification for microbial source tracking than other commonly used methods such as pulsed field gel electrophoresis. However, like other methods, HFERP requires construction of a library containing fingerprints from known sources for comparison. HFERP fingerprinting is employed by a concurrent study funded by the TCEQ in Buffalo Bayou and Whiteoak Bayou for source identification and the Westfield Estates data can be better interpreted in the context of this larger data set. E. coli and Enterococcus spp. These watersheds are adjacent to the Hall's Bayou watershed. The resulting fingerprints will be analyzed with statistical algorithms for similarities (e.g. Pearson's product-moment correlation coefficient or Jaccard coefficient) using Bionumerics (Applied Maths) that transforms gel bands to binary data. isolates will be obtained from the IDEXX trays used to determine concentrations (MPN/100 ml) of these indicator bacteria.

Table 1: A7.1 - 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)	Per Cent Complete
Field Parameters										
E. coli, IDEXX Colilert	MPN/100 mL	water	SM 9223-B	31699	1		NA	.5**	NA	
Enterococcus, IDEXX Enterolert	MPN/100 mL	water	ASTM D-6503	31701	1		NA	.5**	NA	
Total Fecal coliform	MPN/100 mL	water	SM 9222-D	31616	1		NA	.5	NA	
Total Fecal Streptococcus	MPN/100 mL	water	SM 9230-C	31673	1		NA	.5	NA	
Days since last significant rainfall	days	NA	TCEQ SOP	72053	NA*	NA	NA	NA	NA	Field
Flow severity (if no flow measured)	1-no flow, 2-low, 3-normal, 4-flood, 5-high, 6-dry	water	TCEQ SOP	01351	NA*	NA	NA	NA	NA	Field
Carbon Utilization Profile (CUP) - Biolog	Fingerprint Pattern	water	Hagedorn et.al. J. Applied Microbiol. 2003. 94(5):792-9	N/A	NA*	NA	NA	NA	NA	
Present Weather	1-clear 2-partly cloudy 3-cloudy 4-rain	NA	NA	89966	NA*	NA	NA	NA	NA	Field
rainfall	inches in last 24 hours	water	TCEQ SOP	82553	NA	NA	NA	NA	NA	90
Temperature	ºC	water	EPA 170.1 and TCEQ SOP	00010	NA*	NA	NA	NA	NA	Field
Water Clarity (if no secchi)	1-excellent 2-good 3-fair 4-poor	water	TCEQ	20424	NA*	NA	NA	NA	NA	Field
Turbidity, Observed (if not lab tested)	1-low 2-medium 3-high	water	TCEQ	88842	NA*	NA	NA	NA	NA	Field
Water Color	1-brownish 2-reddish 3-greenish 4-blackish 5-clear 6-other	water	TCEQ	89969	NA*	NA	NA	NA	NA	Field
Water Odor	1-sewage 2-chemical 3-rotten egg 4-musky 5-fishy 6-none 7-other	water	TCEQ	89971	NA*	NA	NA	NA	NA	Field
Water Surface	1-calm 2-ripples 3-waves	water	NA	89968	NA*	NA	NA	NA	NA	Field
Wind Intensity	1-calm 2-slight 3-moderate 4-strong	NA	NA	89965	NA*	NA	NA	NA	NA	Field
Total Phosphorus	mg/L	water	EPA 365.4	00665	.06	.05	70-130	20	80-120	90

DNA –PCR Fingerprinting HEFRP	Fingerprint Pattern	water		N/A	NA*	NA	NA	NA	NA	

* Procedures for laboratory analysis must be in accordance with the most recently published edition of Standard Methods for the Examination of Water and Wastewater, 40 CFR 136, and TCEQ Surface Water Quality Monitoring Procedures, Vol. 1, September 2003, RG-415.

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

***the most up-to-date AWRL is located at http://www.tceq.state.tx.us/compliance/monitoring/nps/grants/NPS-QAPP.html

References for Table A7.1:

TCEQ SOP, V1 - TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods for Water, Sediment, and Tissue, 2003 (RG-415).
TCEQ SOP, V2 - TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Community and Habitat Data, 2005 (RG-416)
American Society for Testing and Materials (ASTM) Annual Book of Standards, Vol. 11.02

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

Precision

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

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

Laboratory precision is assessed by comparing replicate analyses of laboratory control samples in the sample matrix (e.g. deioinized water, sand, commercially available tissue)or sample/duplicate pairs in the case of bacterial analysis. Precision results are compared against measurement performance specifications and used during evaluation of analytical performance. Program-defined measurement performance specifications for laboratory control standard/laboratory control standard duplicate pairs are defined in Table A7.1.

Bias

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

Representativeness

Study design precludes samples meeting total representation of the water body. Site selection is biased towards locations where the county has identified OSSF violation. Sites are selected where there is an increased potential for finding the presence of bacteria, therefore data are neither randomly selected nor representative of OSSFs in the region. The sampling of all pertinent media will be performed where appropriate according to TCEQ and/or subcontractor SOPs. Use of only approved analytical methods will assure that the measurement data represents the conditions at the site. Routine data collected in Halls Bayou under the H-GAC Clean Rivers Program for water quality assessments is considered spatially and temporally representative of routine water quality conditions. CRP monitoring is conducted on a quarterly basis. However, this data collection in Westfield Estates watershed is not routine and representative only of sites with violations in OSSF ordinances. Data may be collected during varying regimes of weather and flow, though attempts will be made to obtain samples under similar physical conditions. Only a very limited number of samples will be collected and evaluated. Therefore, complete representativeness for the OSSFs in the water body cannot be achieved. Therefore, this data is not suitable for inclusion in TRACS.

Comparability

Confidence in the comparability of routine data sets for this project and for water quality assessments is based on the commitment of project staff to use only approved sampling and analysis methods and QA/QC protocols in accordance with quality system requirements and as described in this QAPP and in TCEQ and laboratory 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, page 32.

Completeness

The completeness of the data is a relationship of how much of the data is available for use compared to the total potential data. Ideally, 100% 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 that 90% data completion is achieved.

Limit of Quantitation

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

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

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

A8 SPECIAL TRAINING/CERTIFICATION

There are no special requirements for staff training or certifications for this project. New field personnel must receive training in proper sampling and field analysis from the subcontractor. Before actual sampling or field analysis occurs, they will demonstrate to the H-GAC QA Officer (or designee) in the field their ability to calibrate field equipment, if necessary, and perform field sampling and analysis procedures. Field personnel training is documented and retained in their personnel file at the subcontractor and will be available during a monitoring systems audit. A copy of staff training records will be provided to H-GAC by the subcontractor.

Laboratory analysts have a general knowledge of laboratory operations, test methods, and quality assurance. They also have a combination of education, experience, skill, and training to perform their specific function. Laboratory management maintains records of qualifications and training on each

employee. The H-GAC QA officer will visit the laboratory, examine SOPs and related laboratory management criteria prior to the initiation of the study.

Global Positioning System (GPS) training and certification are required in accordance with TCEQ Operating Policies 8.12: Global Positioning System. Certification can be obtained by: 1) completing an agency training class, 2) completing a suitable training class offered by an outside vendor, or 3) by providing documentation of sufficient GPS expertise and experience.

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

A9 DOCUMENTS AND RECORD

Records and Documents Retention Requirements

The documents and records that describe, specify, report, or certify activities are listed in Table 2:A9.1. The list below is limited to documents and records that may be requested for review during a monitoring systems audit. Other types of project documents and records as appropriate are listed in Table A9.2 and are to be used for internal H-GAC purposes only. Retention time refers to after commencing after the close of the project. H-GAC reserves the right to retain documents longer than the TCEQ minimum.

Table 2: A9.1. Project Documents and Records – For Review During Audits

Document/Record for Review	Location	Retention (yrs)	Format
QAPPs, amendments and appendices	H-GAC	5 years	Electronic/paper
Field SOPs	H-GAC	5 years	Paper
Laboratory QA Manuals	H-GAC/Laboratory(ies)*	5 years	Paper
Laboratory SOPs	H-GAC/Laboratory(ies)*	5 years	Paper
QAPP distribution documentation	H-GAC	5years	Electronic/paper
Field staff raining records	H-GAC/Laboratory	5 years	Paper
Field equipment calibration/maintenance logs	H-GAC	5 years	Paper
Field instrument printouts	H-GAC	5 years	Paper
Field notebooks or data sheets	H-GAC/Laboratory	5 years	Paper
Field SOP	H-GAC/Laboratory	5 years	Paper
Laboratory QA manuals	Laboratory	5 years	Paper
Laboratory instrument readings/ printouts	Laboratory	5 years	Paper
Laboratory data reports/results	H-GAC/Laboratory	5 years	Electronic/Paper

Laboratory equipment maintenance logs	Laboratory	5 years	Paper
Corrective action documentation	H-GAC/Laboratory	5 years	Electronic/Paper
Instrument readings/printouts	Laboratory	5 years	Paper
Instrument raw data files	Laboratory	5 years	Paper/electronic/LIMS electronic
Laboratory procedures	H-GAC/Laboratory(ies)*	5 years	Paper

Table 3: A9.2 Project Documents and Records – Copies Retained for H-GAC Purposes

Document/Records Not for Review	Location	Retention (yrs)	Format
Bacteriological field samples logs	H-GAC	5 years	Paper
Laboratory initial demonstration of capability	H-GAC	5 years	Paper
Laboratory Instrument Performance	Laboratory	5 years	Paper
Laboratory sample reception logs	Laboratory	5 years	Electronic/paper
Laboratory Internal/external standards	Laboratory	5 years	Paper
Laboratory data verification for integrity, precision,, accuracy, and verification	Laboratory(ies)*	5 years	Paper
Quality control verification /validation	H-GAC	5 years	Paper
Progress reports/final reports/data	H-GAC/Laboratory	5 years	Paper
Written Communications and phone logs between Project Manager and Laboratory	H-GAC	5 years	Paper
Written Communications/phone logs between H-GAC and TCEQ Project Managers	H-GAC	5 years	Paper
PowerPoint Presentations	H-GAC	5 years	Paper
Chain of custody records	H-GAC	5 years	Paper
Laboratory calibration records	Laboratory	5 years	Electronic/Paper

Laboratory Test Reports

The laboratory will document the test results clearly and accurately in the form of a test report. Routine data reports should be consistent with the NELAC standards (Section 5.5.10) as applicable and include the information necessary for the interpretation and validation of data. (Bacteria source tracking has no applicable NELAC standard.) The test report will include the information necessary for the interpretation and validation of data, including the following:

- title of report and unique identifiers on each page;
- name and address of the laboratory;
- name and address of the client;
- a clear identification of the sample(s) analyzed;
- date and time of sample collection and laboratory receipt;
- sample depth if applicable;
- identification of method used for identification of samples that did not meet QA requirements and why (e.g., holding times exceeded);
- sample results;
- units of measure
- sample matrix

- dry weight or wet weight (as applicable)
- clearly identified subcontract laboratory results (as applicable);
- a name and title of person accepting responsibility for the report;
- project-specific quality control results to include sample/duplicate pairs, field split results (as applicable); 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 or is necessary for verification and validation of data;
- *LOQ and LOD (formerly referred to as the reporting limit and the method detection limit, respectively), and qualification of results outside the working range (if applicable)*
- *Certification of NELAC compliance on a result by result basis where applicable,* and
- any other information deemed appropriate by the laboratory and/or H-GAC.

Electronic Data

The purpose of data collected under this QAPP is to establish pre- and post implementation levels of bacteria and to determine source of bacteria. Data will not be submitted to the TCEQ's Surface Water Quality Monitoring Information System (SWQMIS) but will be available to TCEQ and other programs as data collected under an approved QAPP. The Data Summary as contained in Appendix C of this document will be submitted with the data.

Data will be submitted electronically to the H-GAC Project Manager as an MS Excel file and in the Event/Result file format described in the TCEQ SWQM Data Management Reference Guide as adapted for this study.

B1 SAMPLING PROCESS DESIGN (Experimental Design)

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

B2 SAMPLING METHODS

This section describes the procedures for sample collection, sample preservation, and holding time requirements. System failure will be addressed according to procedures documented in following sections. SOP sampling procedures are included as Attachment G."

Field Sampling Procedures

Field sampling will be conducted according to procedures documented in the *TCEQ Surface Water Quality Monitoring Procedures Volume 1: Physical and Chemical Monitoring Methods for Water, Sediment, and Tissue, 2003 (RG-415).* Additional aspects outlined in Section B below reflect specific requirements for sampling under this Program and/or provide additional clarification. Laboratory SOPs apply as well. A copy of Field SOPs will be provided to the H-GAC Project Manager by the subcontractor.

Water samples will be collected according to Laboratory SOPs, manually in liter bottles for in stream sample collection, or smaller bottles for on-site collection. Subcontractors may use disposable, sterile, 60 and 120 ml plastic bottles for bacteriological samples.

For bacterial source identification, additional duplicate grab samples will be taken.

Sample volume, container types, minimum sample volume, preservation requirements, and holding time requirements. The Subcontractor/Laboratory has the specific information for each analytical test provided in Table 4: B2.1 and Table 5: B2.2. Preservation of all samples bacteria is performed immediately upon collection (within 15 minutes).

Table 4: B2.1 BMP Effectiveness Monitoring (Sample Storage, Preservation and Handling Requirements)

Parameter	Matrix	Container	Preservation	Sample Volume	Holding Time
Escherichia coli *IDEXX*	Water/grab	Sterile Plastic	Cool to 4°C; 0.008 % $Na_2S_2O_3$	100 mL or maximum amount possible	8 hours

Table 5: B2.2 Other Watershed and/or Bayou Monitoring

Parameter	Matrix	Container	Preservation	Sample Volume	Holding Time
Enterococcus IDEXX	Water/grab	Sterile Plastic	Cool to 4°C; 0.008 % $Na_2S_2O_3$	100 mL or maximum amount possible	8 hours
Total Phosphorus-P	Water/grab	Pre-cleaned cubitainer,	ice, dark, pH<2 with H2SO4	250 mL	28 days
Escherichia coli *IDEXX*	Water/grab	Sterile Plastic	Cool to 4°C; 0.008 % $Na_2S_2O_3$	100 mL or maximum amount possible	8 hours

Processes to Prevent Contamination

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

Water Quality Sampling Procedures

Sampling will be conducted using procedures consistent with those described in Section B2 and with the TCEQ SWQM Procedures Manual (2003). All water samples from the bayou will be collected as a "grab sample" from the water body bank, at a depth of one foot, if possible. Total stream depth at the sampling location, as well as depth from which the sample is collected, will be documented on the field form. Appropriate QA/QC samples will be collected, in particular, field splits will comprise a minimum of 10% of the samples. All samples will be immediately preserved and chilled upon collection, and maintained at the appropriate temperature until submitted to the respective laboratories for analysis.

Table 5: B2.2. Watershed and Instream Monitoring (Sample handling references for regional monitoring entities.)

Monitoring Entity	Reference to Sample Handling
Subcontractor to be determined	Subcontractor Standard Operating Procedure (SOP)

Documentation of Field Sampling Activities

Field sampling activities are documented on field data sheets, which will be provided by the subcontractor and approved by the H-GAC Project Manger. Work sheets may include but are not limited to flow worksheets, and field biological assessment forms and are part of the field data record. As soon as the subcontractor is identified, the field data sheets will be amended to this QAPP. An example is provided in Appendix C.

The following will be recorded for all visits:

1. Station location;
2. Sampling date;
3. Location;
4. Sampling depth;
5. Sampling time;
6. Sample collector's name/signature;
7. Values for all field parameters;
8. Detailed observational data, including:
    - water appearance;
    - weather;
    - biological activity;
    - unusual odors;
    - pertinent observations related to water quality or stream uses (e.g., exceptionally poor water quality conditions/standards not met; stream uses such as swimming, boating, fishing, irrigation pumps, etc.);
    - watershed or in stream activities (events affecting water quality, e.g., bridge construction, livestock watering upstream, etc.);
    - specific sample information ; and
    - missing parameters (i.e., when a scheduled parameter or group of parameters is not collected);
9. Sample bottle/container type and preservative, if applicable; and
10. Description of location from which the sample was taken. Since each sampling location will be unique in configuration, description with schematic should include

- Whether site is on land or in the water body;
- Proximity to OSSF system attachment to residence;
- Photograph;
- Schematic diagram of sampling location(s) with descriptive text;
- Proximity of site to physical structures (e.g. house, trailer, and garage);
- Proximity of site to bayou or water body;
- Names and identifiers of persons witnessing the sampling (e.g. inspector, H-GAC staff); and
- Any other information deemed appropriate at the time of sample collection.

Recording Data

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

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; and
3. Close-outs on incomplete pages with an initialed and dated diagonal line.

All sample bottles will be clearly identified with the site identification, date and time of collection, the sample type/schedule, sampler name, sample identification number, and the preservative used, if applicable

Deficiencies, Non-conformances and Corrective Action Related to Sampling Requirements

Deficiencies are defined as unauthorized deviations from procedures documented in the QAPP or other applicable documents. Non-conformances are deficiencies, which affect data quantity and/or 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 field or laboratory staff and reported to the cognizant field or laboratory supervisor who will notify the H-GAC Project Manager. H-GAC's Project Manager will notify the H-GAC QAO of the potential nonconformance. The H-GAC's QAO will initiate a Nonconformance Report (NCR) to document the deficiency.

The H-GAC Project Manager, in consultation with the H-GAC 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 H-GAC Project Manager in consultation with H-GAC QAO will determine the disposition of the nonconforming activity or item and necessary corrective action(s); results will be documented by the contractor 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) to 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 that, 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 SAMPLING HANDLING AND CUSTODY

Sample Tracking/Chain-of-Custody

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

A sample is in custody if it is in actual physical possession or in a secured area that is restricted to authorized personnel. The Chain-of-Custody (COC) form is used to document sample handling during transfer from the field to the laboratory. The following information concerning the sample is recorded on the COC form (See Appendix D). The following list of items matches the COC form in Appendix D.

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

Sample Labeling

Waterproof sample labels that are adhesive backed and capable of being attached directly to the sample container will be used. Alternately, sample bottles, which will accept permanent label information written directly on the bottle may be used. In either case, samples are labeled on the container with an indelible marker or pen. Label information includes as a minimum:

1. Site identification;
2. Date and time of sampling;
3. Preservative added, if applicable;
4. Designations (specific);
5. Sample type (i.e., analysis(es) to be performed);
6. Sampler name (collector); and

7. Where multiple samples are collected at the same site, the precise location at which the sample was collected will be identified by unique number. This number will be recorded on a schematic diagram on the field data sheet. Numbering will be sequentially, beginning with the sample collected closest to the residence at the OSSF location.

Other information may be entered on the sample label if space permits. However, any other information entered on the label must not interfere with the clarity of the required information.

Sample Handling

Upon collection, all local partners immediately immerse their samples in coolers containing ice. If a temperature blank is carried (it is not required), it shall be placed on top of the samples instead of buried in the ice. When the samples arrive at the lab, a lab personnel taking custody of samples will verify the samples are "in the process" of cooling to 4 °C before signing the COC. Internal sample handling, custody, and storage procedures for each of the subcontractors/laboratories supporting H-GAC's monitoring entities are described in the Quality Assurance Manuals (QMS) and Standard Operating Procedures (SOP) for the laboratory. The laboratory will provide a copy of its QMS to the H-GAC Project Manager and it will be kept on file with H–GAC. For example, the reference for EIH is "Standard Operating Procedure (SOP) for Bacteria Samples and a Sample Handling SOP, August 2004."

Deficiencies, Non-conformances and Corrective Action Related to Chain-of-Custody

Deficiencies are defined as unauthorized deviations from procedures documented in the QAPP or other applicable documents. Non-conformances are deficiencies, which affect data quantity and/or 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 field or laboratory staff and reported to the cognizant field or laboratory supervisor who will notify the H-GAC Project Manager. The H-GAC Project Manager will notify the H-GAC QAO of the potential nonconformance. The H-GAC QAO will initiate a Nonconformance Report (NCR) to document the deficiency.

The H-GAC Project Manager, in consultation with the H-GAC 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 H-GAC Project Manager in consultation with the H-GAC QAO will determine the disposition of the nonconforming activity or item and necessary corrective action(s); results will be documented by the H-GAC 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) to 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 that, if uncorrected, could have a serious effect on safety or on the validity or integrity of data) will be reported to the GBEP immediately both verbally and in writing.

B4 ANALYTICAL METHODS

The analytical methods are listed in Table 1: A7.1. The analyses cited in the table are EPA approved methods as cited in TCEQ SWQM Procedures Vol. 1 and in 40 Code of Federal Regulations, Section 136, Part B. Copies of laboratory SOPs are retained by H-GAC and are available for review by TCEQ. Laboratory SOPs are consistent with EPA requirements as specified in the method. At a minimum, laboratories producing data under this QAPP are compliant with ISO/IEC Guide 25. Laboratories collecting data under this QAPP are compliant with the NELAC Standards where applicable. It is the responsibility of the Laboratory Project Manager and QAO to confirm the completeness, adequacy, and consistency of participants' and subcontractors' SOPs falling under this QAPP.

Standards Traceability

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

Analytical Method Modification

Only data generated using approved analytical methodologies as specified in this QAPP will be submitted to 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 documented in logbooks, on field data sheets, etc. by field or laboratory staff and reported to the cognizant field or laboratory supervisor or local project manager who will notify the H-GAC Project Manager or QAO. The H-GAC Project Manager will notify the H-GAC QAO of the potential nonconformance if need be so the H-GAC QAO can initiate a Nonconformance Report (NCR) to document the deficiency. Deficiencies and NCR's may be initiated by either a local partner or the H-GAC QAO depending on who found the deficiency and which direction the line of communication went.

The H-GAC Project Manager, in consultation with H-GAC 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 H-GAC Project Manager in consultation with the H-GAC QAO will determine the disposition of the nonconforming activity or item and necessary corrective action(s); results will be documented by the H-GAC 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) to 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 that, 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.

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

B5 QUALITY CONTROL

Sampling Quality Control Requirements and Acceptability Criteria

The minimum field quality control (QC) requirements are outlined in the *TCEQ Surface Water Quality Monitoring Procedures Manual.* Field QC samples are submitted as separate samples to the laboratory and reported accordingly on the data reports. Specific requirements are outlined below. Field QC Samples are reported with the data report. See Section C2.

Additional method specific QC requirements -- Additional QC samples are run (e.g., 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. Acceptable criteria for field splits will be 30% RPD. Bacteriological duplicates will be employed at a 10% frequency

Field Split - A field split is a single sample subdivided by field staff immediately following collection and submitted to the laboratory as two separately identified samples according to procedures specified in the *SWQM Procedures*. Split samples are preserved, handled, shipped, and analyzed identically and are used to assess variability in all of these processes. Field splits apply to conventional samples only and are collected on a 10% basis or one per batch, whichever is greater. 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 sample handling and analytical system. If it is determined that elevated quantities of analyte (i.e., > 5 times the RL) were measured and analytical variability can be eliminated as a factor, than variability in field split results will primarily be used as a trigger for discussion with field staff to ensure samples are being handled in the field correctly. Some individual sample results may be invalidated based on the examination of extenuating information. The information derived from field splits is generally considered to be event specific and would not normally be used to determine the validity of an entire batch; however, some batches of samples may be invalidated depending on the situation. Professional judgment during

data validation will be relied upon to interpret the results and take appropriate action. The qualification (i.e., invalidation) of data will be documented on the Data Summary. Deficiencies will be addressed as specified in this section under Deficiencies, Nonconformances, and Correction Action related to Quality Control.

Laboratory Control Sample (LCS) - An LCS consists of a sample matrix (e.g., deionized water, sand, commercially available tissue) free from the analytes of interest spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes. It is used to establish intra-laboratory bias to assess the performance of the measurement system. The LCS is spiked into the sample matrix at a level less than or near the mid point of the calibration for each analyte. In cases of test methods with very long lists of analytes, LCSs are prepared with all the target analytes and not just a representative number, except in cases of organic analytes with multipeak responses.
The LCS is carried through the complete preparation and analytical process. LCSs are run at a rate of one per analytical batch. A batch is defined as samples that are analyzed together with the same method and personnel, using the same lots of reagents, not to exceed the analysis of 20 environmental samples.

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

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

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

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

Laboratory Duplicates - A laboratory duplicate is prepared 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 at a rate of one per batch. A batch is defined as a set of environmental samples that are prepared and/or analyzed together within the same process using the same lot of reagents.

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. The specifications for bacteriological duplicates in Table A7.1 apply to samples with concentrations > 10 org./100mL.

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

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

Limit of Quantitation (LOQ) – The laboratory will analyze a calibration standard (if applicable) at the LOQ on each day project samples are analyzed. Calibrations including the standard at the LOQ will meet the calibration requirements of the analytical method or corrective action will be implemented.

LOQ Sediment and Tissue Samples – When considering LOQs for solid samples and how they apply to results, two aspects of the analysis are considered: (1) the LOQ of the sample, based on the Areal-world@ in which moisture content and interferences affect the result and (2) the LOQ in the QAPP which is a value less than or equal to the AWRL based on an idealized sample with zero % moisture.

The LOQ for a solid sample is based on the lowest non-zero calibration standard (as are those for water samples), the moisture content of the solid sample, and any sample concentration or dilution factors resulting from sample preparation or clean-up.

To establish solid-phase LOQs to be listed in Table A7.1 of the QAPP, the laboratory will adjust the concentration of the lowest non-zero calibration standard for the amount of sample extracted, the final extract volume, and moisture content (assumed to be zero % moisture). Each calculated LOQ will be less than or equal to the AWRL on the dry-weight basis to satisfy the AWRL requirement for sediment and tissue analyses. When data are reviewed for consistency with the QAPP, they are evaluated based on this requirement. Results may not Aappear@ to meet the AWRL requirement due to high moisture content, high concentrations of non-target analytes necessitating sample dilution, etc. These sample results will be submitted to the TCEQ with an explanation on the data summary as to why results do not appear to meet the AWRL requirement.

LOQ Check Standard – An LOQ check standard consists of a sample matrix (e.g., deionized water, sand, commercially available tissue) free from the analytes of interest spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes. It is used to establish intra-laboratory bias to assess the performance of the measurement system at the lower limits of analysis. The LOQ check standard is spiked into the sample matrix at a level less than or near the LOQ for each analyte for each batch samples that are run.

The LOQ check standard is carried through the complete preparation and analytical process. LOQ Check Standards are run at a rate of one per analytical batch. A batch is defined as samples that are analyzed together with the same method and personnel, using the same lots of reagents, not to exceed the analysis of 20 environmental samples.

The percent recovery of the LOQ check standard is calculated using the following equation in which %R

is percent recovery, SR is the sample result, and SA is the reference concentration for the check standard:

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

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

Method blank –A method blank is a sample of matrix similar to the batch of associated samples (when available) that is free from the analytes of interest and is processed simultaneously with and under the same conditions as the samples through all steps of the analytical procedures, and in which no target analytes or interferences are present at concentrations that impact the analytical results for sample analyses. The method 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 LOQ. For very high-level analyses, the blank value should be less then 5% of the lowest value of the batch, or corrective action will be implemented.

Deficiencies, Nonconformance and Corrective Action Related to Quality Control

Deficiencies are defined as unauthorized deviations from procedures documented in the QAPP. Nonconformances are deficiencies, which affect data quantity and/or 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 field or laboratory staff and reported to the cognizant field or laboratory supervisor or local project manager who will notify the H-GAC Project Manager or QAO. The H-GAC Project Manager will notify the H-GAC QAO of the potential nonconformance if need be so the H-GAC QAO can initiate a Nonconformance Report (NCR) to document the deficiency. Deficiencies and NCR's may be initiated by either a local partner or the H-GAC QAO depending on who found the deficiency and which direction the line of communication went.

The H-GAC Project Manager, in consultation with H-GAC 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 H-GAC Project Manager in consultation with the H-GAC QAO will determine the disposition of the nonconforming activity or item and necessary corrective action(s); results will be documented by the H-GAC 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) to 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 that, 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 Quality Assurance Manuals (QAM). 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. The Laboratory University Project Manager/QAO assumes responsibility for compliance of the QAM Quality Assurance Management Plan from the laboratory with the QAPP requirements.

B7 INSTRUMENT CALIBRATION AND FREQUENCY

No field equipment in this study requires calibration.

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 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. Calibration records are available to the TCEQ for review. The Laboratory Project Manager/QAO and the Laboratory Managers assume responsibility for compliance of the QAM Quality Assurance Management Plan from the laboratory with the QAPP.

B8 INSPECTION/ACCEPTANCE REQUIREMENT FOR SUPPLIES AND CONSUMABLES

All field supplies and consumables will be inspected and accepted for use in this project by the field staff. Acceptance criteria for such supplies and consumable, in order to satisfy the technical and quality objectives of this project, are documented in the individual laboratories' QMs.

All laboratory related items will be inspected and accepted for use in this project by the laboratories. Each

new batch of supplies is tested before use to verify that they function properly and are not contaminated. Acceptance criteria for such supplies and consumables, in order to satisfy the technical and quality objectives of this project, are documented in the individual laboratories QAMS.

B9 NON-DIRECT MEASUREMENTS

In addition to water quality data collected in the Westfield Estates Watershed under this QAPP, will gather water quality data measured from the Clean Rivers Program (CRP) of the TCEQ will be gathered for Halls Bayou (SLOC 20455 and 20553). The type of data gathered will be *E. coli* data and other data related to impairments in the Westfield Estates watershed. Data collection activities by the TCEQ have been addressed in TCEQ approved QAPPs for the CRP program. The data has been collected and analyzed using approved techniques with the required sensitivity. The data are also considered representative of in-stream water quality conditions in that they have been collected at set intervals throughout the year and are not biased toward flow events or seasonality. Data will be evaluated at the time of analysis and will meet the requirements for precision and accuracy (i.e., bias). There are no limitations on the use of the CRP-collected data. The NRA will map the locations of all the sampling sites used for this project.

B10 DATA MANAGEMENT

Data Management Process

Data Management Protocols are addressed in the Data Management Plan, which is in Appendix E of this document. The data management process is outlined in a flow chart found in Appendix E.1 H-GAC's Data Manager receives hard copy and electronic data from the Laboratory. The data are reviewed for accuracy and completeness then eventually submitted to TCEQ as an appendix to the final report.

Data Verification/Validation

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

Data Errors and Loss

All field forms used as part of this study are located in Appendix C.

A Data Submittal Form (F.1) and Review Check List (Appendix F.2) is completed and submitted by the laboratory when data is sent to the H-GAC Data Manager. The form includes a list of the number of sample events included and the number of results that should accompany the data submittal. Additionally, copies of field sheets, Chain-of-Custody forms and Lab Data reports or QC back up are received with each electronic submittal. Some reviews are performed manually by the H-GAC Data Manager through sorting processes in Microsoft (MS) Excel, others are completed using scripts written in

MS Access. Electronic copies are made of all data sets. Only the copies are manipulated, not original data sets. There is plenty of space for notes of other data management activities on each set of data review sheets.

Forms and Checklists

See Appendix F for the Field and Laboratory Data Sheets.
See Appendix C for the Data Summary.

Record Keeping and Data Storage

H-GAC recordkeeping and document control procedures are contained in the water quality sampling and laboratory standard operating procedures (SOPs) and this QAPP. Original field and laboratory data sheets are stored in the Laboratory offices in a fireproof file in accordance with the record-retention schedule in Section A9. The laboratory submits electronic data along with hard copies of field sheets and COC forms. In addition, the laboratory is required to submit a Data Review Checklist to H-GAC. Electronic data is stored in folders on the H-GAC network as "originals" and as copies for data management, verification, and validation. Daily and weekly backups are completed on H-GAC's server. Hard copies are filed in filing cabinets for use as needed. All data is maintained according to the schedule in Section A9 of this QAPP.

Data Handling, Hardware, and Software Requirements

H-GAC maintains several networked computers to store and manage ambient monitoring data. All PC's are equipped with at least MS Windows 2007 and MS Office 2007, which includes MS Excel 2007 and MS Access 2007.

Information Resource Management Requirements

Data will be managed in accordance with the TCEQ Surface Water Quality Monitoring Data Management Reference Guide and applicable H-GAC information resource management policies. The grantee does not create TCEQ certified locational data using Global Positions System (GPS) equipment. GPS equipment may be used as a component of acquiring the information required by the Station Location (SLOC) request process however, TCEQ staff are responsible for creating the certified locational data that may ultimately be entered into the TCEQ's Surface Water Quality Monitoring database

Information Resource Management Requirements

H-GAC includes an Information Resource Management Department responsible for maintaining all computer hardware and software, including but not limited to servers, network accounts, data back-ups, security, firewalls, etc. Daily management is conducted along with regular maintenance and upgrades to the system. Software development and database administration are also the responsibility of the information resources department. Information resources develops applications based on user requests and assures full system compatibility prior to implementation. H-GAC information technology (IT) policy is contained in IT SOPs which are available for review at H-GAC offices

C1 ASSESSMENTS AND RESPONSE ACTIONS

The following table (Table 6: C1.1) represents the types of assessments and response action for data collection activities applicable to this QAPP appendix.

Corrective Action

The H-GAC Project Manager is responsible for implementing and tracking corrective action procedures as a result of audit findings. Records of audit findings and corrective actions are maintained by both the TCEQ and the H-GAC QAO.

A field audit will be conducted during the effective period of this QAPP.. Findings from the audit will be documented on a checklist, summarized in an audit report and sent to the sub-contractor for review and determination of a corrective action response. The sub-contractor will have 30-days to determine how findings will be addressed and respond to H-GAC regarding changes and a timetable for implementation. The H-GAC QAO is responsible for implementing and tracking corrective action procedures as a result of audit findings. Records of audit findings and corrective actions are maintained by both the sub-contractor and the H-GAC QAO. Corrective action documentation will be submitted to TCEQ with the Progress Reports.

If audit findings and corrective actions cannot be resolved, then the authority and responsibility for terminating work is specified in the TCEQ QMP and in agreements or contracts between participating organizations.

Table 6: C1.1. Assessment and Response Requirements

Assessment Activity	Approximate Schedule	Responsible Party	Scope	Response Requirements
Status Monitoring Oversight, etc.	Continuous	H-GAC	Monitoring of the project status and records to ensure requirements are being fulfilled. Monitoring and review of contract laboratory performance and data quality	H-GAC project manager reports to TCEQ in Quarterly Report.
Laboratory/Sub-Contractor Inspections	Beginning of Study	H-GAC Project Manger, QAO,	Analytical and quality control procedures employed at the laboratory and the contract laboratory	Laboratory QAO implements corrective action and sends report to H-GAC QAO as requested.
Monitoring Systems Audit of H-GAC	Dates to be determined by TCEQ	TCEQ/QAS	The assessment will be tailored in accordance with objectives needed to assure compliance with the QAPP. Field sampling, handling and measurements; facility review; and data management as they relate to NPS Project.	30 days to respond in writing to TCEQ to address corrective actions
Laboratory Inspections	Based on work plan and or discretion of contractor	H-AC QAO	Analytical and quality control procedures employed at the laboratory and the contract laboratory	30 days to respond in writing to the H-GAC. H-GAC will then report problems/results to TCEQ in Progress Report.
Monitoring Systems Audit of Sub-contractors	Based on work plan and or discretion of contractor	H-GAC QAO	The assessment will be tailored in accordance with objectives needed to assure compliance with the QAPP. Field sampling, handling and measurement; facility review; and data management as they relate to the NPS Project	30 days to respond in writing to H-GAC to address corrective actions. Sub-contractor laboratory sends report to H-GAC QAO and resolves any deficiencies as needed.
Site Visit	Dates to be determined by TCEQ	TCEQ PM	Status of activities. Overall compliance with work plan and QAPP	As needed

C2 REPORTS TO MANAGEMENT

Reports to H-GAC Project Management

The H-GAC is required to report the status of implementation of the procedures discussed in this project plan and, thereby, the status of data quality. In addition, a written progress report will be provided to H-GAC by the sub-contractor that summarizes project accomplishments and/or problems on a quarterly basis in the form of a written report.

After evaluation of the information collected and review of data submitted, the H-GAC QAO and Data Manager will either investigate suspected problems with the data or complete information for the Data Summary Sheet that accompanies the quarterly report data submittal to TCEQ. It is essential that the sub-contractor QAO is informed either informally (phone call), by fax or by e-mail memoranda of any quality assurance problems encountered and the solutions adopted. This information will be transmitted by the H-GAC's Program Manager and the H-GAC Data Manager when data is submitted in quarterly reports.

This information will be reported to the TCEQ Project Manager and TCEQ Quality Assurance Specialist as required under this contract. The results of field and laboratory monitoring system audits will be detailed in reports to the local program managers and/or the person who directly supervises field activities. This information will also be reported to the TCEQ by means of status reports to be included in the quarterly progress reports. Responses from local agencies regarding the audit reports and findings will also be included in the quarterly progress reports to TCEQ.

Reports to TCEQ Project Management

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

Quarterly Progress Report - Summarizes the H-GAC'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 H-GAC, a report of findings, recommendations and response is sent to the TCEQ in the quarterly progress report.

Monitoring System Audit Response – H-GAC will respond in writing to the TCEQ within 30 upon receipt of a monitoring system audit report to address corrective actions.

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

Reports by TCEQ Project Management

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

D1 DATA REVIEW, VERIFICATION, AND VALIDATION

For the purposes of this document, data verification is a systematic process for evaluating performance and compliance of a set of data to ascertain its completeness, correctness, and consistency using the methods and criteria defined in the QAPP. Validation means those processes taken independently of the data-generation processes to evaluate the technical usability of the verified data with respect to the planned objectives or intention of the project. Additionally, validation can provide a level of overall confidence in the reporting of the data based on the methods used.

All field and laboratory data 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 to GBEP.

The procedures for verification and validation of data are described in Section D2 below. The Field Data manager and the H-GAC Data Manager are responsible for ensuring that field data are properly reviewed, verified, and submitted in the required format to the project database. The Laboratory Manager is responsible for ensuring that laboratory data are reviewed, verified, and submitted in the required format to the H-GAC project database. Finally, the H-GAC QAO is responsible for confirming the validation of all collected data and ensuring that all reported data meet the data quality objectives of the project and are suitable for reporting to TCEQ.

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, page 17 of this document.

Integrity of data review, verification, and validation will be performed using self-assessments and peer review as appropriate to the project task, followed by technical review by the manager of the task. The data review tasks to be performed by field and laboratory staff are listed in the first two sections of Table D2.1, respectively. The data to be verified are evaluated against project performance specifications (Section A7) and are checked for errors, especially errors in transcription, calculations, and data input. Potential errors are identified by examination of documentation and by manual *(or computer-assisted)* examination of corollary or unreasonable data. If a question arises or an error is identified, the manager of the task responsible for generating the data is contacted to resolve the issue. Issues, which can be corrected, are corrected and documented. If an issue cannot be corrected, the task manager consults with higher-level project management to establish the appropriate course of action, or the data associated with the issue are rejected. Field and laboratory reviews, verifications, and validations are documented.

After the field and laboratory data are reviewed, another level of review is performed once the data are combined into a data set. This review step as specified in Table D2.1 is performed by H-GAC Data Manager and QAO. Data review, verification, and validation tasks to be performed on the data set include, but are not limited to, the confirmation of 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. The *H-GAC*Project Manager and QAO are each responsible for validating that the verified data are scientifically valid, defensible, of known precision, bias, integrity, meet the data quality objectives of the project, and are reportable to TCEQ. One element of the validation process involves evaluating the data again for anomalies. Any suspected errors or anomalous data must be addressed by the manager of the task associated with the data, before data validation can be completed.

Another element of the data validation process is consideration of any findings identified during the monitoring systems audit conducted by the TCEQ Lead 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. After the data are reviewed and documented, the H-GAC Project Manager, with concurrence of the QAO validates that the data meet the data quality objectives of the project and are suitable for reporting to TCEQ.

Table 7: D2.1. Data Review/Verification Tasks

Field Data Review	**Responsibility**
Field data reviewed for conformance with data collection, sample handling and chain of custody, analytical and QC requirements	Subcontractor & H-GAC QAO
Post-calibrations checked to ensure compliance with error limits	Subcontractor QAO
Field data calculated, reduced, and transcribed correctly	Subcontractor QAO
Laboratory Data Review	
Laboratory data reviewed for conformance with data collection, sample handling and chain of custody, analytical and QC requirements to include documentation, holding times, sample receipt, sample preparation, sample analysis, project and program QC results, and reporting	Subcontractor Lab QAO
Laboratory data calculated, reduced, and transcribed correctly	Subcontractor Lab QAO
Reporting limits consistent with requirements for Ambient Water Reporting Limits.	Subcontractor Lab QAO & H-GAC QAO
Analytical data documentation evaluated for consistency, reasonableness and/or improper practices	Subcontractor Lab QAO
Analytical QC information evaluated to determine impact on individual analyses	Subcontractor Lab QAO
All laboratory samples analyzed for all parameters	H-GAC QAO
Data Set Review	
The test report has all required information as described in Section A9 of the QAPP	Subcontractor Data Mgr. & H-GAC Data Mgr.
Confirmation that field and lab data have been reviewed	Subcontractor & H-GAC Data Managers &/or Subcontractor Lab & H-GAC QAOs
Data set (to include field and laboratory data) evaluated for reasonableness and if corollary data agree	Subcontractor QAO & H-GAC Data Manager or QAO
Outliers confirmed and documented	Subcontractor & H-GAC Data Managers or Subcontractor & H-GAC QAO
Field QC acceptable (e.g., field splits and trip, field and equipment blanks)	Subcontractor & H-GAC QAO
Sampling and analytical data gaps checked and documented	H-GAC QAO
Verification and validation confirmed. Data meets conditions of end use and are reportable	H-GAC Program Manager

D3 Reconciliation With User Requirements

The quality objectives and criteria described in Section A7, page 17 of this document are deemed to be consistent with and support the intended use of data set forth in the same section. Data will be evaluated continually by laboratory representatives (Project Manager, Quality Assurance Officer, and Data Manager) during the life-term of the project to ensure that they are of sufficient quality and quantity to meet the project goals. If the data do not meet the goals specified in Section A7, page 17, they will not be transferred to the TCEQ to be used in decision-making nor will the data be used in the calculations of aquatic life subcategories and bioassessment metrics. Any instances where data are rejected will be documented in project quarterly reports.

Data collected from this project will be analyzed by H-GAC to report the performance of the BMPs and the measured reductions in NPS loadings. The percentage of pollutant removal achieved as a result of the OSSF implementation performance will be one of several criteria examined by H-GAC in the design and sizing of other projects where failing OSSFs are significant contributors to . BMP, bacteria level, bacteria source, and/or instream monitoring data developed for this project that do not meet requirements in this QAPP will be submitted to TCEQ.

Appendix A. Work Plan

APPENDIX A. Work Plan (pages 41 – 43)

TASK 1: PROJECT ADMINISTRATION and MANAGEMENT

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

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

Task 1.2 **Quarterly Progress Reports** – To be submitted to TCEQ by the 20th of the month following each state fiscal quarter for incorporation into the Grant Reporting and Tracking System (GRTS). Progress reports will contain a level of detail sufficient to document the activities that occurred under each task during the quarter, and contain a detailed tracking of deliverable status under each task.

Task 1.3 **Reimbursement Forms** - Reimbursement forms will be submitted to the TCEQ by the last day of the month following each state fiscal quarter.

Task 1.4 **Communication Plan** -- The GRANTEE Project Manager will maintain regular telephone and/or email communication with the TCEQ Project Manager regarding the status and progress of the project in regard to any matters that require attention between Quarterly Progress Reports. This will include a call or meeting each January, April, July, and October. Minutes recording the important items discussed and decisions made in each call will be attached to each Quarterly Progress Report. Matters that must be communicated to the TCEQ Project Manager in the interim between QPRs include:

- Requests for approval of activities or expenditures those are not specifically included in the scope of work.
- Notification in advance when GRANTEE has scheduled public meetings or events, initiation of construction, or other major task activities under this contract
- Events or circumstances that may require changes to the budget, scope of work, or schedule of deliverables. Such information must be reported within 72 hours of discovering these events or circumstances

Task 1.5 **Contractor Evaluation** - GRANTEE will participate in an annual Contractor Evaluation.

Task 1.6 **Project Fact Sheet –** The Project Manager will develop a one-page fact sheet of the project using the TCEQ NPS Projects Template. The fact sheet will briefly describe what the project is going to accomplish, gives background information on why the project is being conducted, the current status of the project and lists who is involved in the project. The project fact sheet will be submitted to the TCEQ within 60 days after receipt of fact sheet template from TCEQ. The fact sheet will be updated annually and submitted with the fourth quarter progress report. The fact sheet may be updated more often, as the project

status changes. The fact sheet will be published on the GRANTEE's website after approval from the TCEQ Project Manager, which will be within 30 days of submission by the Grantee..

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

Deliverables:

- **Quarterly Progress Reports- 6/15/2009; 9/15/2009; 12/15/2009**
  3/15/2010; 6/15/2010; 9/15/2010; 12/15/2010
  3/15/2011; 6/15/2011; 8/31/2011

- **Reimbursement Forms- 6/30/2009; 9/30/2009; 12/31/2009**
  3/31/2010; 6/30/2010; 9/30;2010; 12/21/2010
  3/31/2011; 6/30/2011; 9/30/2011

- **Communication Plan- 6/15/2009; 9/15/2009 12/15/2009**
  3/15/2010; 6/15/2010; 9/15/2010; 12/15/2009
  3/15/2011; 6/15/2011; 9/15/2011;

- **Contractor Evaluation- 8/31/2009; 8/31/2010; 8/31/2011**

- **Project Fact Sheet- 60 days from receipt of template after contract execution**
  6/15/2010; 6/15/2011

TASK 2: STAKEHOLDER ADVISORY GROUPS

Goal: *To lead the community-based component of the Watershed Protection Plan and Project by continued broadening and completing development of a balanced and diversified Stakeholder Advisory Group.*

Task 2.1 **Stakeholder Advisory Group (SAG) Interface** – Utilizing the existing partner network, which includes local officials, county government, state and federal government, special interest groups, environmental groups, developers, and citizens, SAG will provide advice on plan updates, QAPP amendments, scope of work, implementation phase, and community education. The group will determine guidelines for future SAG role, involvement, and responsibility for the Plan after completion of implementation phase. This group will work toward Community acceptance of project, promoting continuing education, support maintenance programs, best management practices, and development and of long term sustainability of watershed protection plan. Meetings will be held on a regular basis. This group will transition to assuming the leadership role in managing the watershed protection plan at the end of the project. Additional stakeholders may be added to the group as the need and opportunity arises.

Task 2.2 **Stakeholder Advisory Group Meetings** - Hold meetings with the Stakeholder Advisory Group to establish priorities and focus of work effort. Meetings will be held on a regular basis to provide status of work progress to the group and obtain input on next steps. Stakeholders will review and approve the plan prior to finalization.

Task 2.3 **Dissemination of Information on Status of Project –** Use Stakeholder Advisory Group meetings to disseminate project information held on a quarterly basis the first year and thereafter as warranted by developments in the project (at least twice a year), and at project conclusion. Town Meetings in English and Spanish will be held in print, radio, and television.

Measure of Success: Continuation of a community-based Stakeholder Advisory Group where information is disseminated, dialogue, and discussion of issues occurs, and feedback is received to and from the community.

Deliverables: The following will be submitted with quarterly reports if listed activity occurs within a particular quarter.

- Stakeholder group activities (e.g. announcements, agendas, minutes, or press releases)
- Changes to SAG operating structure
- Changes in SAG membership
- Official acceptance letter(s) from the Stakeholder Group approving the watershed protection plan.
- Education and outreach materials developed or utilized
- Attendance at local and regional meetings to communicate and obtain input on the project - describe activities in progress reports

TASK 3: WATER QUALITY MONITORING, BACTERIA SOURCE IDENTIFICATION, DATA COLLECTION, VALIDATION, AND DETERMINATION OF EFFECTIVENESS OF CORRECTIVE MEASURES

Goal: *To (1) further characterize indicator bacteria levels and possible sources pre-implementation and (2) to assess effectiveness of implementation practices.*

Task 3.1 **QAPP** – This project will be conducted under an amended QAPP for Phase I submitted to and previously approved by TCEQ. .The QAPP was approved by stakeholders and draft QAPP provided to TCEQ on December 15, 2008. A planning meeting with TCEQ held approximately 30 days later to discuss their comments on the QAPP. The Final QAPP was approved 20 days after this meeting.

Task 3.2 **QAPP Amendments and Updates** – QAPP will be revised as necessary for two sampling phases (FY09 and FY11). GRANTEE Project Manager will develop amendments as needed and submit to the TCEQ an updated Quality Assurance Project Plan (QAPP) with project specific data quality objectives consistent with the EPA QA/R5 format 45

days prior to the initiation of any data collection. TCEQ Project Manager will provide comment and approval on the QAPP within 30 days of receipt of the amended QAPP. Updates will on an annual basis if needed according to procedures in the QAPP.

Task 3.3 **Water Quality Monitoring Plan** – Water Quality Monitoring plan was previously approved by the stakeholders. There are several objectives of the monitoring component of this project. First, it will provide pre-and post implementation data for ascertaining the effectiveness of BMP measures. Secondly, it strives to further characterize the impairments (bacteria) through identification of the source of bacterial marker species. A detailed post-implementation monitoring is planned. This will enhance baseline data and provide comparative pre- and post-project data at a site that has had previous detections of indicator bacteria. The data will be used to further characterize the indicator bacteria levels and to determine the impact of multiple best management practices (BMPs) over time at the watershed scale for the Westfield Estates Watershed Protection Plan. H-GAC monitors two CRP sites immediately upstream and downstream of the watershed inflow in Halls Bayou. Since improvement in the impairment post-project may take up to two years to become evident, monitoring through the CRP program after the conclusion of the project is essential. A summary of the CRP results will be provided with annual reports throughout the course of the study.

Task 3.4 **Data Collection-** Sampling sites and periods in the community watershed will correspond to those used in FSSI – Phase I study. Additional sites may be added as they become available.

Task 3.5 **Data Submittal-** H-GAC will submit the data to TCEQ at the conclusion of each sampling phase in report form, in the quarterly report following completion of the report and prior to use, or prior to presenting to stakeholders.

Ambient data collected quarterly under the CRP program, and the CRP QAPP will be pursuant to the CRP data reporting requirements.

Measure of Success: *Annual updates by the TCEQ and continuing conformance to QAPP provisions*.

Deliverables: The following will be submitted with quarterly reports if listed activity occurs within a particular quarter.

.

- QAPP update and input (annually) – 30 days prior to end of the fiscal year
- Water quality data submittal (CRP) – annual
- Water quality monitoring non-conformances will be included in quarterly progress reports.

TASK 4: DETERMININATION OF MANAGEMENT MEASURES

Goal: *Identify and quantify need for correction of specific failing septic systems and non-human bacteria impairment sources through home surveys, characterization and prioritization of needs, qualification of homes for assistance, and further analysis to identify additional non-human bacteria impairment sources.*

Task 4.1 **Survey Community** – Approximately 700 homes in Westfield Estates will be inspected for status of water use and septic system issues.

Task 4.2 **Failing Septic System Inspection** - In-depth inspection and rehabilitation plan development for approximately 5-15% of the homes, estimated to be half of those needing remediation.

Task 4.3 **Prioritization** – Development of criteria for prioritization of homes in need of corrective action and completing ranking process.

Task 4.4 **Qualification** - Qualify residents for grant assistance based on need; Develop intake forms, including information on system, health issues of applicant (HIPPA regulations apply); agreements for maintenance and connection to public sanitary system if one becomes available; outreach for participation; collection and review of applicants; and development of action list.

Task 4.5 **Description of needed management measures for specific sites** to be included in the Watershed Protection Plan

Measure of Success: *Completion of survey, inspections, prioritization, qualification, and analysis.*

Deliverables: The following will be submitted with quarterly reports if listed activity occurs within a particular quarter.

- Inspection criteria for homes
- In-depth inspection and rehabilitation plan for homes
- Criteria for prioritization and qualification
- Prioritization of structural implementation

TASK 5: IMPLEMENTATION OF STRUCTURAL CORRECTIVE MEASURES

Goal: *Implement corrective measures addressing failing septic systems to decrease bacterial impairment of the bayou*

Task 5.1 **Corrective Maintenance of Certain Systems -** Addresses impairment (bacteria) issues

in the community through pump-out and related maintenance for qualifying systems.

Task 5.2 **Construction** - Remediation, replacement, or installation of septic systems according to rehabilitation plan, priority, and applicant qualification for homes, or as many homes as funding allows.

Task 5.3 **Maintenance Program-** Work with partners and homeowners to ensure recipients of maintenance or constructed systems participate in maintenance agreement program.

Measure of Success: *Failing septic systems returned to useful service or replaced, with participation in maintenance program.*

Deliverable: Updates on the implementation of structural corrective measures will be included in quarterly reports. The following will be submitted with quarterly reports if listed activity occurs within a particular quarter.

- Structural corrective measures implemented
- Corrective maintenance plans
- Construction design of the onsite-septic systems
- Maintenance Program plan and agreement form for the homeowner

TASK 6: IMPLEMENTATION OF BEHAVIORAL MEASURES

Goal: *To reduce bacterial impairment resulting from non-human bacterial sources through adoption of community-based best management practices.*

Task 6.1 **Develop BMPs -** With Community involvement develop BMPs for human and non-human sources (dogs, chickens, and other determined sources) contributing to bacterial impairment of the watershed.

Task 6.2 **Implementation of BMPs** – Based on stakeholder and community resident involvement as part of education and outreach program on septic system care and maintenance and behavioral modification for watershed activities contributing to non-human source contributions to bacteria levels.

Measure of Success: *Development of BMP and implementation through public outreach meetings.*

Deliverable: Activities on the Implementation of Behavioral Measures will be included in the quarterly report. The following will be submitted with quarterly reports if listed activity occurs within a particular quarter.

- BMPs Developed
- Education and outreach materials and activities

TASK 7: EDUCATION AND PUBLIC OUTREACH

Goal: *Develop an information/education component that will be used to enhance public understanding of the project and encourage their early and continued participation in selecting, designing, and implementing the NPS management measure that will be implemented.*

Task 7.1 **Update Westfield Estates WPP**- Preliminary description of education and outreach efforts included with WPP. These efforts will be expanded as the project moves forward to incorporate specific maintenance aspects necessary for long term success.

Task 7.2 **Education on Septic Systems Maintenance and Failure**- Project promotion and education programs, bilingual in nature where possible. Examples may include manned tables at local businesses (e.g. grocery store), elementary school, faith-based organizations, water bills inserts, fliers, residents going door to door, and town meetings.

Task 7.3 **Continuing Education**- Education (bilingual) on on-site septic system care including septic system brochures, with classes at community center; program transitioned to local stakeholder's advisory group management at end of project.

Task 7.4 **Watershed Protection Plan Website** – Updates of Westfield Estates WPP on H-GAC's Watershed Protection Plan web page. To include maps; Phase I report; meeting information, notes and agenda; survey; and regular status updates on the implementation phase and WWP itself.
(http://h-gac.com/westfield)

Measure of Success: *Description of education and outreach in WPP, development of educational material, public participation in town meetings and continuing education classes and inclusion of WPP update on H-GAC's webpage.*

Deliverable: **Education and public outreach activities will be included in the quarterly report.**The following will be submitted with quarterly reports if listed activity occurs within a particular quarter.

- Education and outreach materials
- Webpage Updates

TASK 8: WATERSHED PROTECTION PLAN UPDATE

Goal: *Update the Westfield Estates WPP as it addresses bacterial impairment in the Westfield Estates watershed.*

Task 8.1: **Update Plan** – Update based on information collected under this project, including stakeholder-based input. Finalizing the Stakeholder Advisory Group, which will take responsibility for maintaining the plan, will not occur until the project "Wrap-Up meeting.

Measure of Success: *Plan updated as needed.*

Deliverable: Activities for the quarter on the watershed protection plan updates will be included in the quarterly report. The following will be submitted with quarterly reports if listed activity occurs within a particular quarter.

- Westfield Estates WPP updated as needed.

.

TASK 9: INDICATORS TO MEASURE PROGRESS, AND EFFECTIVENESS OF IMPLEMENTATION EFFORTS POST-CONSTRUCTION

Goal: *To determine the effectiveness of remediation of a significant number of failing septic systems in a community on reducing bacterial impairment in the bayou.*

Task 9.1 **Pre- and Post-construction Monitoring -** Monitor selected sites in the watershed for levels of bacteria and source of contamination in accordance with sites and protocols in the QAPP.

Task 9.2 **Survey Septic Violations -** Determine level of septic system failure violations in community pre and post-construction.

Task 9.3 **Quantify Impairment Reduction**- Determine decrease of non-human bacterial sources in watershed by DNA analysis and indicator bacterial level reduction

Task 9.4 **Continuing Maintenance-** Maintenance of on-site septic systems through arrangement with partner Sunbelt Freshwater Supply District-Oakwilde and monitored by SAG until transfer to the permanent stakeholder's advisory group.

Measure of Success: *Collection and review of sampling data to assess success of failing septic system corrective measures on reducing bacterial impairment in the bayou. Inclusion of data in the final report.*

Deliverable: The following will be submitted with quarterly reports if listed activity occurs within a particular quarter.

- Monitoring, data collection, and analysis pre-a and post - implementation
- Septic systems maintenance agreements

TASK 10: FINAL REPORT

Goal: *To provide the TCEQ and the EPA with a comprehensive report on the activities and success of the pilot project conducted by the **Grantee Organization** during the course of this project.*

Task 10.1 **Draft Final Report –** Provide a comprehensive, technical report summarizing all project activities, findings, and the contents of all previous deliverables, referencing and/or attaching them as web links or appendices. This comprehensive, technical report will provide analysis of all activities and deliverables under this scope of work. The report may include the following information in acceptable format:

Title
Table of Contents
Executive Summary
Introduction
Project Significance and Background
Methods
Results and Observations
Discussion
Summary
References
Appendices

TCEQ Project Manager will review this report within 30 days of receipt and provide comment.

Task 10.2 Final Report revising the Draft report to address comments provided by the TCEQ Project Manager.

Measure of Success: *Acceptance of the report by the TCEQ.*

Deliverables:

- **Final Draft Report**– 7/15/2011
- **Final Report**- 8/31/2011

Deliverables Due Dates

Schedule of Deliverables Based on Project Funding/Initiation of February 17, 2009. Schedule and Scope of Work will be amended accordingly if Project Funding/Initiation is delayed.

Task No.	Deliverable	Due Date
	Post Award Meeting	To be determined
1.2	Quarter Three Progress Report FY 09	6/15/09
1.2	Quarter Four Progress Report FY 09	9/15/09
1.2	Quarter One Progress Report FY 10	12/15/09
1.2	Quarter Two Progress Report FY 10	3/15/10
1.2	Quarter Three Progress Report FY 10	6/15/10
1.2	Quarter Four Progress Report FY 10	9/15/10
1.2	Quarter One Progress Report FY 11	12/15/10
1.2	Quarter Two Progress Report FY 11	3/15/11
1.2	Quarter Three Progress Report FY 11	6/15/11
1.2	Quarter Four Progress Report FY 11	8/31/11
1.3	Quarter Two Reimbursement Request FY 09	3/31/09
1.3	Quarter Three Reimbursement Request FY 09	6/30/09
1.3	Quarter Four Reimbursement Request FY 09	9/30/09
1.3	Quarter One Reimbursement Request FY 10	12/31/09
1.3	Quarter Two Reimbursement Request FY 10	3/31/10
1.3	Quarter Three Reimbursement Request FY 10	6/30/10
1.3	Quarter Four Reimbursement Request FY 10	9/30/10
1.3	Quarter One Reimbursement Request FY 11	12/31/10
1.3	Quarter Two Reimbursement Request FY 11	3/31/11
1.3	Quarter Three Reimbursement Request FY 11	6/30/11
1.3	Quarter Four Reimbursement Request FY 11	9/15/11
1.4	Quarterly conference call with TCEQ	4/15/2009
1.4	Quarterly conference call with TCEQ	7/15/2009

1.4	Quarterly conference call with TCEQ	10/15/2009
1.4	Quarterly conference call with TCEQ	1/15/2010
1.4	Quarterly conference call with TCEQ	4/15/2010
1.4	Quarterly conference call with TCEQ	7/15/2010
1.4	Quarterly conference call with TCEQ	10/15/2010
1.4	Quarterly conference call with TCEQ	1/15/2011
1.4	Quarterly conference call with TCEQ	4/15/2011
1.4	Quarterly conference call with TCEQ	7/15/2011
1.5	Contractor Self-Evaluation	8/31/09
1.5	Contractor Self-Evaluation	8/31/10
1.5	Contractor Self-Evaluation	8/31/11
1.6	Project Fact Sheet	60 days after receipt of template after contract initiation
1.6	Project Fact Sheet Update	8/31/09
1.6	Project Fact Sheet Update	8/31/10
1.6	Project Fact Sheet Update	8/31/11
10.1	Draft Final Report	7/15/11
7.2, 10.2	Final Report	8/31/11

APPENDIX B. Sampling Design and Procedure

APPENDIX B. Sampling Design and Procedure (pages 44-49)

Appendix B. 1. Sampling Process Design and Monitoring Schedule

Sample Design Rationale

Malfunctioning On-site Sewer Facilities (OSSF) have long been thought to play a role in water quality by adversely affecting receiving waters with bacterial contamination. The sample design is based on the goals of the PHASE I special study, which was to determine if malfunctioning OSSF generate quantities of bacteria (E. coli or Enterococcus) at levels sufficient to pose a health risk to humans. In PHASE II, the goal is to establish pre-and post implementation bacteria levels in the watershed to establish success of the implementation. The sample design rationale uses *E. coli.* These data will be used, in conjunction with additional water-quality data collected by H-GAC, to assess current conditions in Westfield Estates..

Site Selection Criteria

This data collection effort encompasses passive sampling of observed malfunctioning OSSF, as identified by county enforcement officials. Discharge from these such systems may enter into water bodies and thereby adversely affect "in-stream" water quality. To date sampling sites in the Phase II study will be the same sites used in Phase I where possible. Additional sites may be added. A list of the monitoring sites as well as the criteria followed for the selection follows. Such sites include at least 10 sampling sites in an urban area in a Hispanic community identified in Harris County Precinct 2. All monitoring activities will be developed in coordination with TCEQ.

To this end, some general guidelines are followed when selecting sample sites, as identified below. Overall consideration is given to accessibility and safety. All monitoring activities have been developed with coordination with the H-GAC.

1. Monitoring sites are representative of malfunctioning OSSF in the watershed in proximity to and representative of possible in-stream water quality affects and hydrology during the study period. Where possible, sites are representative of a specific type of land use.

2. Monitoring sites are chosen based on accessibility and safety.

3. Other criteria include odor, black water, and proximity to obvious failing OSSF.

Tentative site locations have been determined using a high-resolution GPS unit. The differentially corrected GPS has a reported accuracy of within a 1-meter radius. Additionally, site locations were plotted in the field on USGS quadrangle maps, described relative to surrounding landmarks in field notes, and, if necessary, plotted on smaller scale site maps. All GPS coordinates were plotted on high-resolution aerial photography with an accuracy of $\pm$8 feet. Using these data collection and verification techniques, the TCEQ's Agency Horizontal Accuracy (Level 2 or higher) locational accuracy standards will be met.

The data collection design is summarized in Table B1 (Sampling Sites and Monitoring Frequencies) and Figure B1 (Sample Site Map).

Monitoring Sites

A list of sites from Phase I is as follows. Additional sites may be added based on field studies.

2400 block of Warwick A
2400 block of Warwick B
2300 block of Warwick
2100 block of Warwick A
2100 block of Warwick B
2400 block of Cromwell
2500 block of Cromwell A
2500 block of Cromwell B
2500 block of Cromwell C
2600 block of Cromwell
2700 block of Kowis
2500 block of Kowis P
2500 block of Kowis A
2500 block of Kowis B
2700 block of Trenton
2700 block of William Tell A
2700 block of William Tell B
2600 block of William Tell A
2600 block of William Tell B
2700 block Kowis outfall
2700 block Chamberlain outfall
Sunbelt FWSD – Oakwilde outfall

Sampling Procedure

Specific sampling procedures will be determined by the uniqueness of each sampling location and in conjunction with the laboratories ability to collect samples from meaningful sites.

Critical vs. Non-critical Measurements

In Phase I, because sample site location is biased, in an attempt to show possible presence of bacteria, which may affect human health, the limited number of samples involved, the nature of this program as a "pilot study," and the fact that these data will not be entered into any TCEQ database, data is considered non-critical. In Phase II these data are secured to establish pre-and post implementation bacterial levels. Data will be made available to TCEQ and other entities as having been conducted under an approved QAPP

Appendix B.2. Field Sampling Procedures

1.0 Scope & Application

1.1. This document outlines the procedures used to collect samples from malfunctioning OSSFs. Location of OSSF sampling site will be determined after consultation with county health & environmental enforcement officials, one of whom will be present during sampling procedure. Site will be chosen based on previous violation/citation with the county as to malfunctioning OSSF.

2.0 Summary

2.1. Investigators will be assigned sampling runs by the laboratory Project Manager. The investigator will be expected to prepare for the run by reviewing the computer generated sampling record sheets and associated information, then collecting and calibrating the appropriate sampling equipment. The investigator will then precede to the designated OSSF site where he/she will identify himself join county enforcement staff and as necessary the H-GAC Project Manager. Contact will be made with the OSSF site resident by the enforcement official. The property will be inspected to determine appropriate sampling sites. The runs will usually consist of sampling (1) the discharge of malfunctioning OSSF into an adjacent water body (if applicable, including upstream and down stream locations, (2) pooled water within close proximity to the residence served by the OSSF, and (3) any other pooled or standing water on the site, including ditches. All samples collected will be stored on ice and custody will be maintained until the investigator returns to the Laboratory. The laboratory secretary or other laboratory personnel identified in the laboratory SOP will then take custody of the samples. The investigator will note all observed and/or determined in the field, or found during laboratory sample analysis.

3.0 References

3.1. TCEQ SOP - Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods for Water, Sediment, and Tissue, 2003; RG-415.
3.2. Standard Methods for the Examination of Water and Wastewater, 40 CFR 136.
3.3. Laboratory SOP.
3.4 American Society for Testing and Materials, Annual Book of Standards, Vol. 11.02

4.0 Definitions

4.1. Grab Sample - An individual sample collected in less than 15 minutes.
4.2. Split Sample – A single, homogeneous sample that has been equally divided into two or more sub-samples.
4.3. Direct Sample – sample collected directly into the sample receptacle from the designated discharge point, sample spigot, or source.
4.4. Indirect Sample – Sample collected in a sample bucket or container from the sampling point before being poured into the sample receptacle.
4.5. Custody – the act or right of caring or guarding.

5.0 Health & Safety

5.1. Be alert to environmental dangers and use discretion to determine if it is safe to exit your vehicle and collect a sample. These dangers may include unfriendly dogs, biting insects, rusted or unsafe structures, slip or trip hazards, wet catwalks, and ongoing upsets at industrial facilities.

5.2. Do not enter confined spaces.
5.3. Follow safety rules.
5.4. Wear appropriate eye and hand protection when collecting and handling the samples.
5.5. Wear appropriate footwear. Footwear required for industrial facilities may differ from that required at municipal facilities.
5.6. In case of spill or exposure, wash the exposed area thoroughly and disinfect with Sanigel or similar product. If preservative is spilled on an object, neutralize with baking soda and dilute with water.
5.7. Prepare for weather extremes. Carry ice and potable water during the summer and wear warm clothing during the winter.
5.8. Report any injuries to the Laboratory Safety Officer as soon as possible and complete an accident report form. If a site representative is present, notify them also.

6.0 Sample Handling and Preservation

6.1. Complete a custody/sampling record for each sample collected.
6.2. Make sure that each sample bottle is labeled with the date and time it was collected, the name of the site sampled, the outfall number, the type of preservative used and the investigator's signature. Since multiple samples will be obtained at each sight, number these sequentially, beginning with the sampling location closest to the residence and ending with the outfall down stream sample (if applicable). Not all sites may be adjacent to the water body.
6.3. Maintain sample custody until it can be relinquished to the identified laboratory personnel.
6.4. The laboratory prepares sample bottles with the appropriate preservative. Each bottle is labeled with the preservative it contains. Refer to attached list "Aqueous Samples, Containers, Preservation, and Holding Time" in the laboratory SOP.
6.5. Store all samples on ice or as appropriate.
6.6. Do not allow foreign objects to enter the sample bottle. Conduct all testing directly in the outfall or in the sample collection container after the sample has been poured into the sample bottles.
6.7. Once a sample bottle is closed, do not open it.
6.8. Report any sample bottles damaged during transit to the Laboratory Director.

7.0 Equipment and Apparatus

7.1. See laboratory SOP titled "Routine Sample Checklist" for equipment list.
7.2. Potable Water
7.3. UV Protective glasses (sunglasses) for facilities utilizing UV disinfection.

8.0 Reagents and Standards

8.1. Not Applicable

9.0 Procedure

9.1 Run Preparation and Timing
9.1.1. Review the sampling run assigned by the Laboratory Supervisor.
9.1.1.1. Establish a sampling route using Key Maps or knowledge of the area. Plan the run so that there is enough time allotted to collect samples and return to the Laboratory by 3:30 PM.
9.1.1.2. Check sampling history for any recent violations.

9.1.1.3. Read any special instructions detailed in the sample record.
9.1.1.4. Speak to Laboratory Supervisor if any questions arise.
9.1.2. Assemble all equipment necessary to complete the run including keys, bottles, and coolers.
9.1.3. Check assembled bottles for cleanliness and damage.
9.1.4. Calibrate and run QA/QC on all equipment that requires it according to the appropriate SOPs.

9.2 Arrival at a site
9.2.1. Meet county enforcement official at the site. Residents may not be present at all sites
9.2.1.1. Be prepared to present photo identification. If the designated enforcement official is not available, contact the laboratory project manager. Document the name of the enforcement official and resident present on the sample record.
9.2.2. Exercise discretion when waiting for the enforcement official, a 15-20 minute wait is not considered unreasonable. Representatives may not be available during the lunch hour; it may be necessary to return at a later time.
9.2.3. Upon being contacted, the resident may or not wish to accompany you. If the resident does not wish to accompany you, clarify any questions you may have regarding the site before proceeding. Record the name of the resident and the enforcement officer on the sample record sheet.
9.2.4. Follow reasonable the safety and security procedures. Photograph the site, including residence, location of OSSF and field, pooled or standing water, and outfall.
9.2.5. If you cannot sample at an assigned site, indicate this on the sample record sheet and explain why it was not possible to collect a sample at that time.

9.3 Sample Collection
9.3.1. Verify that the outfall or designated sample collection point(s) the sample is being collected from is the correct location.
9.3.1.1. Check the description on the sample record sheet.
9.3.1.2. Check for any signs or markers.
9.3.1.3. Ask the resident.
9.3.1.4. Ask the enforcement official
9.3.2. Prepare sample bottles, making sure that each bottle is labeled.
9.3.3. Collect the representative grab sample.
9.3.3.1. Where possible, collect the sample directly from the outfall or designated sample point into the sample bottle. This is a direct grab sample.
9.3.3.2. In areas where there are confined spaces or physical impediments, use a sample collection bucket on a rope or pole to collect the sample. Rinse the sample bucket a minimum of three times with effluent before collecting a sample to prevent contamination. This is an indirect grab sample. Pour the sample from the bucket into the sample bottles.
9.3.3.3. When a split sample is requested, use a sample collection bucket or common glass or plastic container (since larger volumes are needed) to collect the sample. Rinse the sample bucket or collection container a minimum of three times with effluent before collecting the sample. Once the sample is collected, pour equal portions into the waiting sample bottles. Between each series of pours, swirl the collection container gently to prevent separation and settling.

9.3.3.4. When collecting the sample, do not allow the sample bucket or collection container to lie on the bottom of or scrape the sides of the outfall where it can collect accumulated residue or algae. This may result in a non-representative sample.

9.3.3.5. Document the type and method of sample collection on the sample record sheet. Also, document whether a plant representative collected a sample and whether it was a split sample.

9.3.3.6. After conducting some field tests, it may be necessary to go back and collect additional samples (i.e. fecal). Repeat steps 9.3.3.1 through 9.3.3.6 to collect these samples.

9.4 Field Tests and Measurements

9.4.1. Field tests should be conducted as soon as the sample is collected.

9.4.2. All additional tests will be conducted according to the SOP associated with that specific test equipment or method.

9.5 Field Observations

9.5.1. Observe the discharge and the sample collected. Record any observations including clarity, color, surface conditions, and odors. Observations such as oil present in greater than trace amounts, visible foam, and floating solids are direct violations of the county/TCEQ permit. Other observations may indicate a problem with the effluent that may later be determined during laboratory analysis. They may also indicate a problem with facility operations.

9.5.2. If a problem at the site is observed, record the conditions observed in the receiving stream. Conditions may include but are not limited to sludge build up, discoloration, odor, and dead vegetation or aquatic life. These observations detail the environmental impact the discharge is having on the receiving stream.

9.5.3. If a resident is present, document any remarks he/she makes with regard to problems with OSSF operations.

9.5.4. Record all observations on the sample record sheet. The back of the sheet may also be used for more detail.

9.6 Returning to the Laboratory

9.6.1. Return all samples to the Laboratory by 3:30 PM. If you are delayed, contact the Laboratory Secretary by telephone and inform her of the reason.

9.6.2. Conduct any QA/QC testing required by the equipment used. Document on the Routine Sampling Check List.

9.6.3. Make sure all samples are correctly labeled and all paperwork is complete then place the samples into Laboratory Secretary's custody.

9.6.4. If samples are collected after hours, make sure all samples are correctly labeled and all paperwork is complete. Place the samples in the after hours refrigerator behind the locked laboratory doors and place the accompanying paperwork on top of the refrigerator.

10.0 Quality Control

10.1. QC Equipment

10.1.1. Operate all equipment in accordance with the applicable SOP.

10.2. Method Performance and Demonstration of Capability

10.2.1. All investigators will be trained on the procedures to conduct routine sampling and will demonstrate ability to follow the procedures before being allowed to conduct routine sampling unsupervised.

10.2.2. All investigators will receive additional training on use of field equipment required to conduct routine sampling.

11.0 Documentation

11.1. Record QA/QC for equipment used during routine sampling on the Routine Sampling Check List.

11.2. Record observations and data described in section 9.0 in the appropriate section of the Sample Record sheet.

12.0 Pollution Prevention and Waste Management

12.1. All waste will be placed in an appropriate waste container or returned to the laboratory office for proper disposal.

13.0 Attachments

13.1. Routine Sampling Check List

13.2. Sample Record sheet

13.3. Flow Charts

APPENDIC E: Field Data Sheet

APPENDIX C. FIELD DATA SHEETS(S) Example

Field Data Sheets specific to the laboratory will be added after choice of sub-contractor is confirmed.

FIELD DATA SHEETS: FECAL PATHOGENS STUDY (PAGE 1 OF 3)

Project Name/Location								
Job Number								
Sampler(s) (signature)								
Date	Time	Sample No.	Location Sample Site (Draw schematic on back of page 1)*	Analysis E. coli	Analysis Enteroc.	Sample Depth	Water Appear	Present Weather

* Description of location should include whether site is on land or in the water body; proximity to OSSF system attached to residence; descriptive text; proximity of sampling site to physical structures (e.g. house, trailer, and garage); proximity of site to bayou or water body; any other pertinent information

APPENDIX C. FIELD DATA SHEETS(S) Example

Field Data Sheets specific to the laboratory will be added after choice of sub-contractor is confirmed.

FIELD DATA SHEETS: FECAL PATHOGENS STUDY (PAGE 2 OF 3)

Project Name/Location								
Job Number								
Sampler(s) (signature)								
Sample No.	Biol. Activity	Water Odor	Stream/Site Activity	Missing Parameter	Sample Bottle Type	Witnesses to Sampling	Photo	Observations on Water Quality

APPENDIX C. FIELD DATA SHEETS(S) Example

Field Data Sheets specific to the laboratory will be added after choice of sub-contractor is confirmed.

FIELD DATA SHEETS: FECAL PATHOGENS STUDY (PAGE 3 OF 3)

Project Name/Location								
Job Number								
Sampler(s) (signature)								
Sample No.	Days Since Last Rain	Flow Severity	Temperature (water)	Water Clarity	Turbidity Observed	Water Color	Water Surface	Wind Intensity

APPENDIX D. Chain of Custody Form (s)

NAME OF SUBCONTRACTOR/LABORATORY
Address
Phone

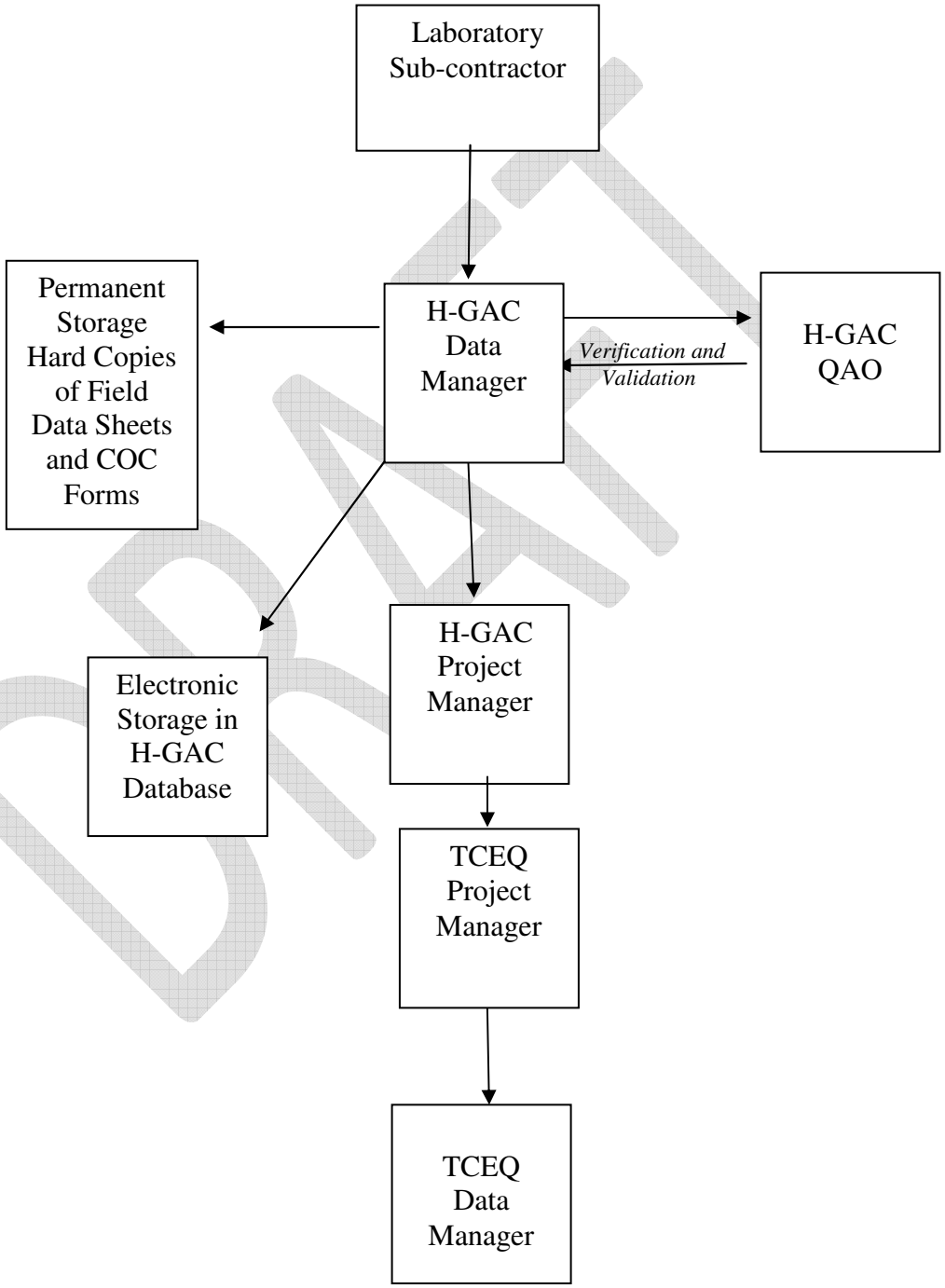
CHAIN OF CUSTODY RECORD

Project Name:					**# of containers**	**Analyses Required**			**Sample ID**
OSSF Site Location/ Sample site	**Date**	**Time (24hr)**	**Matrix**	**Description**		**Enterococcus**	**E. coli**	**Preservative or filtration**	
Collected by: (signature)			Date:	Time:	Received by: (signature)		Date:	Time:	Laboratory remarks:
Relinquished by: (signature)			Date:	Time:	Received by: (signature)		Date:	Time:	
Relinquished by: (signature)			Date:	Time:	Received by: (signature)		Date:	Time:	Lab log #

APPENDIX E: Data Management Plan

Appendix E.1: Data Flow Sheet

Electronic data, field data sheets, and COC forms are submitted to H-GAC by the Sub-contractor.



Appendix E.2. Data Management Plan
Personnel

Dr. Kathleen Ramsey is responsible for managing the project for the lead organization. The H-GAC QAO is responsible for ensuring that data is managed by H-GAC and its subcontractors according to this data management plan and QAPP.The H-GAC Data Manager
is responsible for reviewing the water quality data from EIH or other laboratory, performing all quality control checks on the data, converting the data to the required format, archiving the data, backing up the data at H-GAC

The laboratory director similarly credentialed individual if an alternate sub-contractor is utilized, is responsible for managing the water quality data and ensuring that the data comply with this QAPP. He will submit the evaluated data to H-GAC.

The Sub-contractor/Laboratory Manager is responsible for ensuring that the data resulting from laboratory analyses for this project is managed according to the lab QMPs and this QAPP.

Systems Design – Data will be entered into, stored in, and transmitted between personal computers operating on Microsoft Windows 2007, and using common commercially available software. Microsoft Access or Excel 2007, will be used as databases, and data files created by these software programs will be transmitted between computers via the Internet. The TCEQ database hardware and software are described elsewhere and available from the TCEQ Data Manager

Data Dictionary

Tag_id	A7	This field is the key between the event and results tables and is 7 characters long. The first character(s) is the prefix code for the submitting agency.
Station	A9	This is a combination of the segment_id and the sequence of a site within a segment Stationid A5 This is a unique id that identifies each sampling station. This number is generated by the TNRCC.
Enddate	A10	The date the sample was collected in the form of MM/DD/YYYY
Endtime	A5	The time the sample was collected in military format (HH:MM)
Enddepth	A6	This is the depth in meters at which the sample was collected.
Startdate	A10	This field is only required for composite samples and is the beginning date in the form of MM/DD/YYYY
Starttime	A5	This field is only required for composite samples and is the beginning time (in military format) at which the sample was collected (HH:MM)
Startdepth	A6	This field is only required for composite samples and is the depth nearest surface (in meters) at which the sample was collected.
Category	A1	This field is only required for composite samples and should correspond to the following codes: T is for time composites S is for space composites (i.e.depth)

		B is for both space and time composites F is for flow weighted composites
Calculatn	A1	This field is no longer used and should be left blank
Type	A2	This field is only required for composite samples and should correspond to the following codes: CN for continuous ## where ## is the number of grabs in the composite GB where the number of grabs is unknown
Comment	A135	This is a text field where record of any observational data is included with the sample
Source1	A2	The TCEQ assigned code for the submitting agency.
Source2	A2	An optional field that may be used to further identify the sample
Program	A2	A field that further identifies the sample. This field may be used to tie targeted monitoring to specific permits.
Storetcode	A5	This is a five digit code which identifies the substance or measurement.
Gtlt	A1	If the value is above the detection limit then this field should contain an . If the value is below the detection limit then this field should contain an <.
Value	A8	This is the test result and should be reported in units according to the storet description

The following table outlines the codes that will be used when submitting data under this QAPP.

Name of Monitoring Entity	**Source Code 1**	**Source Code 2**	**Program Code**
Qualified laboratory	TBD	TBD	TBD

TBD = to be determined

Storet codes for data collected under this project include the following:

00530 RESIDUE, TOTAL NONFILTRABLE (MG/L)

31648 E. COLI, MTEC, MF, #/100ML

31700 E. COLI, MF PARTITION PROCEDURE

01351 FLOW: 1=NO FLOW, 2=LOW, 3=NORMAL, 4=FLOOD, 5=HIGH, 6=D

31649 ENTEROCOCCUS, MF

Data Management Plan Implementation – Implementation of the data management plan is displayed graphically in Appendix G. Figure G.1. Field data will be recorded on field data reporting forms, then conveyed to Laboratory Data Manager, who will enter them into a database file. All values in the electronic file will be compared to the paper forms after entry. Field data forms will be maintained at the Laboratory for five years.

The results *E. coli* and Enterococcus tests at the Laboratories will be provided on paper forms, then entered into an electronic database file by a technician to be specified at a later date. After this operation, each value in the database is compared to the value on paper for accuracy.

If any calculations are made, at least 10% will be checked by hand for accuracy. A technician to be identified at a later date will convert the electronic file to MS Access format, and following manual accuracy checks, archive copies of each file to CD-ROM format. The Data file, along with a data management checklist, will be then transferred to the GBEP Project Manager by e-mail. After approving the data management checklist, the GBEP Project manager will convey the file to the GBEP Data Manager. GBEP Data manager will run the TCEQ automated screening procedure on the file to check for errors and outliers, then forward the results to the TCEQ Project Manager. Upon approval of the TCEQ Project manager, the TCEQ Data Manager will add this data to the TCEQ database if appropriate.

Quality Assurance/Control - See Section D of this QAPP. The Laboratory Quality assurance Officer will confirm that QA/QC procedures are followed using a quality control checklist (see Appendix F).

Backup/Disaster Recovery – Data files stored on the network servers at the Laboratory, H-GAC, and TCEQ computer systems are routinely backed up. After a summary report is produced at the Laboratory, it will then be saved to a CD for distribution and archive at the Laboratory offices. Copies of the field data reporting forms and laboratory paper records will be maintained, at the Laboratory, for a period of five years as additional insurance against data loss.

Archives/Data Retention - Complete original data sets are archived on permanent media (CD) and retained on-site by the laboratory for a retention period specified in the original QAPP approved by the TCEQ Project Manager

Appendix E.3: Data Summary

Data Summary Sheet

Data Source: _____

Date Submitted: _____

Tag_ID Range: _____

Date Range: _____

Comments:

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Houston-Galveston Area Council
Data Manager_____Date_____

Quality Assurance Officer_____Date_____

APPENDIX F: Check Lists

APPENDIX F. Data Submittal Form & Data Review Check List and Comment Sheet

Appendix F.1. Data Submittal Form

Please complete this form, sign where applicable, and submit with copies of Field Sheets, Chain-of-Custody Forms & Lab Data Reports pertaining to the data in this submittal. One form is required for each submission. Failure to complete and submit this form will impede the process whereby data is submitted to TCEQ or included in the H-GAC database.

Laboratory:_____

Water Body:_____

Data Start Date:_____ Data End Date:_____

Total Number of Events in this Data Submittal: _____
(Total number of sample sites monitored times the number of monitoring visits to each site)

Total Number of Results in this Data Submittal:_____
(Each event contains multiple field &/or laboratory results)

Appendix F.2 Field Data Review Check List

List equipment used to collect field measurements._____
Were all field parameters measured & documented for each station location? Yes ____ No____
Were water samples collected for all required laboratory parameters at every station location? Yes____ No____
Were water samples "iced" immediately upon collection or acidified in the field as required? Yes___ No____
Were all field sheets completed using indelible ink? Yes___ No____
Were errors on the field sheets corrected using a single line with initials of person making the correction & the date corrected? Yes___ No____
If no, explain._____
_____
Were empty sections of every field sheet closed-out with a diagonal line, initials and the date closed-out? Yes___ No____
Were problems encountered while collecting any field measurements? *Explain*._____
_____
Were these problem(s) documented on the field sheets? Yes___ No____
Were the problems encountered in the field, communicated to the supervisor so the H-GAC Project Manager could be notified as required by the QAPP? Yes___ No____
Were all chain-of-custody forms &/or field data sheets filled out completely and accurately? Yes___ No____
Were empty sections of every Chain of Custody form &/or field data sheet closed-out with a diagonal line, initials and the date closed-out? Yes___ No____
Have the field data sheet(s) or chain-of-custody form(s) changed since the last data submittal to H-GAC? Yes___ No____
*Explain, if yes or attach a new form*_____
_____

Additional comments about Field Data _____
_____
_____
Person who reviewed the field sheets for accuracy & completeness:

*Print Name*_____*Signature*_____*Date*_____

Appendix F. 3. Lab Data Quality Review

Were all holding times confirmed? Yes___ No___
Were samples received at the lab "iced down" and in the process of cooling to 4ºC ± 2ºC?
Yes____ No____
*Explain if no*_____
Were any water samples analyzed and reported that exceeded holding time requirements?
Yes___ No____
Were empty sections of the Chain of Custody form closed-out with diagonal lines, initials and the date closed-out? Yes___ No____
Are all the lab values reported consistent with the Lab Reporting Limits (LRL) in Table A7.1 of the Regional QAPP? Yes___ No____
*Explain if no*_____
Have errors on the lab sheets been corrected using a single line with initials of person making the correction & the date corrected? Yes___ No____
Were empty sections of every lab sheet closed-out with a diagonal line, initials and the date closed-out? Yes___ No____
Did all field splits fall within the 30% Relative Percent Difference (RPD) used to determine potential excessive variability? Yes__ No____
*Explain if no*_____
_____
Were there any results that were not reported by the lab? Yes___ No____
*Explain if yes*_____

Data reasonableness and correctness of analysis have been confirmed and documented in the electronic database for the following situations.

- For bacteria densities that are too few or too numerous to count, are the values reported as < or > the applicable minimum or maximum value? Yes___ No____
- Are there any results in this data set greater than the maximum screening values or less than the minimum screening values? Yes___ No____
- Are there any result values in the data set that "Best Professional Judgment" would indicate a possible error and an investigation is warranted? Yes___ No____
- Are there result values in the data set, which are part of a "hold time exceeded" or "did not pass QA" or "received hot, __ ºC" but could still be included in the set because a parameter does not require special handling? (ie. TDS does not have to be iced) Yes___ No____
- *If yes to any previously bulleted questions*, have the results been reconfirmed and documented in the database as being accurate? Yes___ No____

What kind of QA/QC data is provided with this data submittal?_____
_____

Additional comments about Lab Data _____
_____

Person who reviewed the lab sheets & results for accuracy & completeness:

*Print Name*_____*Signature*_____*Date*_____

Data Entry, Formatting and Table Structure

Are all sampling START TIMEs and END TIMEs data entered using
the 24-hour clock format with leading zeros as necessary? Yes___ No___
Are all sample *DEPTHs* reported in meters? Yes___ No___
Were any samples collected from depths greater than 0.3 meters? Yes___ No___
*Explain if yes*_____

_____

If the sample was not a grab, was the composite information recorded? Yes___ No___
Have all asterisks (*) been removed from the database being submitted to H-GAC?
(An asterisk will interfere with queries, searches, etc.) Yes___ No___

Are there any blank fields in the database? Yes___ No___
*Explain if yes*_____

_____

If there are no results to enter due to lab or sampling problems, is there an
explanation for the blank field in the comment section? Yes___ No___
Are only the sample sites listed in the current QAPP, Coordinated Monitoring Schedule (CMS), or most recent amendment included with the data being submitted to H-GAC?
Yes_____ No_____
*Explain if no*_____

_____

Was data reviewed for outliers? Yes___ No___
(Refer to www.tceq.state.tx.us/water/quality/data/wmt/storet.html

Are all outliers confirmed, documented and identified so the H-GAC Data Manager
can review them? Yes___ No___
Are the appropriate quality assurance/quality control information or results included with the data set for verification and validation by H-GAC? Yes___ No___
Have at least 10% of the data in the data set been reviewed against the field
and laboratory data sheets? Yes___ No___

Additional comments about Data Entry, Formatting and Table Structure_____

_____

_____

_____

Person who reviewed the database for accuracy & completeness:

*Print Name*_____*Signature*_____*Date*_____

Electronic data set was submitted to H-GAC on _____
Electronic data set was submitted to H-GAC by:

*Print Name*_____*Signature*_____*Date*_____

Appendix F.4 MICROBIOLOGICAL QA COMMENT SHEET

A. Are holding times confirmed? _____

B. Have checks on correctness of analysis or data reasonableness been performed? _____

Explain any answers that may indicate a problem with the data (attach another page if necessary):

Site Location	Date of sample	Comments

APPENDIX G: Letter of Adherence to the Project QAPP.

APPENDIX G: Letter to document adherence to the project QAPP.

DATE: Date

TO: Kathleen Ramsey
Houston-Galveston Area Council

FROM: Project Manager
Sub-contractor/Laboratory

RE: Awareness and commitments to QAPP Requirements
_____, Texas

Please sign and return this form by date _____to:

Sub-Contractor/Laboratory
Address
City, State Zip code
ATTN: Project Manager

I acknowledge receipt of the referenced document(s). I understand the document(s) describe quality assurance, quality control, data management and reporting, and other technical activities that must be implemented to ensure the results of work performed will satisfy stated performance criteria.

_____

Signature Date

Copies of the signed forms should be sent by H-GAC to the TCEQ Project Manager within 30 days of receipt.

Appendix H. Possible sampling sites

Possible Locations of Sampling Sites. Specific sites to be identified after the QAPP is approved by TCEQ and after feld surveys determine the viability of Phase I sites and possible additional sites. Phase I sampling sies were located in Westfield Estates proper because the community contains approximately 65% of the failing septic system violations in the watershed.. Other possible locations in the watershed as identified by septic system violations, are shown in Figure 5 H.2.

Figure 4: H.1.

APPENDIX I: Data Summary

Appendix I. NPS DATA SUMMARY

A completed checklist must accompany all data sets submitted to the TCEQ by the Contractor.

Data Format and Structure	**Y, N, or N/A**
A. Are there any duplicate *Tag_Ids* in the *Events* file?	_____
B. Are all *StationIds* associated with assigned station location numbers?	_____
C. Are all dates in the correct format, MM/DD/YYYY?	_____
D. Are all times based on the 24 hour clock format, HH:MM?	_____
E. Is the *Comment* field filled in where appropriate (e.g. unusual occurrence, sampling problems)?	_____
F. Are *Reporting Entity*, *Monitoring Entity*, and *Monitoring Type* codes used correctly?	
G. Do the *Enddates* in the *Results* file match those in the *Events* file for each *Tag_Id*?	_____
H. Are all measurements represented by a valid *Storetcode* with the correct units?	_____
I.. Are there any duplicate *Storetcodes* for the same *Tag_Id*?	_____
J. Are there any invalid symbols in the Greater Than/Less Than (*Gt/lt*) field?	_____
K. Are there any tag numbers in the *Result* file that are not in the *Event* file?	_____
L. Have verified outliers been identified with a "1" in the *Remark* field?	_____

Data Quality Review

A. Are all the "less-than" values reported at or below the specified reporting limit?	_____
B. Have checks on correctness of analysis or data reasonableness performed?	_____
e.g.: Is ortho-phosphorus less than total phosphorus?	_____
Are dissolved metal concentrations less than or equal to total metals?	_____
C. Have at least 10% of the data in the data set been reviewed against the field and laboratory data sheets?	_____
D. Are all *Storetcodes* in the data set listed in the QAPP?	_____
E. Are all *StationIds* in the data set listed in the QAPP?	_____

Documentation Review

A. Are blank results acceptable as specified in the QAPP?	_____
B. Was documentation of any unusual occurrences that may affect water quality included in the *Event* table's *Comments* field?	_____
C. Were there any failures in sampling methods and/or deviations from sample design requirements that resulted in unreportable data? If yes, explain on next page.	
D. Were there any failures in field and laboratory measurement systems that were not resolvable and resulted in unreportable data? If yes, explain on next page.	

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

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

Date Submitted to TCEQ: _____

TAG Series: _____

Date Range: _____

Data Source: _____

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

Contractor's Signature: _____

Date: _____

APPENDIX J: Standard Operating Procedures

SOP HFERP Fingerprinting

This protocol is written for high-throughput analysis: for the set-up of 96 PCR reactions which are then run on 4 gels, it may be modified as needed.

Day 1

Streak 95 isolates of E. coli onto plate count agar (Difco) for single colony isolation. If E. coli are isolated into frozen stock microtiter plates, plates may be stamped for isolation. Incubate for 24 hrs at 37ºC.

Day 2

1. Add 100 µl of sterile .05 M NaOH to a sterile 96 well microtiter or PCR plate. Loop 1 µl of bacteria from 24 hr incubated PCA plates into the NaOH wash. Heat plate at 95ºC for 15 minutes in appropriate thermal cycler. Optional/Preferred: Spin down plate at 640 RPM for 10 minutes to pellet cells and concentrate DNA to the supernatant.
2. Defrost PCR reagents, mix master mix (on ice) and aliquot 23 µl of master mix into individual wells of a low profile multiplate (MJ Research) or other appropriate PCR plate, and add 2µl of the NaOH supernatant.

HFERP Master Mix

Described per reaction:

ddiH2O	12.65µl
5X Gitscher buffer(*)	5µl
DMSO	2.5µl
6FAM-BOX primers(**)	1µl
100µM dNTP's	1.25µl
BSA	.2µl
Taq Polymerase (5u/µl)	.4µl

(*) 5X Gitscher buffer instructions are below.
(**) 1 µl of 6FAM-BOX primers consists of a mixture of 0.09 µg of unlabeled Box A1R primer per µl and 0.03 µg of 6-FAM fluorescently labeled Box A1R primer per µl (Integrated DNA Technologies, Coralville, IA).

***5X Gitschier Buffer as found in:**

Rademaker, J.L.W., F.J. Louws, and F.J. de Bruijn. 1998. Characterization of the diversity of ecologically important microbes by rep-PCR genomic fingerprinting. Molecular Microbial Ecology Manual **3.4.3**:1-27.

Prepare and autoclave stock solutions of each reagent, and subsequently combine them to prepare a 5X buffer. For 200 ml of 5X buffer, proportion the stock solutions to achieve a final concentration of each of the following reagents using sterile, double-distilled water:

To prepare 200 ml of 5X Gitschier combine:	Final concentration
16.6 ml of a 1 M $(NH_4)_2SO_4$	83 mM $(NH_4)_2SO_4$
67 ml of a 1 M Tris-HCl pH 8.8	335 mM Tris-HCl pH 8.8
6.7 ml of a 1 M $MgCl_2$	33.5 mM $MgCl_2$
1.3 ml of 1:100 dilution of a 0.5 M EDTA	33.5 µM EDTA
2.08 ml of a 14.4 M commercial stock of ß-mercapto-ethanol	150 mM ß-mercapto-ethanol

Adjust final volume to 200 ml with approximately 106 ml water.

Dispense buffer into sterile 1.5 ml microcentrifuge tubes and store at -20° C. This buffer may be stored for several months.

3. Our project performed PCR for HFERP using an Eppendorf Gradient Thermocycler using the protocol specific for this thermocyclers and the Box A1R primer. PCR was initiated with an incubation at 95ºC for 2 minutes, followed by 30 cycles, consisting of 94ºC for 3 seconds, 92ºC for 30 seconds, 50ºC for 1 minute, and 65ºC for 8 minutes (40). PCR reactions were terminated after an extension at 65ºC for 8 min, and stored at 4ºC.

Day 3

1. Remove PCR reactions from the PTC and to each well add 6.6µl of a mixture of 50 µl Genescan-2500 ROX internal lane standard (Applied Biosystems, Foster City, CA) and 200 µl non-migrating loading dye (150 mg Ficoll 400 per ml, and 25 mg blue dextran per ml.) Mix dye with reaction appropriately.

2. For every 24 reactions, prepare the following:

0.5X TAE BUFFER

ddiH2O	1980ml
50X TAE stock (Gibco-BRL)	20

250 ml Agarose gel (Note: Pour gel when agar temp is below 60ºC to avoid comb/tray warp.)

SeaChem LE Agarose	3.75g
0.5X TAE Buffer	250ml

3. Load 12µl for each PCR reaction to the gel, 24 reactions per gel. Gels should run at 70V for 17-18 hrs @ 4ºC with pumps attached to each gel box to recirculate buffer.
4. Obtain images from each gel using the BioRad gel documentation system with the filters for ROX and fluorescein.
5. Add gel images to the Bionumerics database for analysis.