

Westfield Estates Watershed Protection Plan
BMP Effectiveness Monitoring Quality Assurance Project Plan

Houston-Galveston Area Council
3555 Timmons Lane, Suite 120
Houston, TX 77027

Funding Source:

Nonpoint Source Program CWA §319(h)
Prepared in cooperation with the Texas Commission on Environmental Quality
and the U.S. Environmental Protection Agency
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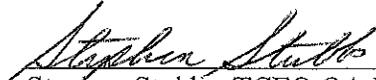
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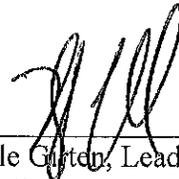
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A1 APPROVAL PAGE

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Field Operations Support Division

 1-17-12
Stephen Stubbs, TCEQ QA Manager Date

 1/13/12
Kyle Gerten, Lead NPS QA Specialist Date
Quality Assurance Team

Water Quality Planning Division

[Signature] 12/21/2011
Monica Harris, Section, Manager Date
Water Quality Planning and Implementation Section

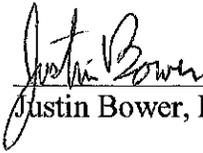
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Kerry Niemann, Team Leader Date
Nonpoint Source Program

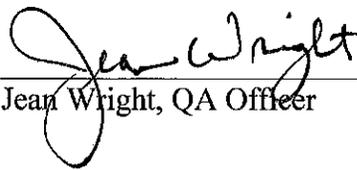
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Nancy Ragland, Team Lead Date
Data Management and Analysis

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Anju Chalise, NPS QA Specialist Date
Nonpoint Source Program

[Signature] 12/21/2011
Anju Chalise Date
Project Manager, Nonpoint Source Program

Houston-Galveston Area Council

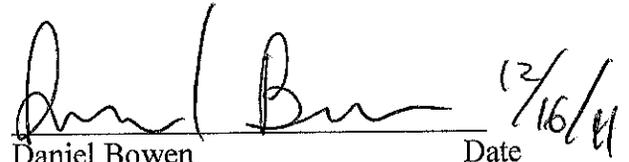

Justin Bower, Project Manager 12/16/11
Date


Jean Wright, QA Officer 12/16/11
Date

The Houston-Galveston Area Council (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 H-GAC will maintain this documentation as part of the project's quality assurance records. This documentation will be available for review. Copies of this documentation will also be submitted as deliverables to the TCEQ NPS Project Manager within 30 days of final TCEQ approval of the QAPP. (See sample letter in Attachment 1 of this document.)

Eastex Environmental Laboratory, Inc. (Eastex)


Pam Hickman Date
Eastex Lab Director


Daniel Bowen Date
Eastex Quality Assurance Officer

A2 TABLE OF CONTENTS

Contents

A1 Approval Page.....	2
A2 Table of Contents	6
A3 Distribution List.....	8
A4 Project/Task Organization.....	12
A5 Problem Definition/Background.....	17
A6 Project/Task Description.....	18
A7 Quality Objectives and Criteria.....	20
A8 Special Training/Certification	24
A9 Documents and Records	24
B1 Sampling Process Design (Experimental Design).....	27
B2 Sampling Methods.....	30
B3 Sample Handling and Custody.....	32
B4 Analytical Methods	34
B5 Quality Control	34
B6 Instrument/Equipment Testing, Inspection and Maintenance.....	36
B7 Instrument/Equipment Calibration and Frequency	36
B8 Inspection/Acceptance of Supplies and Consumables.....	36
B9 Non-direct Measurements	36
B10 Data Management	37
C1 Assessments and Response Actions	38
C2 Reports to Management	42
D1 Data Review, Verification, and Validation	43
D2 Verification and Validation Methods.....	43
D3 Reconciliation with User Requirements.....	45
Appendix A. Area and Monitoring Site Location Maps.....	46
Appendix C. Data Review Checklist and Summary	66
Appendix D. Field Data Reporting Form	72
Appendix E. Chain-of-Custody Form	75
Appendix F. Data Management Flow Chart.....	77
Appendix G: Corrective Action Status Table.....	83
Appendix H: Corrective Action Plan Form.....	85

Attachment 1 – Example Letter to Document Adherence to the qapp87

List of Tables

Table A7.1: Measurement Performance Specifications for the Houston-Galveston Area Council..20
Table A9.1: Project Documents and Records: H-GAC.....23
Table A9. 2 Project Documents and Records: H-GAC.....26
Table B1.1: Wet Weather Monitoring Sites.....29
Table B1.2: Dry Weather Monitoring Sites.....29
Table B2.1: BMP Effectiveness Sample Storage, Preservation, and Handling Requirements for the Houston-Galveston Area Council.....29
Table B3.1: Sample Handling References.....32
Table C1.1: Assessments and Response Requirements.....38
Table C2.1: QA Management Reports.....41
Table D2.1: Data Review Tasks for H-GAC’s Monitoring Program.....43

List of Figures

Figure A4.1: Organization Chart – Lines of Communication.....15
Figure A4.2: Eastex Organizational Chart.....16
Figure B1.1: Westfield Estates Watershed Monitoring Locations.....30
Figure C1.1: Corrective Action Process for Deficiencies.....46
Figure AA1: Watershed Project Area and Monitoring Locations.....53
Figure AA2: Site W1, Warwick Outfall.....54
Figure AA3: Site W2, Cromwell Outfall.....54
Figure AA4: Site W3, Chamberlain Outfall.....54
Figure AA5: Site W4, William Tell Outfall.....54
Figure AA6: Site W5, Kowis Outfall.....54
Figure AF1: Data Management Process Flow Chart.....77
Figure AF2: Draft NPS Data Management Process Flow Chart.....78

A3 DISTRIBUTION LIST

The Lead NPS QA Specialist will provide original versions of this project plan and any amendments or revisions of this plan to the TCEQ Project Manager and the H-GAC Project Manager. The TCEQ NPS Project Manager will provide copies to the TCEQ Data Management and Analysis Team Leader and EPA Project Officer within two weeks of approval. The TCEQ NPS 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.

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Austin, Texas 78711-3087

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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.

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Jean Wright, Quality Assurance Officer
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Pam Hickman, Eastex Lab Director
Phone#
Daniel Bowen, Eastex Quality Assurance Officer
Phone#
NPS Rev 1.2

List of Acronyms

AWRL	Ambient Water Reporting Limit
BMP	Best Management Practice
CAP	Corrective Action Plan
COC	Chain of Custody
CRP	Clean Rivers Program
CWA	Clean Water Act
DM	Data Manager
DMP	Data Management Plan
DMRG	Data Management Reference Guide
DM&A	Data Management and Analysis
DO	Dissolved Oxygen
DOC	Demonstration of Capability
DQO	Data Quality Objective
EAMD	East Aldine Management District
EPA	Environmental Protection Agency
FEMA	Federal Emergency Management Agency
FSSI	Failing Septic System Initiative
FWSD	Fresh Water Supply District
FY	Fiscal Year
GBEP	Galveston Bay Estuary Program
GIS	Geographic Information System
GPS	Global Positioning System
H-GAC	Houston-Galveston Area Council
HCPCT2	Harris County Precinct 2
HCPID	Harris County Public Infrastructure Department
LA	Load Allocation
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
LOD	Limit of Detection

LOQ	Limit of Quantitation
NCDC	National Climatic Data Center
NELAC	National Environmental Laboratory Accreditation Conference
NOAA	National Oceanic Atmospheric Administration
NOS	National Ocean Survey
NPDES	National Pollutant Discharge Elimination System
NPS	Nonpoint Source
OSSF	On-Site Sewage Facility
PO	Project Officer
PS	Point Source
QA/QC	Quality Assurance/Quality Control
QAM	Quality Assurance Manual
QAO	Quality Assurance Officer
QAPP	Quality Assurance Project Plan
QAS	Quality Assurance Specialist
QM	Quality Manager
QMP	Quality Management Plan
RBP	Rapid Bioassessment Protocol
RE	Relative Error
RPD	Relative Percent Difference
RWA	Receiving Water Assessment
SLOC	Station Location
SOP	Standard Operating Procedure
SWQM	Surface Water Quality Monitoring
SWQMIS	Surface Water Quality Monitoring Information System
TCEQ	Texas Commission on Environmental Quality
TSWQS	Texas Surface Water Quality Standards
WQI	Water Quality Inventory
WLA	Waster Load Allocation
WPP	Watershed Protection Plan

A4 PROJECT/TASK ORGANIZATION

TCEQ

Field Operations Support Division

Kyle Girten

Lead NPS QA Specialist

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

Water Quality Planning Division

Kerry Niemann, Team Leader

NPS Program

Responsible for management and oversight of the TCEQ NPS Program. Oversees the development of QA guidance for the NPS program to be sure it is within pertinent frameworks of the TCEQ. Monitors the effectiveness of the program quality system. Reviews and approves all NPS projects, internal QA audits, 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.

Anju Chalise

NPS Project Quality Assurance Specialist

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

Rebecca Ross

NPS Data Manager

Responsible for coordination and tracking of NPS data sets from initial submittal through NPS Project Manager review and approval. Ensures that data is reported following instructions in the Surface Water Quality Monitoring Data Management Reference Guide (January 2010, or most current version). Runs automated data validation checks in SWQMIS and coordinates data verification and error correction with NPS Project Managers' data review. Generates SWQMIS summary reports to assist NPS Project Managers' data reviews. Provides training and guidance to NPS and Planning Agencies on technical data issues. Reviews QAPPs for valid stream monitoring stations. Checks validity of parameter codes, submitting entity code(s), collecting entity code(s), and monitoring type code(s). Develops and maintains data management-related standard operating procedures for NPS data management. Serves on planning team for NPS projects.

Houston-Galveston Area Council

Justin Bower

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.

Jean Wright

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. Conducts laboratory inspections. Develops, facilitates, and conducts monitoring systems audits.

William Hoffman

H-GAC Data Manager

Responsible for acquiring all field and lab data from local partners and organizations performing special studies for H-GAC. Responsible for ensuring that field data are properly reviewed and verified. Coordinates and maintains records of data verification and validation. Responsible for the transfer of basin quality-assured water quality data to the TCEQ in the Event/Result file format specified in the TCEQ Data Management Reference Guide (DMRG). Maintains quality-assured data on H-GAC

internet sites. Ensures data are submitted according to workplan specifications. Provides the point of contact for the TCEQ Data Manager to resolve issues related to the data.

Pam Hickman (Eastex)

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.

Daniel Bowen (Eastex)

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.

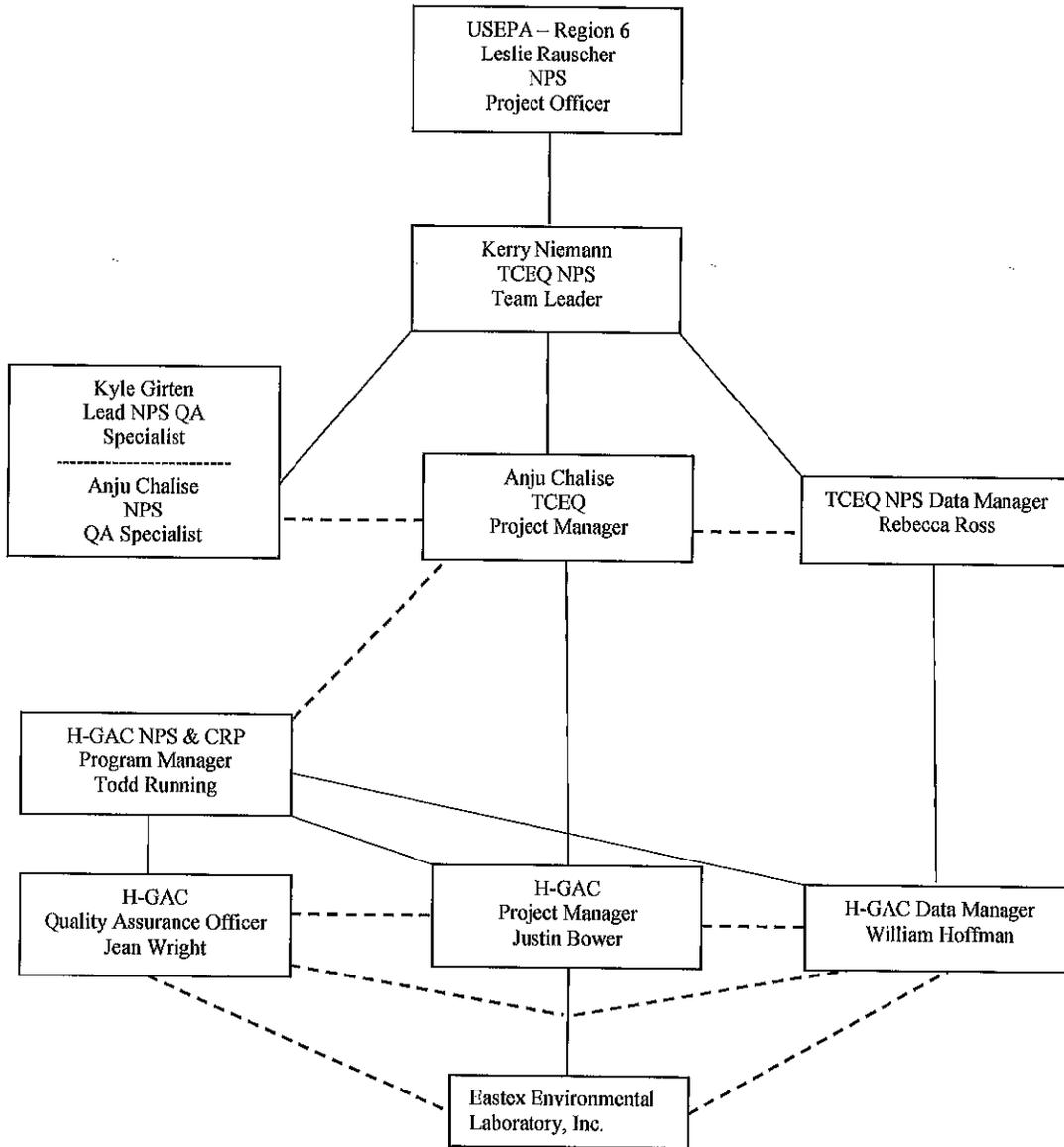
U.S. EPA Region 6

Leslie Rauscher

EPA Project Officer

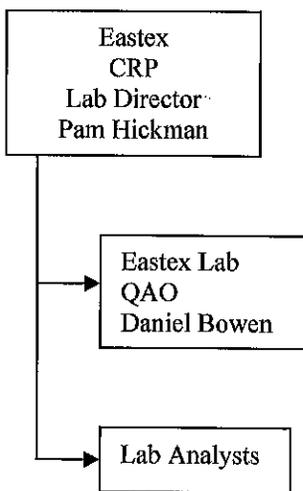
Responsible for managing the CWA Section 319 funded grant on the behalf on EPA. Assists the TCEQ in approving projects that are consistent with the management goals designated under the State's NPS management plan and meet federal guidance. Coordinates the review of project work plans, draft deliverables,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

Figure A4.1 Organization Chart - Lines of Communication



Lines of Management ———
 Lines of Communication - - - - -

Figure A 4.2 Eastex Environmental Laboratories, Inc. - Organizational Chart



A5 PROBLEM DEFINITION/BACKGROUND

The area of northern Harris County adjacent to the northern boundary of the City of Houston has experienced widespread issues with bacterial contamination in local waterways and drainage conveyances. This contamination, rising from a variety of sources including malfunctioning OSSFs (On-Site Sewage Facilities), domestic and pet animal wastes, and urban wildlife, has led to violations of the state water quality standard for contact recreation in the majority of these water bodies. Due to concern among local and county leaders and residents, high-interest areas in Harris County Precinct 2 were identified for further evaluation. The Westfield Estates Community was prioritized as an area of high concern and was the subject of an initial Failing Septic System Initiative (FSSI) in 2007, a collaborative effort between the HGAC, the Galveston Bay Estuary Program (GBEP) and Harris County Precinct 2 (HCPCT2). The final report of this study indicated that the levels of bacteria in the drainage ditches of Westfield Estates were in a range that posed an acute risk to human health. Additionally, the drainage ditches discharge to the adjacent Halls Bayou, contributing to its bacterial impairment.

In response to these findings, a Watershed Protection Plan (WPP) process was initiated for the Westfield Estates Watershed (Watershed) in 2008. The Watershed is defined in the WPP as the drainage area comprised of the linear stormwater ditches in the community and the area that drains to them, up to the discharge point to Halls Bayou. There are no existing monitoring sites in these ditches, although the adjacent Halls Bayou has existing sites in close proximity upstream and downstream of the Watershed. The watershed is a densely developed, urban residential area, with some light industry (primarily small-scale automotive businesses) within its borders and some commercial activity at its boundaries. The goal of the project is to reduce the levels of bacteria in the drainage ditches of the Watershed to the greatest degree practicable through the implementation of a variety of best management practices (BMPs) and other measures. A suite of implementation activities were selected by community stakeholders as part of the WPP process. While the study identified both human and nonhuman sources as causes of the bacterial impairment, the focus of structural measures was placed primarily on mitigating the direct, concentrated inputs of malfunctioning septic systems through limited OSSF remediation, low-flow devices to decrease overflows from OSSFs, and trash reduction where feasible to reduce pooling. Nonhuman sources were to be addressed primarily through educational measures and pet waste BMPs. The TCEQ entered into an implementation contract with the HGAC in 2009 to begin the implementation of the WPP pending the approval of its final draft. Funding for the implementation phase of the WPP is provided by a CWA 319(h) grant administered through the TCEQ and local match from the HGAC, GBEP, HCPCT2, Harris County Public Infrastructure Division (HCPID), East Aldine Management District (EAMD), Sunbelt Freshwater Supply District (FWSD), and various other local organizations.

To provide a baseline for measuring the effectiveness of the proposed management measures, the WPP called for a round of pre- and post-implementation sampling. The objective of these sampling efforts is to determine the baseline of current bacterial contamination through pre-implementation sampling and then determine the effectiveness of implemented BMPs through post-implementation sampling.

The linear ditches that comprise the water bodies of the Watershed are primarily ephemeral and their volume is subject to precipitation events. Previous monitoring efforts have targeted standing pools of water in dry weather. However, these pooling areas (in which the primary source of bacteria is hypothesized to be input from malfunctioning OSSFs or direct sewage /grey water discharges) are not constant. Pooling is subject to the presence of sedimentary barriers, trash accumulation, and the deteriorated nature of the drainage system and therefore may be subject to shifting locations. Remediation

of OSSFs and human source inputs may further exacerbate this issue by reducing or eliminating dry weather flows all together. In this case, the absence of dry weather pooling may itself be an indicator of progress.

Due to the dynamic nature of watersheds and multiple variables, some uncertainty is to be expected when a Watershed Protection Plan is developed and implemented. As the recommended restoration measures of the Watershed Protection Plan are put into action, it will be necessary to track the water quality response over time and make any needed adjustments to the implementation strategy. Data collected during this project will be used to demonstrate the effectiveness of the BMPs as required by EPA guidelines. This demonstration will be accomplished by evaluating the efficiency of pollutant removal after the implementation of the implementation activities. This process will be especially variable in the Westfield Estates Watershed given the unique nature of its linear ditches as the target water bodies. As described above, the dry weather sampling of the standing pools may be hampered if these pools are reduced. Additionally, the potentially dynamic nature of the pool location may require a certain degree of flexibility in site selection for dry weather sampling.

The specific sampling methodologies and procedures needed to address the sampling needs of this watershed in a manner suited to rigorous scientific quality standards are described in this document. The purpose of this Quality Assurance Project Plan (QAPP) is to clearly delineate the sampling plan, H-GAC's QA policy, management structure, and procedures which will be used to implement the QA requirements necessary to verify and validate the water quality data collected in associated with the BMPs which are initiated through this project. The QAPP is reviewed by the TCEQ to help ensure that data generated for the purposes described above are scientifically valid and legally defensible. This process will ensure that data collected under this QAPP and submitted to TCEQ have been collected and managed in a way that guarantees its reliability and therefore can be used as deemed appropriate by the TCEQ.

A6 PROJECT/TASK DESCRIPTION

The objective of the project is to evaluate the effectiveness of implemented BMPs in reducing bacterial contamination in the linear drainage ditches of the Westfield Estates Watershed. This objective will be accomplished by collecting and analyzing water samples taken directly from the linear ditches within the Watershed and comparing results pertaining to bacterial contamination prior and subsequent to implementation activities. The results from the second (post-implementation) round of sampling will be evaluated against comparable data from the first (pre-implementation) round of sampling to determine if there is an improvement in water quality pertaining to bacterial contamination. This objective is intended to assess water quality improvement to support EPA Performance Activity Measures under the Clean Water Act 319(h) grant program.

Five wet-weather sites have been selected at the outlets of the drainage ditches on the eastern half of the Watershed to which drainage for the entire project area flows. Dry weather sampling will take place at the same locations, or in available pooled areas located within the same block as the wet-weather sites, during dry weather conditions. During each of the two rounds of sampling (pre- and post-implementation) the five wet weather sites will be sampled two times for a total of 10 samples each sampling round, for a total of 20 wet weather samples, taken during wet weather conditions. During each of the two rounds of sampling (pre- and post-implementation) the five dry weather sites (i.e. a pool at the wet weather site or within the same block as the corresponding wet weather site) will be sampled two times for a total of 10 samples each sampling round for a total of 20 dry weather samples, taken during dry weather conditions.

Therefore, the total samples for each round of sampling will be 20, yielding a total of 40 samples. The sampling will take place during state fiscal year 2012 as part of TCEQ nonpoint source contract 582-9-77098. The efficiency of the BMPs will be measured by reduction in indicator bacteria (*E. coli*) in the samples from the linear drainage ditches.

The data from the pre- and post-implementation sampling will be compared; however, no other data from previous efforts or ambient sampling from adjacent Halls Bayou will be compared for this effort. The ultimate objective of the project is to conduct BMP effectiveness monitoring to assess progress toward meeting the WPP goals.

Project Task Descriptions

1. Develop and obtain an approved QAPP for the Watershed Protection Plan sampling activities
 - a. Wet and dry-weather water quality monitoring in the Watershed (before and after implementation of BMPs) will be covered by this QAPP.
2. Conduct monitoring
 - a. Pre-implementation monitoring will be conducted during wet (2 events) and dry weather (2 events) prior to implementation of BMPs.
 - b. Post-implementation monitoring will be conducted during dry (2 events) and wet weather (2 events) after initial implementation of BMPs.

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

See Section B1 for monitoring to be conducted under this QAPP. See Figure B1.1 for monitoring site locations.

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 QAPP 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

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

No routine water quality monitoring will be conducted under this QAPP. Only biased wet and dry weather monitoring events will be conducted to assess BMP effectiveness.

The BMP effectiveness sampling events are a form of systematic monitoring in that the assessments will be conducted for a limited amount of time and at a limited number of sampling locations. This information will be made available to TCEQ for inclusion in SWQMIS. The objective of the BMP monitoring is to determine effectiveness of the BMPs implemented during this project. The suite of parameters includes *E. coli* bacteria and flow (where possible) . There are several tasks associated with this objective.

1. Conduct initial BMP location surveys as per the procedures in the WPP. Structural BMP locations will be based on owner approval of remediation of malfunctioning OSSFs, installation of low flow devices, or dissemination of pet waste containers. Behavioral BMPs such as education and workshops will not be location specific.
2. Prior to implementation of BMPs, one round of pre-implementation monitoring will be conducted during which two wet weather and two dry weather events will be monitored. Samples will be collected at all locations or all locations able to be sampled, based on existence of pools during dry weather. During each wet weather sampling event, flow will be estimated from an average ditch depth/volume and a location specific flow. Given the relatively uniform character of the ditches, these measurements will be assumed to be characteristic of the entire ditch. During each dry weather sampling event, volume will be estimated from standing pool dimensions and assumed slope.
3. Install/conduct BMPs on an ongoing basis. Structural BMPs will be installed, upon owner approval, throughout the watershed on an ongoing basis (currently through fiscal year 2012). Behavioral BMPs (primarily educational meetings, community events and presentations) will be conducted at regular intervals throughout the project period (FY 12).
4. Subsequent to the implementation of structural BMPs and the initiation of behavioral measures, a second round of (post-implementation) sampling will be conducted at the same locations (as is practicable given flow conditions) and same conditions (two samples in both dry and wet weather events) as the pre-implementation sampling described in 2.

5. Manage and analyze the data.

6. Present results of monitoring effort to TCEQ and the project stakeholders.

The measurement performance specifications to support the project purpose for a minimum data set are specified in Table A7.1 and in the text following. The table has been modified to reflect actual parameters, methods, etc. employed by H-GAC and Eastex Environmental Laboratory. Procedures for laboratory analysis are in accordance with the most recently published edition of Standard Methods for the Examination of Water and Wastewater, 40 CFR 136.

Table A7. 1 Measurement Performance Specifications for the Houston-Galveston Area Council

PARAMETER	UNITS	MATRIX	METHOD	PARAMETER CODE	AWRL	Limit of Quantitation (LOQ)	LOQ CHECK STANDARD %Rec	PRECISION (RPD of LCS/LCSD)	BIAS %Rec. of LCS	LAB
Field Parameters measured and collected by H-GAC										
Water Clarity (if no secchi)	1-excellent 2-good 3-fair 4-poor	water	TCEQ	20424	NA*	NA	NA	NA	NA	Field
Days since last significant rainfall	days	NA	TCEQ SOP V1	72053	NA*	NA	NA	NA	NA	Field
Present Weather	1-clear 2-partly cloudy 3-cloudy 4-rain 5-other	NA	NA	89966	NA*	NA	NA	NA	NA	Field
Flow, Instantaneous	cfs	water	TCEQ SOP V1	00061	NA*	NA	NA	NA	NA	Field
Flow measurement method	1-gage 2-electric 3-mechanical 4-weir/flume 5-doppler	water	TCEQ SOP V1	89835	NA*	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
Maximum Pool Width at Time of Study	Meters	other	TCEQ SOP V2	89864	NA*	NA	NA	NA	NA	Field
Maximum Pool Depth at Time of Study	Meters	other	TCEQ SOP V2	89865	NA*	NA	NA	NA	NA	Field
Pool Length	Meters	other	TCEQ SOP V2	89869	NA*	NA	NA	NA	NA	Field

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

PARAMETER	UNITS	MATRIX	METHOD	PARAMETER CODE	AWRL	Limit of Quantitation (LOQ)	LOQ CHECK STANDARD %Rec	PRECISION (RPD of LCS/LCSD)	BIAS %Rec. of LCS	LAB
Conventional and Bacteriological Parameters										
Collected by H-GAC and Analyzed by Eastex Environmental Lab										
<i>E. coli</i> , IDEXX Colilert	MPN/100 mL	water	SM 9223-B	31699	1	1	NA	0.5*	NA	Eastex
holding time, <i>E. coli</i> , IDEXX Colilert	hours	water	NA	31704	NA	NA	NA	NA	NA	Eastex

* 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.

References for Table A7.1:

United States Environmental Protection Agency (USEPA) "Methods for Chemical Analysis of Water and Wastes" Manual #EPA-600/4-79-020
American Public Health Association (APHA), American Water Works Association (AWWA), and Water Environment Federation (WEF), "Standard Methods for the Examination of Water and Wastewater," 20th Edition, 1998. (Note: The 21st edition may be cited if it becomes available.)
TCEQ SOP, V1 - TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods for Water, Sediment, and Tissue, 2008 (RG-415).

Ambient Water Reporting Limits (AWRLs)

The AWRL establishes the reporting specification at or below which data for a parameter must be reported to be compared with freshwater screening criteria. The AWRLs specified in Table A7.1 are the program-defined reporting specifications for each analyte and yield data acceptable for the TCEQ's water quality assessment. A full listing of AWRLs can be found at <http://www.tceq.state.tx.us/compliance/monitoring/crp/qa/index.html>. The limit of quantitation is the minimum level, concentration, or quantity of a target variable (e.g., target analyte) that can be reported with a specified degree of confidence. The following requirements must be met in order to report results to H-GAC:

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

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

Precision

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

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

Laboratory precision is assessed by comparing replicate analyses of laboratory control samples in the sample matrix (e.g. deionized water, sand, commercially available tissue) or sample/duplicate pairs in the
NPS Rev 1.2

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

Bias

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

Representativeness

Site selection, the appropriate sampling regime, the sampling of all pertinent media according to TCEQ SOPs, and use of only approved analytical methods will assure that the measurement data represents the conditions at the site. This project will include a bias towards rainfall events. Sites chosen will be representative of conditions in all the linear ditches.

Completeness

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

Comparability

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

Analytical Quantitation

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

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

A8 SPECIAL TRAINING/CERTIFICATION

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

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

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

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

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).

A9 DOCUMENTS AND RECORDS

The documents and records that describe, specify, report, or certify activities are listed below in Table A9.1. Any of these documents may be requested for review during a monitoring systems audit. Document and record retention times vary between local partners. A table is provided for each partner agency. Documents such as QAPPs, field and laboratory SOPs, and copies of laboratory QMs, are retained for a minimum of 5 years after the close of the project. Project records (e.g., QAPP distribution documentation, field notebooks and data sheets, laboratory data reports/results, etc.) are retained for a minimum of 2 years after the close of each 2 year contract cycle or the end of the specific project. Laboratory Records are retained in accordance with the NELAC standards.

Table A9.1 Project Documents and Records: H-GAC

Document/Record for H-GAC	Location	Retention (yrs)	Format
QAPPs, amendments and appendices	TCEQ / H-GAC	7+	Electronic & Paper
Local Agency QAPP commitment letters	TCEQ / H-GAC	7+	Paper
Local Partner Field SOPs	H-GAC	7+	Paper
Documentation regarding review and verification of local partner laboratory Quality Assurance Manuals (QMs)	H-GAC	7+	Paper

Document/Record for H-GAC	Location	Retention (yrs)	Format
Documentation regarding review and verification of local partner laboratory Standard Operating Procedures (SOPs)	H-GAC	7+	Paper
QAPP distribution documentation	H-GAC	7+	Paper
Copies of Local Partner Field notebooks or data sheets	H-GAC	7+	Paper
Copies of Local Partner Chain of custody records	H-GAC	7+	Paper
Corrective Action Documentation	H-GAC	7+	Electronic & Paper
H-GAC Field SOPs	H-GAC	7+	Electronic & Paper
H-GAC Field Equipment Calibration & Maintenance Logs	H-GAC	7+	Paper
H-GAC Field Data Sheets or Notebooks	H-GAC	7+	Paper
H-GAC Chain of Custody Records	H-GAC	7+	Paper

Laboratory Test Reports

Test/data reports from the laboratory must document the test results clearly and accurately. Routine data reports should be consistent with the NELAC standards (Section 5.5.10) and include the information necessary for the interpretation and validation of data. The requirements for reporting data and the procedures are provided.

Eastex is the contract lab for analyzing field monitoring. The final lab data for that program is submitted to H-GAC's Data Manager to be reformatted as needed for submission to TCEQ. Eastex reports include the following items.

- 1) The title "Test Report" or other identifying statement (the lab offers several report formats);
- 2) Name and address of laboratory, and phone number with name of contact person;
- 3) A unique identification number and the total number of pages, with all pages sequentially numbered;
- 4) Name and address of client;
- 5) Description and unambiguous identification of the sample(s) including the client identification code;
- 6) Identification of results for any sample that did not meet sample acceptance requirements;
- 7) Date of receipt of sample, date and time of sample collection, and time of sample preparation and/or analysis if the required holding time for either activity is less than or equal to 48 hours;
- 8) Identification of the test method used;
- 9) If the laboratory collected the sample, reference to sampling procedure (grab or composite);
- 10) Any deviations from, additions to or exclusions from SOPs, and any conditions that may have affected the quality of results, and including the use and definitions of data qualifiers;
- 11) Measurements, examinations and derived results, supported by tables, graphs, sketches and photographs as appropriate, and any failures identified; identification of whether data are

- calculated on a dry weight or wet weight basis; identification of the reporting units such as ug/l or mg/kg;
- 12) Clear identification of all test data provided by outside sources, such as subcontracted laboratories, clients, etc.;
 - 13) Clear identification of numerical results with values below the Reporting Limit, and
 - 14) Identification of accreditation status per analysis.

If the Eastex summary reports do not include all the above information, it is still available at the laboratory or in the complete lab report.

Regardless, reports should be consistent with the NELAC standards and should include any additional information critical to the review, verification, validation, and interpretation of data. This should be based on the process that has been worked out with H-GAC and is documented in Section D1 and D2 of this document.

Lab data reports are received from the lab with which H-GAC contracts directly for laboratory services. The contract lab, Eastex Environmental, mails lab reports to H-GAC's data manager for all results from the sampling program. The H-GAC data manager reviews the reports and inputs the data into the appropriate database. Below are abbreviated explanations of the data review process for:

- Data processed at Eastex Environmental Lab go through a multi-level review. Initially the data is reviewed for completeness by a technician familiar with the analysis. The data is then entered into the LIMS where the QC is reviewed by the department technical director. Once this is complete the QAO reviews the data for adherence to the specific QAPP requirements. Data is reported in a hard copy format and electronically in EXCEL with appropriate QC and a summary report is sent electronically to H-GAC.

Electronic Data

H-GAC's contract laboratory submits data to H-GAC electronically. Each data set is submitted with a completed Data Review Checklist (Appendix C).

H-GAC performs data entry for the field data collected by their program and reformats electronic data received from the laboratory. The individual who collected the data inputs the data to an EXCEL spreadsheet. All supporting QA data is input to spreadsheets as well. The field QAO and the Project Manager review more than 10% of the data for accuracy, completeness, and reasonableness.

Eastex sends their data in an EXCEL spreadsheet format. Upon arrival at H-GAC, the data manager begins the data review process by merging and preparing all data in either an Access database or EXCEL spreadsheet. The Data Manager works with a SAS Operator to electronically format, review, and screen the data for reporting errors, outliers, unreasonableness, and several other data relationships. The entire process is described in H-GAC's Data Management Procedures (Appendix F).

After H-GAC completes data management processes for each data set, a completed Data Summary Report/Sheet (see example in Appendix C) will be submitted. The Data Summary Report/Sheet will include information from the Data Review Checklist as well as information about what was done to the data by H-GAC before it was submitted to TCEQ.

Data is submitted electronically to the TCEQ in the Event/Result file format described in the most current version of the *Surface Water Quality Monitoring Data Management Reference Guide* (DMRG, January 2010). A completed Data Summary Report/Sheet (see Appendix C) will be submitted with each data submittal. This Data Summary identifies all the actions that were taken in regards to this data. Explanations can range from why data is missing or was removed, to confirming outliers..

H-GAC will submit a station location request (SLOC) directly to the TCEQ Data Manager through SWQMIS for each sampling site to obtain a station identification number. Wet weather sampling sites, as described in Sections A6 and B1, will be set locations, and SLOCs will be submitted for these locations prior to sampling. If flow or pooling at these locations is not present in dry weather sampling events (also described in the aforementioned sections) and representative pools are not located in allowable distances from the established SLOC, a SLOC request will be submitted for the location actually sampled. In this instance, the SLOC will be submitted retroactive to the sampling event. The TCEQ Project Manager should be copied on all the correspondence throughout the process. The TCEQ Project Manager will ensure that entity-GAC actually requests SLOCS before submitting any data to the TCEQ. In the event that a SLOC request is necessary for a dry-weather site (as per Section B1), H-GAC will submit the SLOC prior to submitting data to SWQMIS.

For the purposes of verifying which entity codes are included in this QAPP, a table outlining the entities that will be used when submitting data under this QAPP is included below.

Table A9.2 Project Documents and Records: H-GAC

Name of Monitoring Entity	Tag Prefix	Submitting Entity	Collecting Entity	Monitoring Type Code
<i>Houston-Galveston Area Council</i>	<i>I</i>	<i>HG</i>	<i>HG</i>	<i>BF</i>

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

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

B1 SAMPLING PROCESS DESIGN (EXPERIMENTAL DESIGN)

The sample design rationale for the first part of the study (pre-implementation round) is based on the intent to demonstrate baseline levels of indicator bacteria (*E. coli*) and field parameters

during both wet- and dry-weather conditions in the linear drainage ditches in the Watershed prior to the implementation of the BMPs. The second part of the study (post-implementation round) is based on the intent to make a preliminary assessment of whether there is a water quality improvement in the linear drainage ditches following the installation of the BMPs. Each round of study will include two (2) wet and two (2) dry weather events to evaluate the bacterial concentrations under each condition.

The Watershed has distinct sources specific to each weather condition. Contributions from failing OSSFs are prevalent in dry weather while animal waste contaminated runoff is prevalent in wet weather. Therefore, both pre-and post-implementation rounds of sampling will monitor conditions under both wet and dry weather events. "Wet weather event" will be taken to mean a time period within 24 hours after an inch of rainfall is recorded at the nearest rainfall gauge. "Dry weather event" will be taken to mean an event sampled prior to which there has been an antecedent period of at least 72 hours without rainfall, as recorded at the nearest rainfall gauge.

Wet Weather Sites

The linear ditches drain eastward to outlets that discharge to Halls Bayou east of Shady Lane. Wet weather sites were selected based on the best available outfall for the five primary residential streets in the Watershed. Hopper Road, which has curb and gutter drainage, and Lone Oak and Trenton Roads, whose drainage either continues north to Kowis Street or drains commercial area, are being excluded because no BMPs will be implemented in these areas. The outlets represent the last point in the Watershed prior to discharge to Halls Bayou. The sites are designated, from north to south, as W1-W5.

Dry Weather Sites

Dry weather sites are given as pooled water located at the wet weather site, within an allowable distance based on SLOC location requirements, or, failing the availability of the preceding options, representative pools located on the same blocks and streets for which a wet weather site was designated. A representative pool will be defined as standing water of sufficient depth to be sampled given the methods and requirements put forth in this QAPP. For example, the dry weather sample for the Cromwell Outfall site (W2) will be taken in a representative pool located in the 2400 block of Cromwell Street immediately preceding the sampling site. Pooling locations in dry weather are not constant due to changing conditions such as large trash/debris, varying inputs from OSSFs, etc. Therefore, dry weather samples will be taken from pooled areas closest to the wet weather sample site within the identified street block. Dry weather site-areas are referred to by the wet weather site with a "D" suffix (e.g., W1D for the dry weather site-area corresponding to site W1) within project documentation, though they may require a separate SLOC request. In the event that flow or pooling at dry weather locations is not present in dry weather sampling events and representative pools are not located in allowable distances from the established SLOC, a SLOC request will be submitted for the location actually sampled. Because the exact coordinates of these pool locations cannot be known prior to approval of the QAPP, SLOCs for these dry-weather pool sites will be

submitted retroactive to the sampling event. H-GAC will request these SLOCs prior to submitting data to SWQMIS. H_GAC will ensure that all appropriate location data is gathered at the time of the sample, to guarantee that the SLOC request can be properly submitted and approved. Attempting to pre-select these sites is not a viable option based on varied pooling patterns in the ditches, based on presence or absence of large refuse, OSSF inputs, and other factors.

The monitoring site locations are shown in Figure B1.1. Wet weather monitoring sites are specified in table B1.1 and dry weather monitoring sites are specified in Table B1.2. Site specific photos are contained in Appendix A.

Figure B1.1 – Westfield Estates Watershed Monitoring Locations

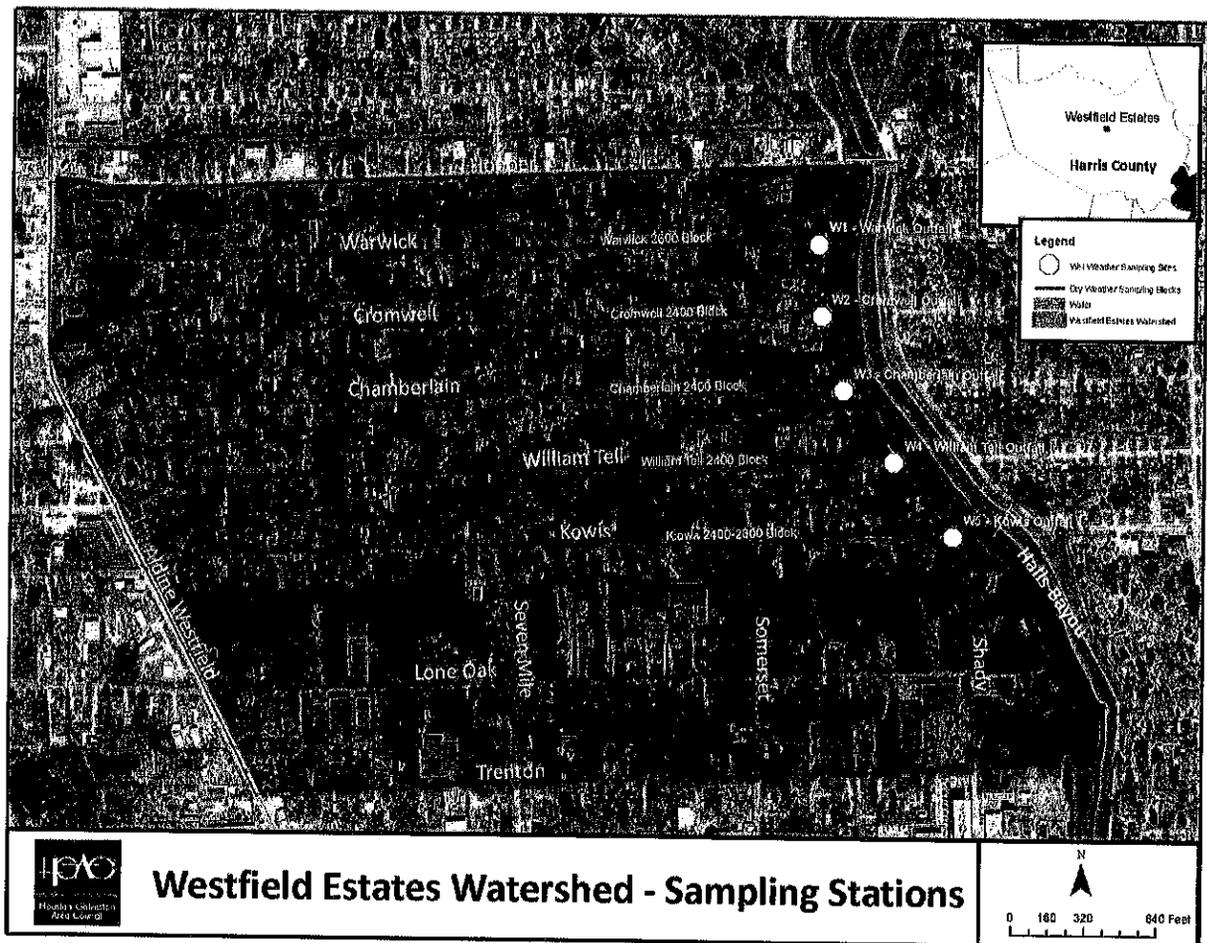


Table B1. 1 - Wet Weather Monitoring Sites

Station Description	Site ID	Latitude/ Longitude	Start Date	End Date	Sample Matrix	Monitoring Frequencies (per year)		
						Pre- implementation Round	Post- Implementati on Round	Comments
Warwick Outfall	W1	29.87861/ -95.34463	12/16/1 1	8/31/12	Water	2	2	Dependant on rainfall.
Cromwell Outfall	W2	29.87774/ -95.34466	12/16/1 1	8/31/12	Water	2	2	Dependant on rainfall.
Chamberlain Outfall	W3	29.87687/ -95.34438	12/16/1 1	8/31/12	Water	2	2	Dependant on rainfall.
William Tell Outfall	W4	29.87599/ -95.34367	12/16/1 1	8/31/12	Water	2	2	Dependant on rainfall.
Kowis Outfall	W5	29.87511/ -95.34294	12/16/1 1	8/31/12	Water	2	2	Dependant on rainfall.

Table B1. 2 - Dry Weather Monitoring Sites

Station Description	Site ID	Latitude/ Longitude	Start Date	End Date	Sample Matrix	Monitoring Frequencies (per year)		
						Pre- implementation Round	Post- Implementati on Round	Comments
Warwick 2400 Block	W1D	Variable	12/16/1 1	8/31/12	Water	2	2	Dependant on available pools.
Cromwell 2400 Block	W2D	Variable	12/16/1 1	8/31/12	Water	2	2	Dependant on available pools.
Chamberlain 2400 Block	W3D	Variable	12/16/1 1	8/31/12	Water	2	2	Dependant on available pools.
William Tell 2400 Block	W4D	Variable	12/16/1 1	8/31/12	Water	2	2	Dependant on available pools.
Kowis 2400-2600 Block	W5D	Variable	12/16/1 1	8/31/12	Water	2	2	Dependant on available pools.

Wet and dry weather events samples taken during the pre-implementation round of sampling will be compared to the post-implementation round to determine whether the implementation of BMPs has reduced indicator bacteria levels in the drainage ditches.

B2 SAMPLING METHODS

Field Sampling Procedures

Field sampling will be conducted according to procedures documented in the *TCEQ Surface Water Quality Monitoring Procedures Volume 1: Physical and Chemical Monitoring Methods for Water, Sediment, and Tissue, 2008.(RG-415)*. In the case when water is flowing in the ditch, samples will be collected akin to samples collected from a flowing stream. In the event there is no flowing water in the ditch, or for dry weather events, samples will be collected from the middle of pools, taking special care not to disturb substrate. The same rules regarding depth of field measurements as found in SWQM will be applied to both wet and dry weather sampling events. Flow during wet weather sampling events will be

measured using a handheld Doppler unit with top-setting wading rod. Flow will not be collected during dry weather sampling events. Container types, expected sample volumes, preservation requirements, and holding time requirements are specified in Table B2.1.

Sample volume, container types, minimum sample volume, preservation requirements, and holding time requirements. The specific information for each analytical test collected by H-GAC is provided in Tables B2.1. Samples will be placed in ice immediately upon collection for transport to the lab.

Table B2.1 BMP Effectiveness Sample Storage, Preservation, and Handling Requirements for the Houston-Galveston Area Council (H-GAC)

Parameter	Matrix	Container	Preservation	Sample Volume	Holding Time
<i>E. coli</i> IDEXX	water	Sterile Plastic	Cool to 4°C	120 mL	6 hours

Sample Containers

Information about H-GAC sample containers is described below.

Houston-Galveston Area Council (H-GAC)

Disposable, sterile, 120 mL plastic bottles are used for bacteriological samples.

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.

Documentation of Field Sampling Activities

Field sampling activities are documented on field data sheets as presented in Appendix D. Flow worksheets are part of the field data record. The following will be recorded for all visits:

1. Station ID
2. Sampling Date
3. Location
4. Sampling depth
5. Sampling time
6. Sample collector's name/signature
7. Values for all field parameters
8. Detailed observational data, including:
 - water appearance
 - weather
 - biological activity
 - unusual odors
 - pertinent observations related to water quality or stream uses (e.g., exceptionally poor water quality conditions/standards not met; stream uses such as swimming, boating, fishing, irrigation pumps, etc.)
 - watershed or instream activities (events impacting water quality, e.g., bridge construction, livestock watering upstream, etc.)

- specific sample information (number of sediments grabs, type/number of fish in a tissue sample, etc.)

Recording Data

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

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

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

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

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

B3 SAMPLE HANDLING AND CUSTODY

Sample Tracking

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

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

1. Date and time of collection
2. Site identification
3. Sample matrix
4. Number of containers
5. Preservative used
6. Was the sample field filtered
7. Analyses required
8. Name of collector
9. Custody transfer signatures and dates and time of transfer

10. Bill of lading (*if applicable*)

Sample Labeling

Samples from the field are labeled on the container or on a water proof label with an indelible marker. Label information includes:

1. Site identification
2. Date and time of collection
3. Sample type (i.e., analysis(es)) to be performed

Sample Handling

Upon collection, H-GAC immediately immerses 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. Samples are transferred to a lab courier who signs the chain of custody form and transports the samples to the lab. After the samples arrive, the 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 laboratories supporting H-GAC's monitoring entities are described in the Quality Management Plans (QMP) kept on file with H-GAC. References for the Eastex lab procedures are listed in the following table.

Table B3. 1 Sample Handling References

Monitoring Entity	Reference to Sample Handling
Houston-Galveston Area Council	H-GAC's Standard Operating Procedures (SOP) Manual for Conducting Surface Water Quality Monitoring references the most current TCEQ Surface Water Quality Monitoring Procedures Manuals Volume 1 & 2 plus specific SOP's additional/pertaining to H-GAC monitoring activities only.
Eastex Environmental Laboratory	Eastex Environmental Laboratory QM, Rev. 14, June 8, 2011, covers samples relinquished to the lab.

Sample Tracking Procedure Deficiencies and Corrective Action

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

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

B4 ANALYTICAL METHODS

The analytical methods, associated matrices, and performing laboratories are listed in Table A7.1 of Section A7. The authority for analysis methodologies under the Clean Rivers Program is derived from the TSWQS (§307.1 - 307.10) in that data generally are generated for comparison to those standards and/or criteria. The Standards state that "Procedures for laboratory analysis will be in accordance with the most recently published edition of *Standard Methods for the Examination of Water and Wastewater*, the latest version of the *SWQM Procedures, Volume 1: Physical Methods for Water, Sediment, and Tissue*, 40 CFR 136, or other reliable procedures acceptable to the Executive Director."

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

Standards Traceability

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

Analytical Method Deficiencies and Corrective Actions

Deficiencies in field and laboratory measurement systems involve, but are not limited to such things as instrument malfunctions, failures in calibration, blank contamination, quality control samples outside QAPP defined limits, etc. In many cases, the field technician or lab analyst will be able to correct the problem. If the problem is resolvable by the field technician or lab analyst, then they will document the problem on the field data sheet or laboratory record and complete the analysis. If the problem is not resolvable, then it is conveyed to the Lab QAO, who will make the determination and notify H-GAC's QAO. If the analytical system failure may compromise the sample results, the resulting data will not be reported to the TCEQ. The nature and disposition of the problem is reported on the data report which is sent to the H-GAC's Data Manager. The H-GAC Project Manager or his designated representative will include this information in the CAP and submit with the Progress Report which is sent to the TCEQ Project Manager.

The definition of and process for handling deficiencies and corrective action are defined in Section C1. TCEQ will include data from this project in SWQMIS.

B5 QUALITY CONTROL

The minimum Field QC Requirements are outlined in the *TCEQ Surface Water Quality Monitoring Procedures*. Specific requirements are outlined below. Field QC sample results are submitted as required with the laboratory data report (see Section A9.).

Laboratory Measurement Quality Control Requirements and Acceptability Criteria

Batch – A batch is defined as environmental samples that are prepared and/or analyzed together with the same process and personnel, using the same lot(s) of reagents. A **preparation batch** is composed of one to 20 environmental samples of the same NELAC-defined matrix, meeting the above mentioned criteria

and with a maximum time between the start of processing of the first and last sample in the batch to be 25 hours. An **analytical batch** is composed of prepared environmental samples (extract, digestates or concentrates) which are analyzed together as a group. An analytical batch can include prepared samples originating from various environmental matrices and can exceed 20 samples.

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

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

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

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

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

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

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

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

Quality Control or Acceptability Requirements Deficiencies and Corrective Actions

Sampling QC excursions are evaluated by the H-GAC Project Manager, in consultation with the H-GAC QAO. In that differences in sample results are used to assess the entire sampling process, including environmental variability, the arbitrary rejection of results based on pre-determined limits is not practical. Therefore, the professional judgment of H-GAC's Project Manager and QAO will be relied upon in

evaluating results. Rejecting sample results based on wide variability is a possibility. Notations of field split excursions are noted in the quarterly report and the final QC Report.

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

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

B6 INSTRUMENT/EQUIPMENT TESTING, INSPECTION AND MAINTENANCE

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

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

B7 INSTRUMENT/EQUIPMENT CALIBRATION AND FREQUENCY

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

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

B8 INSPECTION/ACCEPTANCE OF SUPPLIES AND CONSUMABLES

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

B9 NON-DIRECT MEASUREMENTS

Data obtained for use in this sampling effort is limited to existing GIS data used for refining, and obtaining latitude and longitude data for, site locations.

GIS data to be used are 2004 and 2005 NAIP (National Agricultural Imagery Program) aerial photos.

Existing Clean Rivers Programs monitoring sites (Stations 11126, 11127, 17490 and 20455) have previously been used for casual comparisons of flow, bacteria levels, etc. in Halls Bayou, to which the Watershed ultimately drains, and the Watershed. However, the comparative volumes between the small acreage and drainage of the Watershed and the relatively much larger watershed and flow for Halls Bayou

(especially in wet weather conditions) make further comparison unlikely to produce usable results. References to these sites will only be used for location and in reference to historical comparisons. No data from these sites will be used specifically for this monitoring effort, although the monitoring from these sites may be referenced in the scope of the greater WPP project.

Because most historical data is of known and acceptable quality and were collected and analyzed in a manner comparable and consistent with needs for this project, no limitations will be placed on their use, except where known deviations have occurred.

B10 DATA MANAGEMENT

Data Management Process

Data is received by H-GAC directly from Eastex lab. The paragraph below gives a brief description of their data submission process.

When data is created by or submitted to H-GAC, the data is saved in "Raw Data" folders. When H-GAC begins to process the data, it is saved into a "Working Data" folder. By changing the folder in which the data is saved, H-GAC always has the original data submittal in electronic format. Data is processed by H-GAC's Data Manager, a SAS Operator, and H-GAC's QAO before being provided to TCEQ. Following data verification and validation, the data are exported from the interim database into the Event/Result format required for submission to TCEQ's SWQMIS (as described in the SWQM DMRG January 2010 or later version). Once TCEQ approval of the data is obtained, the data are loaded into SWQMIS by TCEQ data managers.. H-GAC's full data procedure, including data submitted to SWQMIS, is shown in the flow chart in Appendix F- Data Management Procedures.

H-GAC performs data entry for field data collected. The individual who collected the data inputs the data to an EXCEL spreadsheet. All supporting QA data is input to spreadsheets as well. The field QAO and the Project Manager review more than 10% of the data for accuracy, completeness, and reasonableness.

H-GAC receives lab data from Eastex Lab in hard copy and electronic versions. The data is typed into a new format in an EXCEL spreadsheet by either a temporary employee or the Data Manager and is saved in the "RAW Data" files. It is reviewed for accuracy and completeness by either the Data Manager or QAO (but not the person who performed the original data entry).

Either a temp or the Data Manager (DM) begins the task of merging the field and lab data files. The merged file is saved in a "WORKING Data" file. When a dataset is fully merged, it will be provided to TCEQ.

H-GAC's Data Management Flow Chart describes the entire data management process. Data manipulation through the merging task will be the only part applicable to data collected under this QAPP.

Data Errors and Loss

H-GAC stores original electronic data as "Raw Data" files. These files are saved in the original format and other than changing the name of a file, remains unchanged. Any changes to a data file are saved in the "Working Data" folders. In these folders, data is merged and formatted.

Copies of e-mails and communications with Eastex are to be printed and attached to the data set for traceability.

Details of Eastex Lab protocols for data reduction and review are described in their Laboratory Quality Assurance Manual, Revision 14, June 8, 2011, Sections 8.1.

Record Keeping and Data Storage

As each data set is processed by H-GAC, all hard copies of data and/or field forms are organized into packets. All correspondences or reports related to the data set are to be printed and placed in the packet of information. Any other documentation related to that specific data set is also to be attached. Each packet of information is placed in a file storage box for long term storage.

H-GAC creates electronic data along with hard copies of field sheets and COC forms. 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 or file boxes for use as needed. Data more than 2 years old is sent for off-site storage according to H-GAC procedures. All data is maintained for at least seven (7) years by H-GAC and Eastex Lab.

Details of the Eastex Lab Electronic Record Storage system is described in the Laboratory's Quality Assurance Manual, Revision 14, June 8, 2011, Sections 8.4.

Data Dictionary

Terminology and field descriptions are included in the SWQM DMRG (2010 or most recent version).

Data Handling, Hardware, and Software Requirements

H-GAC maintains several networked computers to store and manage data. All computers are equipped with at least Windows XP and Office 2007 which includes MS Excel 2007 and MS Access 2007. The data manager's computer also includes Oracle 9 to assist with screening, management and reformatting the data to TCEQ's specifications. Additionally, the SAS software is available on the DM's and SAS Operator's computers.

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.

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.

C1 ASSESSMENTS AND RESPONSE ACTIONS

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

Table C1.1 - Assessments and Response Requirements

Assessment Activity	Approximate Schedule	Responsible Party	Scope	Response Requirements
Status Monitoring Oversight, etc.	Continuous	H-GAC Project Manager	Monitoring of the project status and records to ensure requirements are being fulfilled.	Report to TCEQ in Quarterly Report
Laboratory Inspections	Dates to be determined by the TCEQ lab inspector	TCEQ Lab Inspector	Analytical and quality control procedures employed at the laboratory and the contract laboratory	30 days to respond in writing to the TCEQ to address corrective actions
Monitoring Systems Audit	Dates to be determined by TCEQ	TCEQ QAS	The assessment will be tailored in accordance with objectives needed to assure compliance with the QAPP. Field sampling, handling and measurement; facility review; and data management as they relate to the NPS Project	30 days to respond in writing to the TCEQ to address corrective actions
Monitoring Systems Audit	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 the contractor QAO to address corrective actions
Site Visit	Dates to be determined by TCEQ	TCEQ PM	Status of activities. Overall compliance with work plan and QAPP	As needed

In addition to those listed above, the following assessment and response actions will be applied to modeling activities. As described in Section B9 (Non-direct Measurements), modeling staff will evaluate data to be used in calibration and as model input according to criteria discussed in Section A7 will follow-up with the various data sources on any concerns that may arise.

Corrective action is required to ensure that conditions adverse to quality data are identified promptly and corrected as soon as possible. Corrective actions include identification of root causes of problems and successful correction of identified problem. Corrective Action Reports (Appendix H) will be filled out to document the problems and the remedial action taken. Copies of Corrective action reports will be included with the quarterly report.

Software requirements, software design, or code are examined to detect faults, programming errors, violations of development standards, or other problems. All errors found are recorded at the time of inspection, with later verification that all errors found have been successfully corrected.

Corrective Action Process for Deficiencies

Deficiencies are any deviation from the QAPP, SWQM Procedures Manual, SOPs, or Data Management Reference Guide. Deficiencies may invalidate resulting data and may require corrective action. Corrective action may include for samples to be discarded and re-collected. Deficiencies are documented in logbooks, field data sheets, etc. by field or laboratory staff. It is the responsibility of the H-GAC's Project Manager, in consultation with H-GAC's QAO, to ensure that the actions and resolutions to the problems are documented and that records are maintained in accordance with this QAPP. If the deficiencies involve data, then H-GAC's Data Manager will be enlisted to handle matters pertaining to the

data. In addition, these actions and resolutions will be conveyed to the TCEQ Project Manager both verbally and in writing in the project progress reports and by completion of a corrective action plan (CAP).

Corrective Action

Corrective Action Plans (CAPs) Corrective Action Plans should:

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

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

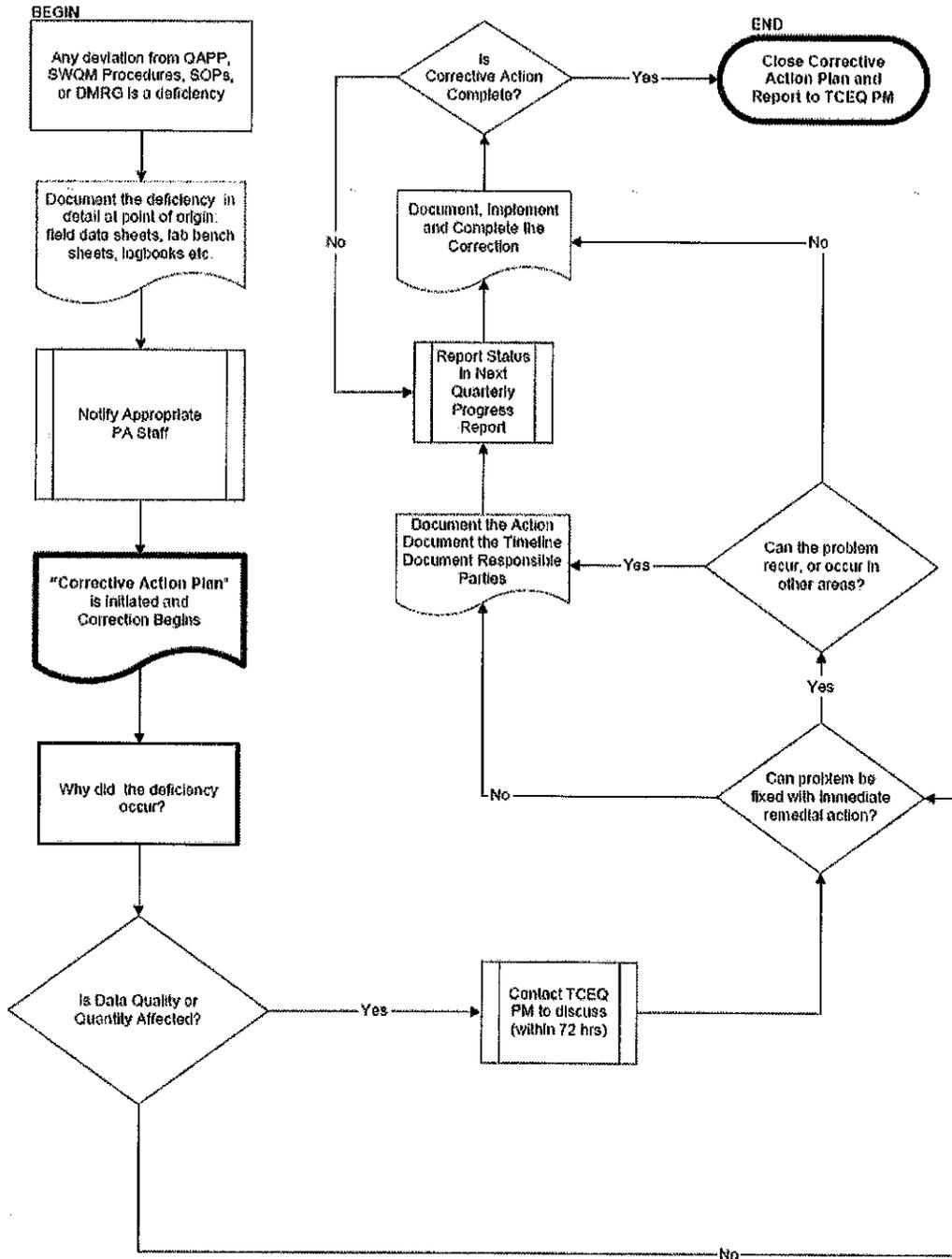
Status of Corrective Action Plans will be included with quarterly progress reports. In addition, significant conditions (i.e., situations which, if uncorrected, could have a serious effect on safety or on the validity or integrity of data) will be reported to the TCEQ immediately.

The H-GAC Project Manager or QAO is responsible for implementing and tracking corrective actions. Records of audit findings and corrective actions are maintained by the H-GAC Project Manager or QAO. Audit reports and corrective action documentation will be submitted to the TCEQ with the Progress Report.

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

Figure C1.1 Corrective Action Process for Deficiencies

Corrective Action Process for Deficiencies



C2 REPORTS TO MANAGEMENT

The table below lists all the reports that are generated by the H-GAC. The reports are described in greater detail in the sections following the table.

Table C2.1 QA Management Reports

Type of Report	Frequency (daily, weekly, monthly, quarterly, etc.)	Projected Delivery Date(s)	Person(s) Responsible for Report Preparation	Report Recipients
Quarterly project reports & invoices from subcontractors	Quarterly	Within 10 days of end of quarter	Subparticipant's project manager	TCEQ Project Mgr
Staff meeting	Weekly	Verbal updates only	team members	Program Mgr & staff
Nonconformance & Corrective Action Reports	As needed			TCEQ Project Mgr
TCEQ Monthly Progress Report	Monthly	15 th day of the month	H-GAC Project Mgr	TCEQ Project Mgr
Monitoring System Audit Report & Response	Once per contract period			TCEQ Project Mgr
Data Review checklists	With data delivery	As needed	Local Partner & sub contractors	H-GAC Data Mgr
Data Summary Report/Sheet	With data delivery	As needed	Data Manager	TCEQ Project Mgr

Reports to H-GAC Project Management

The H-GAC QAO is required to report the status of implementation of the procedures discussed in this project plan and, thereby, the status of data quality.

After evaluation of the information collected and review of data submitted, the H-GAC QAO will either investigate suspected problems with the data or complete information for the Data Summary Sheet that accompanies the data submittal to TCEQ. This information will be transmitted by the H-GAC's QAO to the H-GAC Program Manager and the H-GAC Data Manager when data is submitted. This information will then be reported to the TCEQ Project Manager and TCEQ Quality Assurance Specialist by means of quarterly progress reports as required.

Reports to TCEQ Project Management

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

Progress Report - Summarizes H-GAC's activities for each task; reports monitoring status, problems, delays, and status of 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.

Data Review Checklist and Summary – Contains basic identifying information about the data set and comments regarding inconsistencies and errors identified during data verification and validation steps or problems with data collection efforts (e.g. Deficiencies).

Contractor Evaluation – 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

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

The procedures for verification and validation of data are described in Section D2 below. The H-GAC Data Manager is responsible for ensuring that field data are properly reviewed, verified, and submitted in the required format to the TCEQ for storage in SWQMIS. Likewise, the Eastex Lab Manager is responsible for ensuring that laboratory data are reviewed, verified, and submitted in the required format to be loaded into SWQMIS. 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 of this document.

Data review, verification, and validation will be performed using self-assessments and peer and management review as appropriate to the project task. The data review tasks to be performed by field and laboratory staffs are listed in the first column of Table D2.1. Whether one or both of those groups perform each task is listed in the 2 middle columns, respectively. Potential errors are identified by examination of documentation and by manual and 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 the higher level project management to establish the appropriate course of action or the data associated with the issue are rejected and not reported to the TCEQ. 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's Data Manager and/or QAO. Data review, verification, and validation tasks to be performed on the data set include, but are not limited to, the confirmation of laboratory and field data review, evaluation of field QC results, additional evaluation of anomalies and outliers, analysis of sampling and analytical gaps, and confirmation that all parameters and sampling sites are included in the QAPP.

The Data Review Checklist (See Appendix C) covers three main types of review: data format and structure, data quality review, and documentation review. Information from the lab's Data Review Checklist is transferred to H-GAC's Data Summary Report/Sheet and submitted to the TCEQ with the water quality data to ensure that the review process is being performed.

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

If any requirements or specifications of the project are not met, based on any part of the data review, the responsible party should document the nonconforming activities and submit the information to H-GAC's Data Manager with the data. This information is communicated to the TCEQ by H-GAC in the Data Summary (See Appendix C).

Table D2. 1 Data Review Tasks for H-GAC's Monitoring Program

H-GAC Data to be Verified	Field Task	Laboratory Task (Eastex Lab)	Lead Organization Data Manager Task
Sample documentation complete; samples labeled, sites identified	H-GAC QAO	Sample Custodian.	
Field QC samples collected for all analytes as prescribed in the TCEQ <i>SWQM Procedures Manual</i>	H-GAC QAO		
Standards and reagents traceable	H-GAC QAO	Lab QAO	
Chain of custody complete/acceptable	H-GAC QAO	Sample Cust.	H-GAC Data Mgr
NELAP Accreditation is current		Lab QAO	
Sample preservation and handling acceptable	H-GAC QAO	Sample Custodian.	
Holding times not exceeded		Lab QAO	H-GAC Data Mgr
Collection, preparation, and analysis consistent with SOPs and QAPP	H-GAC QAO	Lab QAO	
Field documentation (e.g., biological, stream habitat) complete	H-GAC QAO		
Instrument calibration data complete	H-GAC QAO	Lab QAO	
Bacteriological records complete		Lab QAO	
QC samples analyzed at required frequency	H-GAC QAO	Lab QAO	H-GAC Data Mgr
QC results meet performance and program specifications		Lab QAO	
Analytical sensitivity (Minimum Analytical Levels/Ambient Water Reporting Limits) consistent with QAPP		Lab QAO	
Results, calculations, transcriptions checked	H-GAC QAO	Technical Director	
Laboratory bench-level review performed		Head Technician	

H-GAC Data to be Verified	Field Task	Laboratory Task (Eastex Lab)	Lead Organization Data Manager Task
All laboratory samples analyzed for all parameters		Lab QAO	
Corollary data agree		Lab QAO	H-GAC Data Mgr
Nonconforming activities documented	H-GAC QAO	Lab QAO	H-GAC QAO
Outliers confirmed and documented; reasonableness check performed	H-GAC QAO	Lab QAO	H-GAC Data Mgr & H-GAC QAO
Dates formatted correctly	H-GAC Data Mgr		H-GAC Data Mgr
Depth reported correctly	H-GAC Data Mgr		H-GAC Data Mgr
TAG IDs correct	H-GAC Data Mgr		H-GAC Data Mgr
TCEQ Station ID number assigned	H-GAC Data Mgr		H-GAC Data Mgr
Valid parameter codes	H-GAC Data Mgr		H-GAC Data Mgr & H-GAC QAO
Codes for submitting entity(ies), collecting entity(ies), and monitoring type(s) used correctly	H-GAC Data Mgr		H-GAC Data Mgr
Time based on 24-hour clock	H-GAC Data Mgr		H-GAC Data Mgr
Absence of transcription error confirmed	H-GAC Data Mgr & H-GAC QAO	Technical Director	H-GAC Data Mgr
Absence of electronic errors confirmed	H-GAC Data Mgr & H-GAC QAO	Technical Director	H-GAC Data Mgr
Sampling and analytical data gaps checked (e.g., all sites for which data are reported are on the coordinated monitoring schedule)	H-GAC Data Mgr & H-GAC QAO		H-GAC Data Mgr & H-GAC QAO
Field QC results attached to data review checklist	H-GAC Data Mgr & H-GAC QAO		H-GAC Data Mgr
Verified data log submitted	H-GAC Data Mgr		H-GAC Data Mgr
10% of data manually reviewed	H-GAC Data Mgr & H-GAC QAO	Technical Director	H-GAC Data Mgr & H-GAC QAO

D3 RECONCILIATION WITH USER REQUIREMENTS

Data produced in this project, and data collected by other organizations (e.g., USGS, TCEQ, etc.), will be analyzed and reconciled with project data quality requirements. Data produced under this project will be forwarded to TCEQ staff for inclusion in SWQMIS.

Data collected under this monitoring effort will be used to evaluate the effectiveness of BMPs and other efforts implemented in the project area. A comparison of change in the pre- and post-implementation data will be generated to help understand the impact of the BMPs.

As part of the Westfield Protection Plan project, results of this monitoring effort may appear in reports, outreach activities and materials, and presentations related to that project. Specifically, the results will be presented to the stakeholders during each monitoring phase, and discussed in the Final Report (see Task 12 under the Scope of Work in Appendix B). Data will be shared with project partners and other entities as allowable under this QAPP and related requirements. It is not expected that the data will be widely shared outside of informing project partner activities within the project area.

APPENDIX A. AREA AND MONITORING SITE LOCATION MAPS

Figure AA1 – Watershed Project Area and Monitoring Locations

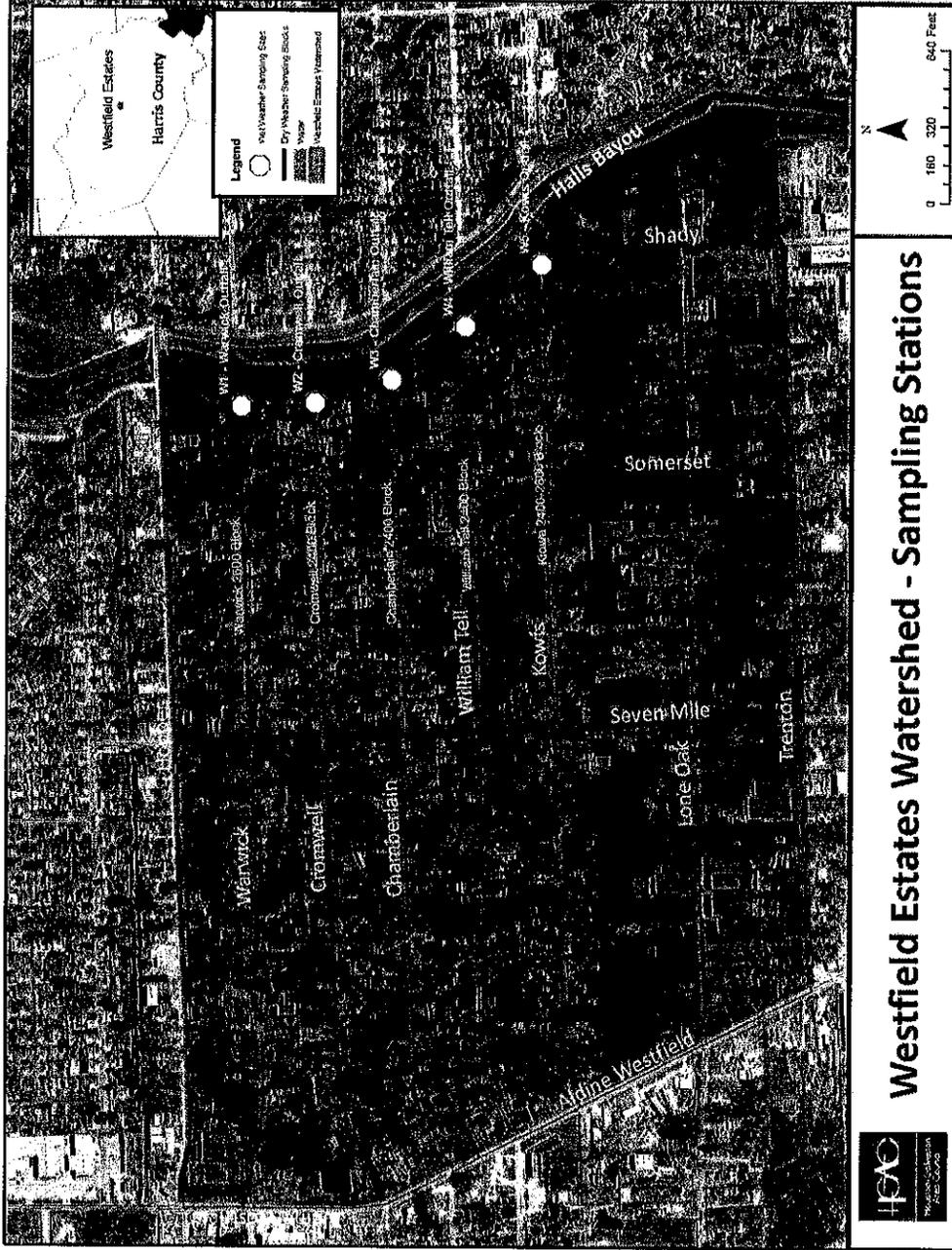
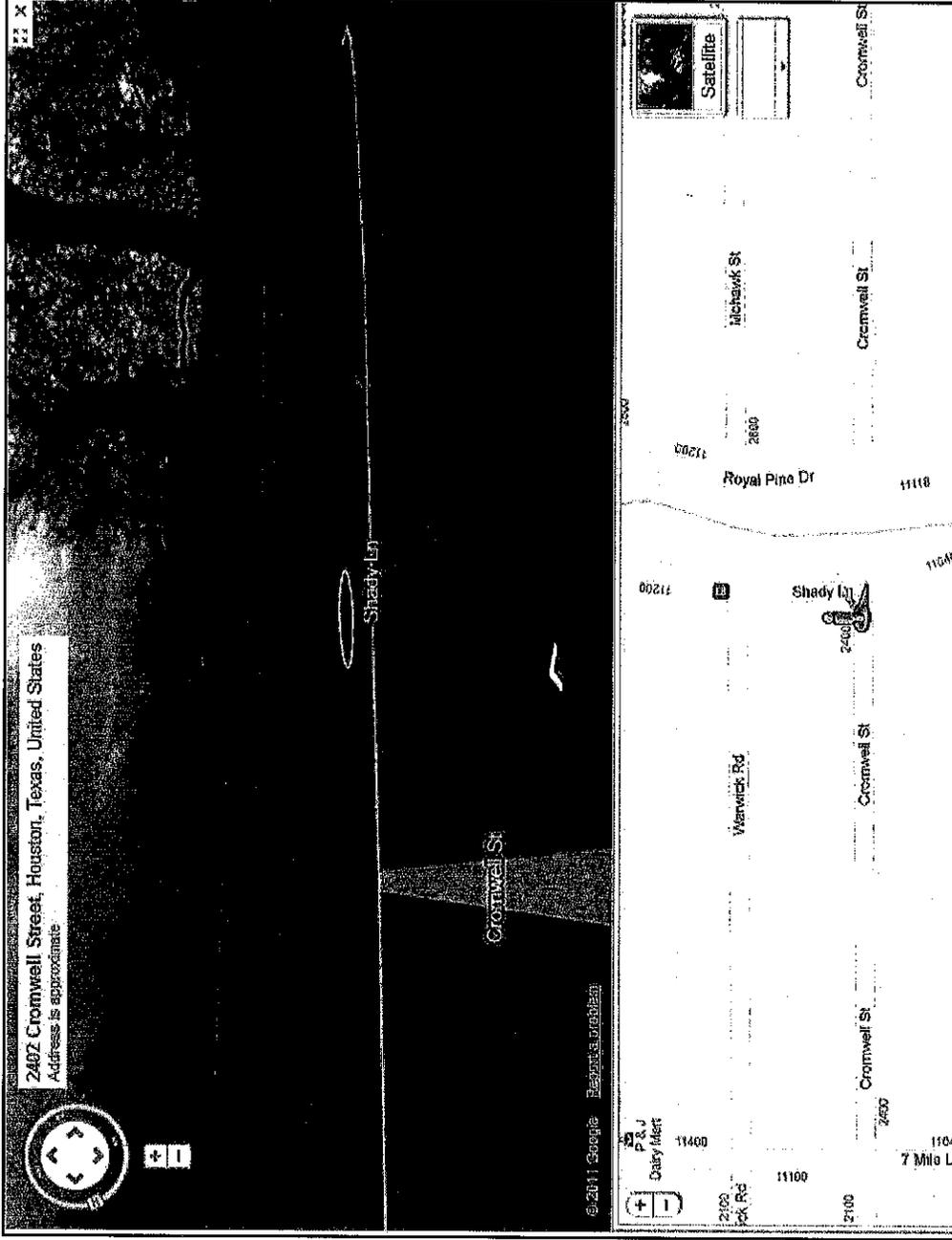
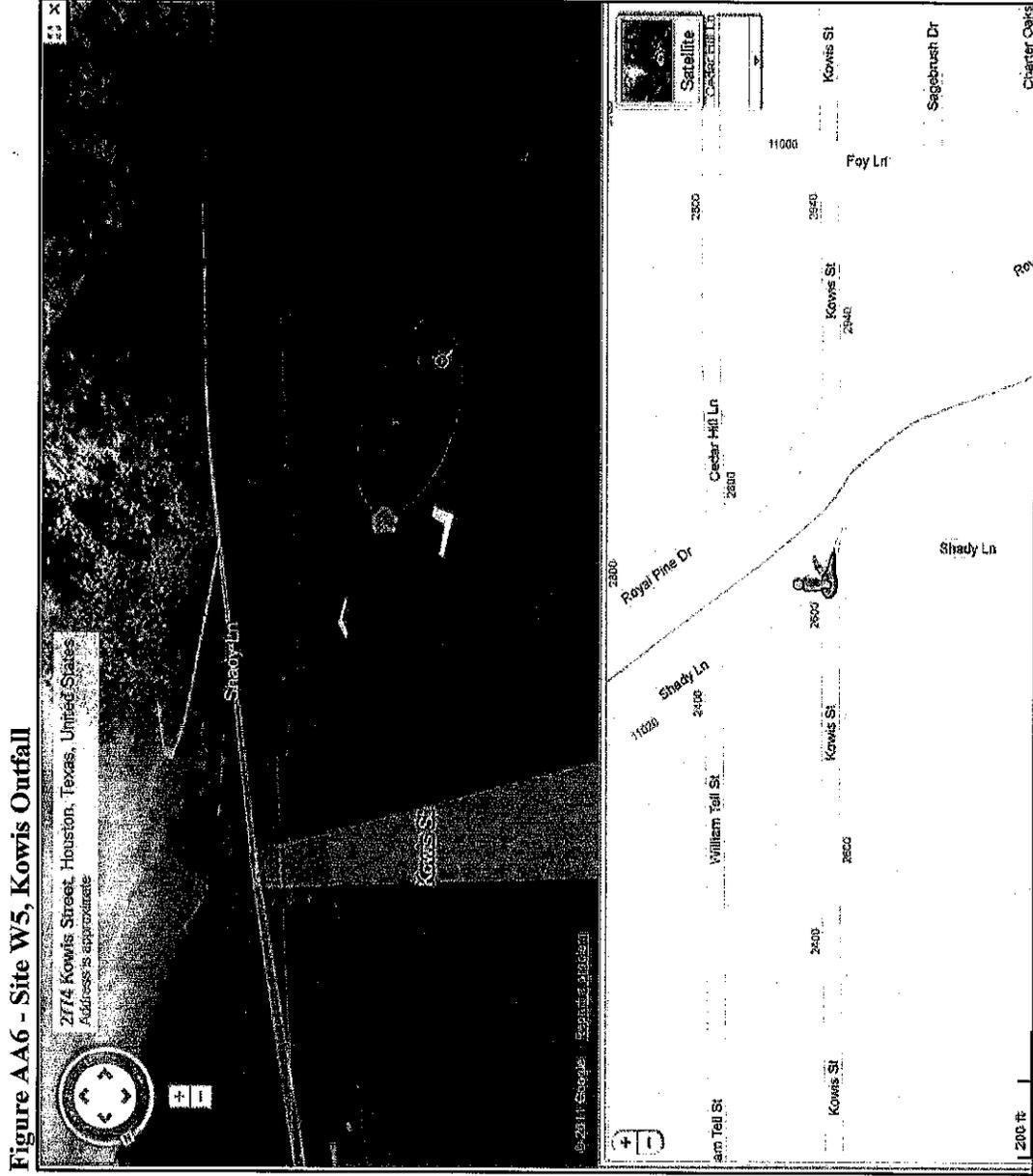


Figure AA3 - Site W2, Cromwell Outfall





Appendix B. Work Plan

Scope of Work

Problem/Need Statement:

The Westfield Estates Watershed is located in northeast Harris County, Texas adjacent to Halls Bayou. It is entirely within the East Aldine Management District (EAMD) and Harris County Precinct 2. The community of Westfield Estates, which covers the majority of the watershed, is served solely by on-site sewage facilities (OSSFs) and has an open ditch stormwater drainage system. Water quality monitoring in the ditches has indicated levels of bacteria orders of magnitude greater than the applicable contact recreational water quality standard, and represent a potential acute public health issue. Public concern led to the impetus for the development of a Watershed Protection Plan (WPP).

High numbers of septic system operation violations have occurred in the Watershed. Westfield Estates was identified as having the highest need for public sewer services in Harris County (Harris County Precinct 2 Study, 2007). Stagnant black-colored water is found in ditches during dry weather from which a strong "sewer" odor emanates. Elevated levels of bacteria (>100,000 MPN/100 ml) were found at most of the 20 sites examined in Westfield Estates in the first phase of this work, Failing Septic System Initiative Phase I, concluded in 2007; (Phase I). Bacteria in ditch water flows through street ditches in the watershed, especially during rain events (in which concentrations ranged from 11,800 to 141,000 MPN/100 ml). An appreciable amount (approximately 16% based on bacterial source tracking efforts) of the contamination comes from failing septic systems. However, Phase I indicates that a significant amount of bacterial contamination comes from non-human sources (84%), primarily chickens and dogs (50%), and other unknown sources (34%). Bacteria levels 6 to 600 times the Water Quality Standard both in the Westfield Estates Watershed and adjacent Halls Bayou may pose a potential for human illness.

Implementation of the permanent solution to the human bacterial source problem (municipal sewer service) is currently underway. However, this process is likely to take several years, and be subject to funding availability. Interim solutions, which emphasize use of best management practices (BMPs) for decreasing bacterial contamination from both human and non-human sources, described and implemented under a WPP, represent a viable option to reducing the bacteria load in the watershed.

Resident's participation in the Phase I Town Meeting and ongoing efforts was excellent and interest was high. A stakeholder's group, which includes elected officials with jurisdiction over the community, and other interested parties, has been established and is involved in developing a WPP for the area. Residents will continue to be actively engaged in project process and progress.

In addition to work within the Westfield Estates Watershed, monitoring and modeling will be conducted in the San Bernard Watershed and the Bastrop Bayou Watershed. The San Bernard River Watershed is located in several counties on the western edge of the Houston-Galveston Area Region, and has a mix of urban and rural land uses. A separate WPP is being developed for this area. The Bastrop Bayou Watershed is located in southern Brazoria County, and also has a mix of urban and agricultural land uses. A WPP has been developed for this area. These efforts will generate crucial data for addressing impairments in these watersheds, but will also help garner data on general effectiveness of BMPs used across WPPs. This scope also provides for facilitation of public participation for the Bastrop Bayou WPP.

General Project Description:

The Westfield Estates WPP proposes to identify, prioritize and implement suitable solutions to the human and nonhuman bacterial sources in the Watershed. These management measures will include structural (low-flow devices, pet waste devices) and nonstructural (education and outreach campaigns) elements. The BMPs and efforts to be implemented under this Scope of Work include:

- Widespread installation of low-flow devices in residential homes to reduce flow to failing OSSFs;
- Installation or sponsorship of pet waste composting or disposal facilities/equipment;
- Educational meetings on OSSF maintenance, pet waste disposal, watershed health, large trash disposal and/or other topics related to bacterial contamination;
- Community surveys to assess knowledge of issues in the Watershed; and
- Multimedia outreach efforts to promote program awareness and generate participation.

In the Westfield Estates WPP, the primary benefit from utilizing low-flow devices is a reduction of human source bacteria introduced into the watershed via overflows from failing OSSFs. This is complemented by a reduction of nonhuman source bacteria through pet waste reduction, education, and outreach. To monitor progress, bacteria levels will be determined by targeted pre- and post-implementation monitoring in the Watershed and ambient monitoring at locations on Halls Bayou above and below the watershed outfall(s) through the Clean Rivers Program (CRP). Additional success will be measured by a decrease in standing water in ditches and generally observable evidence of direct overflows (color, odor of water, etc.). A Community survey will be used to measure general growth in knowledge based on educational programs and outreach efforts. The ultimate solution for human bacteria in the Watershed will be the future installation of sanitary sewer service and/or curb and gutter storm water systems. The ultimate solution for nonhuman sources will be continued education and community outreach efforts.

Project deliverables include:

- Installation of low-flow devices in up to 250 homes in the Watershed;
- Development and implementation of outreach programs for OSSF care and maintenance, pet waste maintenance, and domestic animal waste maintenance;
- Gathered data on BMP effectiveness as measured by pre-and post-implementation monitoring and community surveys;
- Town Meetings two times per year initially, and as needed thereafter, to share progress of this project with watershed residents and project partners;
- A Final Town Meeting "Wrap-Up" of this project; and
- Formation of a permanent Stakeholder Advisory Group to facilitate efforts after the end of the project.

For the Bastrop Bayou WPP, H-GAC will provide ongoing facilitation of WPP development and/or updating, submittal and approval, and continued monitoring and modeling in support of implementation efforts. The project deliverables will include additional monitoring/modeling results, continued maintenance of a Stakeholder Advisory Group, facilitation of partner installation of watershed signage, and general education and outreach efforts through meetings, trash reduction events, and other means.

For the San Bernard WPP, H-GAC will conduct targeted monitoring and modeling to demonstrate BMP effectiveness, in conjunction with the concurrent WPP development project. The project deliverable of
NPS Rev 1.2

this task will be a dataset for local BMP effectiveness that can be applied to other current and future WPPs.

OBJECTIVE 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** - H-GAC's Project Manager will provide technical and fiscal oversight of H-GAC project staff and/or subgrantee(s)/subcontractor(s) to ensure tasks and deliverables are acceptable and completed as scheduled and within budget. With the TCEQ Project Manager's authorization, H-GAC may secure the services of subgrantee(s)/subcontractor(s) as necessary for technical support, repairs and training. Project oversight status will be provided to the TCEQ with the Quarterly Progress Reports.
- Task 1.2** Quarterly Progress Reports - H-GAC will submit Quarterly Progress Reports to TCEQ by the 15th of the month following each state fiscal quarter for incorporation into the Grant Reporting and Tracking System. Progress reports will contain a level of detail sufficient to document the activities that occurred under each task during the quarter, and contain a comprehensive tracking of deliverable status under each task. Quarterly Progress Reports will be distributed to all project partners.
- 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** - H-GAC will participate in a post-award orientation meeting with TCEQ within 60 days of contract execution. The H-GAC 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 Quarterly Progress Reports include:
- Requests for approval of activities or expenditures that are not specifically included in the Scope of Work;
 - Notification in advance of H-GAC scheduled public meetings or events, initiation of construction, or of other major task activities under this contract; and
 - Information regarding events or circumstances that may require changes to the budget, Scope of Work, or schedule of deliverables. Such information must be reported within 48 hours of discovering these events or circumstances.
- Task 1.5** **Contractor Evaluation** – H-GAC 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 Nonpoint Source (NPS) Projects Template. The fact sheet will briefly describe what the project is going to accomplish, give background information on why the project is being conducted, give the current status of the project and will list individuals involved in the project. The project fact sheet will be submitted to TCEQ within 60 days after receipt of the 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 H-GAC's website after approval from the TCEQ Project Manager.

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

Measures of Success: Adherence to TCEQ administrative requirements; timely completion and submittal of Quarterly Progress Reports and deliverables.

Deliverables:

- Minutes of Post Award Orientation Meeting
- Quarterly Progress Reports
- Reimbursement
- Communication Plan
- Contractor Evaluation
- Project Fact Sheet
- Annual Report Article

OBJECTIVE 2: WESTFIELD ESTATES STAKEHOLDER ADVISORY GROUP

Goal: To lead the community-based component of the WPP and Project.

Task 2.1 **Stakeholder Advisory Group Interface** - Utilizing the existing partner network, which includes local officials, county government, state and federal government, special interest groups, environmental groups, developers, and citizens, the Stakeholder Advisory Group will provide advice on WPP plan updates, Quality Assurance Project Plan (QAPP) amendments, Scope of Work, implementation phase, and community education. This group will work toward Community acceptance of the project, promoting continuing education, supporting maintenance programs, and BMPs. Meetings will be held on a regular basis. Additional stakeholders may be added to the group as the need and opportunity arises.

Task 2.2 **Stakeholder Advisory Group Meetings** - Holding meetings with the Stakeholder Advisory Group to establish priorities and focus of work effort. Meetings will be held on

a regular basis to provide the status of work progress to the group, and to obtain input on the next steps. Stakeholders will review and approve the plan prior to finalization.

Task 2.3 **Dissemination of Information on Project Status** - Using the Stakeholder Advisory Group meetings to disseminate project information. These meetings will be 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, as needed, to disseminate information on significant phases of the project.

Task 2.4 **Stakeholder Advisory Group Report** – Submitting regular updates documenting the status of Stakeholder Advisory Group meetings, outreach and educational activities and other Stakeholder Advisory Group activities. A summary will be included in the Final Report (Task 12).

Measures of Success: Stakeholder Advisory Group meetings held where information is disseminated, and dialogue and discussion of issues occur. Town meetings held to communicate information to and obtain feedback from the community.

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

- Stakeholder Advisory Group activities (e.g. announcements, agendas, minutes, or press releases);
- Changes to the Stakeholder Advisory Group operating structure;
- Changes in the Stakeholder Advisory Group membership;
- Official acceptance letter(s) from the Stakeholder Advisory Group approving the WPP upon transfer of responsibility to the permanent Stakeholder Advisory Group;
- 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; and
- Summary of the Stakeholder Advisory Group efforts in the Final Report.

OBJECTIVE 3: WATER QUALITY MONITORING, BACTERIA SOURCE IDENTIFICATION, DATA COLLECTION, VALIDATION, AND DETERMINATION OF EFFECTIVENESS OF CORRECTIVE MEASURES FOR WESTFIELD ESTATES WPP

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 pre-and post-implementation monitoring for the Westfield Estates WPP will be conducted under an approved QAPP as approved by TCEQ. Ambient monitoring in Halls Bayou will be conducted under the general QAPP for the Clean Rivers Program (CRP).

Task 3.2 **QAPP Amendments and Updates** – the QAPP will be revised as necessary. The H-GAC Project Manager will develop amendments as needed. The Project Manager will

submit an updated QAPP with project specific data quality objectives consistent with the *EPA Quality Assurance Project Plans (QA/R5)* format and the TCEQ Surface Water Quality Monitoring Procedures, Volume 1 and 2, to the TCEQ 45 days prior to the initiation of any data collection. TCEQ will provide comment and approval on the QAPP within 30 days of receipt of the amended QAPP. Updates will be on an annual basis, if needed, according to procedures in the QAPP.

Task 3.3 Water Quality Monitoring Plan – A Water Quality Monitoring plan was previously approved by the stakeholders. It will provide pre- and post-implementation data for ascertaining the effectiveness of BMP measures. The data will be used to determine the impact of BMPs over time at the watershed scale for the Westfield Estates WPP.

H-GAC monitors two CRP sites immediately upstream and downstream of the watershed inflows into Halls Bayou. Since improvements to water quality post-project may take several years to be fully apparent because of naturalization of bacteria and soil deposition, 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 and in the Final Report.

Task 3.4 Data Collection - Sampling sites in the watershed and sampling times will correspond to the greatest degree practicable to those used in the Phase I study. Additional sites may be added if necessary. Specific types of monitoring are described in the QAPP.

Task 3.5 Data Submittal - H-GAC will review, verify, and validate water quality monitoring data and will submit the data, in report form, to TCEQ at the conclusion of each sampling phase. This report will be included in the quarterly report following receipt of data from the laboratory and completion of QAPP audit of the data. The data will be submitted to TCEQ before it is presented at Town Meetings.

Ambient data collected quarterly under the CRP program will be submitted pursuant to TCEQ via CRP data reporting requirements. An annual summary will be provided to the TCEQ NPS group.

Measures of Success: Annual updates to the TCEQ and continuing conformance to QAPP provisions.

Deliverables: The following will be submitted with Quarterly Progress Reports if listed activity occurs within a particular quarter:

- QAPP update and input (annually)
- Water quality data submittal (CRP)
- Water quality monitoring non-conformances

OBJECTIVE 4: DETERMINATION OF MANAGEMENT MEASURES FOR WESTFIELD ESTATES WPP

Goal: Identify and quantify the 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 **Prioritization** - H-GAC will facilitate the final prioritization of potential BMPs with the Stakeholders advisory group.

Task 4.2 **Management Measures Summary** - H-GAC will prepare a description of community surveys and selected BMPs as part of the WPP, along with an implementation plan, to be included in an updated WPP.

Measures of Success: Selection of BMPs, inclusion in the WPP, and a community survey description under an implementation plan.

Deliverables: The following will be submitted with Quarterly Progress Reports if listed activity occurs within a particular quarter:

- Final BMP selection (as part of WPP/WPP updates)
- Management Measures Summary/Implementation Plan included in updated WPP

OBJECTIVE 5: IMPLEMENTATION OF STRUCTURAL MEASURES

Goal: Implement corrective measures to reduce bacterial contamination from OSSFs and pet/domestic animal waste.

Task 5.1 **Installation of Low-Flow Devices in Residences** - generate participants, procure supplies, and facilitate the installation of low-flow devices in up to 250 homes in the Watershed.

Task 5.2 **Installation of Pet Waste Reduction Program Elements** - generate participants, procure supplies, and facilitate installation of pet waste reduction program structural elements, to potentially include pet waste composting devices and/or community waste collection stations.

Task 5.3 **Remediation of Selected OSSFs** - coordinate with the EAMD and Harris County in a pilot program by which EAMD will select a few failed OSSFs to remediate, based on existing violations data and supported by inspections and other services from the County. H-GAC will help facilitate this element, which will be funded by contributions from the EAMD and in-kind services from the County.

Task 5.4 **Structural Corrective Measures Summary** - H-GAC will prepare a summary of efforts undertaken to implement structural measures as part of the Final Report (Task 12).

Measures of Success: Substantial participation in the pet waste reduction program and low-flow device program.

Deliverables: Updates on the implementation of structural measures will be included in Quarterly Progress Reports. The structural measures implemented will be submitted with Quarterly Progress Reports if implementation occurs within a particular quarter.

OBJECTIVE 6: IMPLEMENTATION OF BEHAVIORAL MEASURES FOR WESTFIELD ESTATES WPP

Goal: To reduce or affect behaviors that contribute to bacterial contamination through development and implementation of behavioral BMPs, including education and outreach programs and materials.

Task 6.1 **Develop Behavioral Program and Materials** - Create educational programs and materials on care and maintenance of OSSFs, proper pet waste and domestic animal waste disposal and/or composting, illegal dumping in ditches, and other educational topics related to the WPP.

Task 6.2 **Implementation of Behavioral Measures** - Hold public educational meetings based on these programs, and disseminate materials. Attend related community meetings to disseminate materials and speak to these topics where applicable. Provide materials for dissemination at other venues as appropriate.

Task 6.3 **Behavioral Measures Summary**-- H-GAC will prepare a summary on the development and implementation of behavioral measures as part of the Final Report (Task 12).

Measures of Success: Development of Behavioral Measure programs and implementation through public education and outreach meetings, dissemination of materials, and appearance at related community events.

Deliverables: Activities on the Implementation of Behavioral Measure will be included in the quarterly report. The following will be submitted with Quarterly Progress Reports if listed activity occurs within a particular quarter:

- Program(s) Developed
- Education and outreach materials and activities implemented
- Draft and Final Behavioral Measures Summary as part of the Final Report (Task 12)

OBJECTIVE 7: EDUCATION AND PUBLIC OUTREACH FOR WESTFIELD ESTATES WPP

Goal: Develop an information/education component that will be used to enhance public understanding of the project and encourage early and continued participation in selecting, designing, and implementing the NPS management measures proposed in the Westfield Estates WPP.

Task 7.1 **Project Education and Publicity** – H-GAC will implement Project promotion and education programs that are bilingual in nature where possible, and utilize multiple media resources. Notices for meetings and other events will be posted more than two weeks in advance. H-GAC will attempt to reach the broadest, most diverse, audience possible.

Task 7.2 **WPP Website** - Updates of Westfield Estates WPP on H-GAC's WPP 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://www.h-gac.com/westfield>)

Task 7.3 Education and Public Outreach Summary – H-GAC will prepare an education and public outreach summary describing the activities included in this task as part of the Final Report (Task 12).

Measures of Success: Awareness of this project in Community surveys, public participation in meetings and events, and regular WPP updates on H-GAC's webpage.

Deliverables: Education and public outreach activities will be included in the quarterly report. The following will be submitted with Quarterly Progress Reports if listed activity occurs within a particular quarter:

- Education and publicity materials
- Webpage Updates

OBJECTIVE 8: WESTFIELD ESTATES WPP UPDATE

Goal: Update the Westfield Estates WPP as needed.

Task 8.1 Update Plan - Updates based on information collected under this project, including stakeholder-based input, will be provided as the need arises.

Measures of Success: Plan updated as needed.

Deliverables: Activities for the quarter on the WPP updates will be included in the quarterly report. Westfield Estates WPP updates will be submitted with Quarterly Progress Reports if they occur within a particular quarter.

OBJECTIVE 9: MEASURE PROGRESS AND EFFECTIVENESS OF IMPLEMENTATION EFFORTS

Goal: To determine the effectiveness of the management measures implemented in the Watershed.

Task 9.1 Monitor Pre- and Post-Implementation - Monitor selected sites in the watershed in accordance with protocols in the QAPP, before and after implementation of management measures.

Task 9.2 Conduct Community Survey – Survey general community attitudes and knowledge of the project and issues in the Watershed before and after implementation/outreach.

Task 9.3 Quantify Water Quality Improvement - Determine decrease of bacteria in the watershed by indicator bacterial level reduction. Include qualitative factors as supplemental information.

Task 9.4 Summarize Effectiveness Monitoring – H-GAC will prepare a summary on pre- and post-implementation monitoring results, Halls Bayou ambient monitoring data, community surveys, and related indicators as part of the Final Report (Task 12).

Measures of Success: Collection and review of monitoring data to assess success of management measures on reducing bacterial water quality issues. Inclusion of data in the Final Report.

Deliverables: The following will be submitted with Quarterly Progress Reports if listed activity occurs within a particular quarter:

- Monitoring, data collection, and analysis pre- and post- implementation
- Community Survey results

OBJECTIVE 10: BASTROP BAYOU WPP

Goal: To facilitate the public involvement and outreach, ongoing monitoring and modeling assessment, and Plan review and update of the Bastrop Bayou WPP in Fiscal Year (FY) 2011. This task builds on work completed as part of the Bastrop Bayou WPP, as funded by TCEQ under FY 05/06 319 (h) Grant #99614611, Project # 1.22, and the Galveston Bay Estuary Program.

Task 10.1 Stakeholder Group Facilitation – H-GAC will facilitate an ongoing stakeholder group for the Bastrop Bayou WPP by holding regular stakeholder meetings in the Watershed, maintaining a stakeholder communication network, disseminating new information and updates, and receiving public input.

Task 10.2 Water Quality Assessment – H-GAC will conduct additional monitoring and modeling as necessary to support continued assessment of the Bastrop Bayou Watershed. This will include ambient monitoring and targeted monitoring as deemed necessary, and as referenced in a QAPP developed by H-GAC and approved by TCEQ prior to monitoring efforts.

Task 10.3 Implementation Coordination – H-GAC will assist project partners in coordinating specific management measures they will implement in the Watershed. This will include coordinating implementation of watershed signage, green infrastructure pilot projects, trash cleanup events, and any other management measures identified in the Bastrop Bayou WPP, as initiated by partners. Grant funding will support H-GAC staff time and documentation costs related to land acquisition, as specified in the Bastrop Bayou WPP. These costs include time in preparing grant applications, documentation costs related to preparing conservation easements, and staff time spent in pursuing these objectives through meetings with local partners and interested parties.

Task 10.4 Public Outreach and Education – H-GAC will continue to support the Bastrop Bayou WPP through outreach and education efforts including maintaining a project website, attending related meetings and events in the watershed, sponsoring trash cleanup events in the watershed, and disseminating information regarding the project to the public.

- Task 10.5** **WPP Update** – H-GAC will update the Bastrop Bayou WPP as needed based on TCEQ/EPA comment or approval, stakeholder input, or changes in local conditions. The Bastrop Bayou WPP will be updated after the end of FY 11 to reflect data collected and efforts conducted under this task.
- Task 10.6** **Bastrop Bayou Watershed Report** – H-GAC will prepare a Bastrop Bayou Watershed Report detailing the efforts completed under this Task.

Measures of Success: Engaged and active stakeholder group, provision of water quality data sufficient to support Plan objectives and assessment goals, well-coordinated efforts between watershed partners, and strong participation in WPP-related events.

Deliverables: The following will be submitted with Quarterly Progress Reports if listed activity occurs within a particular quarter:

- Stakeholder meeting materials and meeting summaries;
- Monitoring and Modeling results received in that time period;
- Summary of watershed partner activities related to the WPP;
- Public meeting and event materials and summaries; and
- A Bastrop Bayou Watershed Report.

OBJECTIVE 11: SAN BERNARD WATERSHED WATER QUALITY ASSESSMENT

Goal: To support concurrent WPP efforts in the San Bernard River Watershed through ambient and targeted water quality assessment efforts in FY 2012. This task builds on work being conducted by H-GAC for the TCEQ, under the FY 09 American Recovery and Reinvestment Act (ARRA) Grant # 96690301, Project # 5B.

- Task 11.1** **Water Quality Modeling** – H-GAC will conduct modeling based on existing ambient water quality monitoring to support WPP development and implementation efforts in the San Bernard River Watershed. Modeling efforts will be preceded by the development and TCEQ approval of a QAPP(s) under the aforementioned ARRA Grant and will focus on setting up a hydrologic model of the watershed, incorporating flow information, and conducting and evaluating tidal prism modeling. These modeling efforts will complement the modeling, including SELECT (or similar) source loadings quantification and projections of in-stream concentrations, which will occur under the existing ARRA contract under which the WPP is being developed. Results will be disseminated to groups and partners involved in efforts in the San Bernard Watershed.
- Task 11.2** **Water Quality Monitoring** – Subsequent to the development of an approved monitoring QAPP and approved San Bernard WPP, and prior to WPP implementation, H-GAC will conduct targeted monitoring of three prospective BMP sites. The monitoring will include at least 4 storm events per site, and will be submitted in a form acceptable to the Surface Water Quality Monitoring Information System (SWQMIS). This data will provide a baseline assessment of water quality conditions at these sites by which a comparison may be made to post-implementation monitoring. The targeted BMP monitoring, when compared against post-implementation data, will also provide generally applicable

information on BMP effectiveness for guiding future BMP/site selection in a range of projects.

Task 11.3 Water Quality Assessment Report – H-GAC will evaluate and summarize data collected and model results under this task in a San Bernard Water Quality Assessment Report.

Measures of Success: Water quality monitoring and modeling sufficient to support watershed protection efforts in the San Bernard River Watershed completed, outcomes evaluated and summarized in the Final Report (Task 12).

Deliverables: The following will be submitted with Quarterly Progress Reports if listed activity occurs within a particular quarter:

- Water quality monitoring results for three prospective BMP sites providing baseline data on bacteria and dissolved oxygen in at least 4 storm events per site, submitted in a form acceptable to SWQMIS;
- Water quality modeling design and predictive load reduction results for the proposed set of 3 high-priority BMPs in the WPP; and
- A San Bernard Water Quality Assessment Report.

OBJECTIVE 12: FINAL REPORT

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

Task 12.1 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 will include the following information in an 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 12.2 **Final Report** - Revise the Draft report to address comments provided by the TCEQ Project Manager.

Measures of Success: Acceptance of the report by TCEQ.

Deliverables:

- Final Draft Report
- Final Report

APPENDIX C. DATA REVIEW CHECKLIST AND SUMMARY

H-GAC Local Partner

Data Submittal Form and Data Review Checklist

Please complete this form, sign where applicable, and submit with copies of Field Sheets, Chain-of-Custody Forms and Lab Data Reports pertaining to 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 for inclusion in the State of Texas Surface Water Quality Monitoring (SWQM) database or included in the H-GAC Data Clearinghouse. This form applies to only those sampling sites listed in the Coordinated Monitoring Schedule for FY 2012 or FY2013.

Local Partner: _____

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 and/or laboratory results)

Field Data Review

List instrument(s) used to collect field measurements. _____

Was the instrument pre-calibrated before each sampling run? Yes ___ No ___
Explain why not. _____

Was an instrument post-calibration check performed within 24-hours after each use?
Yes ___ No ___
Explain why not. _____

Did all post-calibration checks pass? Yes ___ No ___

What were the minimum and maximum post-calibration errors for the field instrument? Please express as a range.
Dissolved Oxygen ($\pm 6\%$ saturation or ± 0.5 mg/L) _____
pH (± 0.5 standard units) _____
Specific Conductance ($\pm 5\%$ standard) _____
Temperature (± 1.0 °C, annual calibration check) _____
Depth (± 0.2 at 1 meter, annual calibration check) _____

Were all field parameters measured and 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 field sheets corrected using a single line with initials of person making the correction and date corrected? Yes ___ No ___
If no, explain. _____

Were empty sections of every field sheet closed-out with a diagonal line, initials and date closed-out? Yes ___ No ___

Were problems encountered while collecting any field measurements? Yes ___ No ___
Explain. _____

Were these problem(s) documented on the field sheets? Yes ___ No ___

Were 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 there any results (outliers) in this data set greater than the maximum screening value or less than the minimum screening value? Yes ___ No ___

Were outlier(s) documented on the field sheets? Yes ___ No ___

Were all chain-of-custody forms and/or field data sheets filled out completely and accurately? Yes ___ No ___

Were empty sections of every Chain of Custody form and/or field data sheet closed-out with a diagonal line, initials and date closed-out? Yes ___ No ___

Have 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 and completeness: _____

Print Name _____ *Signature* _____ *Date* _____

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 $4^{\circ}\text{C} \pm 2^{\circ}\text{C}$?
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 date closed-out?
Yes ___ No ___

Are all lab values reported consistent with the Limit of Quantitation (LOQ) for each parameter listed in Table A7.1 of the Regional QAPP or Special Studies QAPP? Yes ___ No ___

Explain if no _____

Have errors on lab sheets been corrected using a single line with initials of person making the correction and date corrected? Yes ___ No ___

Were empty sections of every lab sheet closed-out with a diagonal line, initials and 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.

- Are any ortho-phosphate phosphorus results greater than the companion total phosphorus result? Yes ___ No ___
- For bacteria densities that are too few or too numerous to count, are 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 results in the data set that "Best Professional Judgment" would indicate a possible error and an investigation is warranted? Yes ___ No ___
- Are there results in the data set which are part of a "hold time exceeded" or "did not pass QA" or "received hot, ___ °C" but could still be included in the set because a parameter does not require special handling? (i.e. 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 and results for accuracy and completeness:

Print Name _____ Signature _____ Date _____

Data Entry, Formatting and Table Structure

Are all sampling STARTTIMES and ENDTIMES data entered using
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 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 sample sites listed in the current QAPP, Coordinated Monitoring Schedule (CMS), or most recent
amendment included with 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/compliance/monitoring/crp/data/storet.html
"All Parameter Codes" for file: sw parm.txt for Mins and Maxs of every Parameter code)
Are all outliers confirmed, documented and identified so the H-GAC Data Manager
can review them? Yes ___ No ___
Are 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 data in the data set been reviewed against field and laboratory data sheets?
Yes ___ No ___

Additional comments about Data Entry, Formatting and Table Structure

Person who reviewed the database for accuracy and 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* _____

NPS DATA REVIEW CHECKLIST AND SUMMARY

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

QAPP Title: _____

Effective Date of QAPP: _____

Data Format and Structure	Y, N, or N/A
A. Are there any duplicate <i>Tag Id</i> numbers in the Events file?	
B. Do the <i>Tag</i> prefixes correctly represent the entity providing the data?	
C. Have any <i>Tag Id</i> numbers been used in previous data submissions?	
D. Are TCEQ station location (SLOC) numbers assigned?	
E. Are sampling <i>Dates</i> in the correct format, MM/DD/YYYY with leading zeros?	
F. Are the sampling <i>Times</i> based on the 24 hour clock (e.g. 13:04) with leading zeros?	
G. Is the <i>Comment</i> field filled in where appropriate (e.g. unusual occurrence, sampling problems, unrepresentative of ambient water quality)?	
H. <i>Submitting Entity, Collecting Entity, and Monitoring Type</i> codes used correctly?	
I. Are the sampling dates in the <i>Results</i> file the same as the one in the <i>Events</i> file for each <i>Tag Id</i> ?	
J. Are values represented by a valid parameter code with the correct units?	
K. Are there any duplicate parameter codes for the same <i>Tag Id</i> ?	
L. Are there any invalid symbols in the <i>Greater Than/Less Than (GT/LT)</i> field?	
M. Are there any <i>Tag Ids</i> in the <i>Results</i> file that are not in the <i>Events</i> file or vice versa?	
Data Quality Review	Y, N, or N/A
A. Are all the "less-than" values reported at the LOQ? If no, explain on next page.	
B. Have the outliers been verified and a "1" placed in the <i>Verify_flg</i> field?	
C. Have checks on correctness of analysis or data reasonableness been performed? e.g.: Is ortho-phosphorus less than total phosphorus? Are dissolved metal concentrations less than or equal to total metals?	
D. Have at least 10% of the data in the data set been reviewed against the field and laboratory data sheets?	
E. Are all parameter codes in the data set listed in the QAPP?	
F. Are all stations in the data set listed in the QAPP?	
Documentation Review	Y, N, or N/A
A. Are blank results acceptable as specified in the QAPP?	
B. Were control charts used to determine the acceptability of field duplicates?	
C. Was documentation of any unusual occurrences that may affect water quality included in the <i>Event</i> table's <i>Comments</i> field?	
D. Were there any failures in sampling methods and/or deviations from sample design requirements that resulted in unreportable data? If yes, explain on next page.	
E. Were there any failures in field and/or laboratory measurement systems that were not resolvable and resulted in unreportable data? If yes, explain on next page.	
F. Was the laboratory's NELAC Accreditation current for analysis conducted?	

Data Set Information

Data Source:

Date Submitted:

Tag_ID Range:

Date Range:

Comments:

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

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

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

Contractor's Data Manager:

Date:

APPENDIX D. FIELD DATA REPORTING FORM

H-GAC – Ambient Monitoring Data Sheet

Date: _____ / _____ / _____ Station: _____ TCEQ ID: _____

Time (military): _____ Samples Collected
by: _____

Field Parameters	Units / Choices	Results
Sampling Depth	meters	
Total Water Depth	meters	
Water Temp	°C	
Water Clarity	1 – excellent, 2 – good, 3 – fair, 4 – poor	
Water Color	1 – brownish, 2 – reddish, 3 – greenish, 4 – blackish, 5 – clear, 6 – other	
Water Odor	1 – sewage, 2 – oily/chemical, 3 – rotten egg, 4 – musky, 5 – fishy, 6 – none, 7 – other	
Present Weather	1 – clear, 2 – partly cloudy, 3 – cloudy, 4 – raining, 5 – other	
Flow Severity	1 – no flow, 2 – low, 3 – normal, 4 – flood, 5 – high, 6 – dry	
Day of Last Significant Rainfall	Comments or Observations	

Fresh (non-tidal) / Marine (tidal)	Containers	Preservatives	Analyses	Requested
	1 x 100 mL Sterile Plastic	Iced	Bacteria: E. coli Enterococci	

Field Split? Yes ___ No ___

If no,
Date of last split: _____

APPENDIX E. CHAIN-OF-CUSTODY FORM

APPENDIX F. DATA MANAGEMENT FLOW CHART

H-GAC's Data Management Process & Flow Chart

1. Data Manager (DM) receives field and laboratory data from individual local partners and saves electronic files in 'Raw Data' folder. If the data is received as hard copy, DM inputs data to either an EXCEL spreadsheet or ACCESS table. All first versions of this Data are saved as 'Raw Data' for each partner.
2. DM combines data, as needed, into single EXCEL spreadsheets or ACCESS tables. These files are saved on H-GAC's Q-drive as 'Working Data'. Each partner's data is kept separate to make data processing less confusing. However, one file may include data from one month or several months depending on how the data was received by H-GAC. Data from 2 A7.1 Measurement Performance Specification table should NOT be combined. Check with QAO for correct A7.1 tables.
3. Before changes are made to each data set, the DM creates a "Data Summary Report/Sheet" for that specific data set. Every data change or action taken on the data set is documented in the "Data Summary Report/Sheet". Explanations of variations in reporting the data are also included (ex. Bacteria reported at <25 MPN instead of <1 MPN as shows in A7.1 table). The "Data Summary Report/Sheet", which includes information from the partners' "Data Review Checklist", will be submitted to TCEQ with each data set.
4. DM enters permanent 5-digit TCEQ STATION_ID numbers into the spreadsheet or table to replace local partner unique station identifiers (if necessary).
5. DM renames column headers for STATION_ID, ENDDATE, ENDTIME, ENDDEPTH and reformat columns (as necessary) to match the TCEQ format for submitting data to SWQMIS.
 - a. Ex # 1. Secchi Depth should be reported in meters. If data is reported in centimeters or cm and meters, then all data in column should be converted to meters before being sent to SAS.
 - b. Ex # 2. Sample depth should be reported in meters. If data in the sampling depth column is reported in inches or feet or meters or a combination of any, then all the column data must be converted to meters.

6. DM inserts proper Parameter codes in ALL column headers for field and laboratory data. (Note: Before SAS can be used, all column headers must be typed exactly like the SAS listing for that parameter.)
7. DM removes columns from the working files if that parameter is NOT reported to TCEQ. See approved A7.1 tables or consult with QAO.
8. DM checks to make sure each parameter Limit of Quantitation (LOQ) in the metadata file used for SAS matches the A7.1 table in the QAPP for the time period being processed. (Ex. If the data set being processed is from May 2008 through September 2008, the data must be split into 2 files. There is an approved A7.1 table for May thru June 2008 data and another A7.1 table approved for July thru September 2008 data.) Generally, there is a new A7.1 every 2 years or if and when a QAPP amendment occurs.
9. Save the reformatted spreadsheet/table into individual partner folders for SAS processing by the SAS Operator (SO). Folder name:
10. SAS processing begins.
 - a. Data is imported into SAS (software) where an "input data matrix" is created.
 - b. Result values are formatted in SAS following TCEQ rounding and significant digit reporting rules. (All rules and procedures are documented in SAS program code.)
 - c. Formatted values are compared with TCEQ min/max ranges and with laboratory reporting limits as specified in the A7.1 table for each local partner and monitoring agency. Additional SQL scripts are run comparing various parameters for reasonableness. All results outside of the ranges of acceptability are flagged.
 - d. A report called "FLAGGED_RECORDS" is generated by SAS and is reviewed by the DM. The report named "FLAGGED_RECORDS" includes the following.
 - i. Outliers
 - ii. Interparameter relationships
 - iii. QA/QC comparisons (20%)
 - e. Flagged values are provided to the Data Manager in an ACCESS table.
11. The DM reviews each flagged value and makes a decision (proposes action) on whether to **Accept** the result (value as is), **Replace** the result with a different value, or **Drop** the value and leave the "cell" empty in the final matrix table.

Various sources are used to verify flagged record action. Data sheets are reviewed, phone calls are made and e-mails are sent to appropriate lab or field personnel to determine validity of various 'flagged records.'

12. The DM documents all communications and prints out e-mails to attach hard copies to data packets placed in storage.
13. A "Data Summary Report/Sheet", which was created by the DM earlier, is updated while the DM reviews the flagged records data.
14. All DM decisions regarding the flagged records are recorded in "FLAGGED_RECORDS" report, then returned to SO and fed back into SAS.
15. SO generates a report identifying which actions were taken by the DM regarding each flagged record. The action report, DM_CORRECTIONS, may be modified several times before entire process is complete for each data set. After initial SAS processing and DM data review is completed, a "DRAFT_FINAL_DATA_MATRIX" table is created in ACCESS showing all reformatted data and actions taken (such as removing results) by H-GAC.
16. The Quality Assurance Officer (QAO) is notified that the ACCESS "DRAFT_FINAL_DATA_MATRIX" table is ready for review.
17. The QAO reviews the "matrix file" and identifies all values that, in the QAO's judgement, are unreasonable or outliers or above and beyond the value that were flagged according to the formalized rules. The QAO gives comments back to DM in hard copy form only.
18. DM reviews QAO concerns and documents actions taken on the concerns in DM_CORRECTIONS table.
19. DM notifies SO of completed DM_CORRECTIONS table.
20. SO incorporates DM corrections into FINAL_DATA_MATRIX_1 table.
21. SO generates ACTION_REPORT_1 from the DM_CORRECTIONS table which is then printed and attached to the hard copy data set being archived.
22. SO creates EVENT/RESULTS files and notifies DM when complete.
23. DM submits data & Data Summary Report/Sheet to TCEQ Project Manager for review.

If **TCEQ returns any data set** due to unverified outliers, etc., then the following procedures will be activated:

24. DM addresses all of TCEQ's questions and documents items and actions in a new table called TCEQ_CORRECTIONS_1 and submits to SO for SAS processing.
25. SO generates a new matrix file named FINAL_DATA_MATRIX_2 and creates new EVENTS/RESULTS files for DM.
26. DM resubmits EVENTS/RESULTS files to TCEQ along with modified Data Summary Report/Sheet.

If **TCEQ returns any data set again**, then the following procedures will be repeated. These procedures will be repeated until all issues with the data are resolved. The only change will be made to the number at the end of each file.

27. DM addresses all of TCEQ's questions and documents items and actions in a new table called TCEQ_CORRECTIONS_2 and submits to SO for SAS processing.
28. SO generates a new matrix file named FINAL_DATA_MATRIX_3.
29. DM resubmits EVENTS/RESULTS files to TCEQ along with modified Data Summary Report/Sheet.
30. TCEQ will notify H-GAC when data set is approved for loading to SWQMIS. At which time, DM should go into Data Folders and delete unnecessary files. DM should be able to keep only the first and last file of the repeated and updated files. (i.e. DM keeps FINAL_DATA_MATRIX_1 and FINAL_DATA_MATRIX_5 but deletes the files in-between.)

Figure AF.1 – Data Management Process Flow Chart

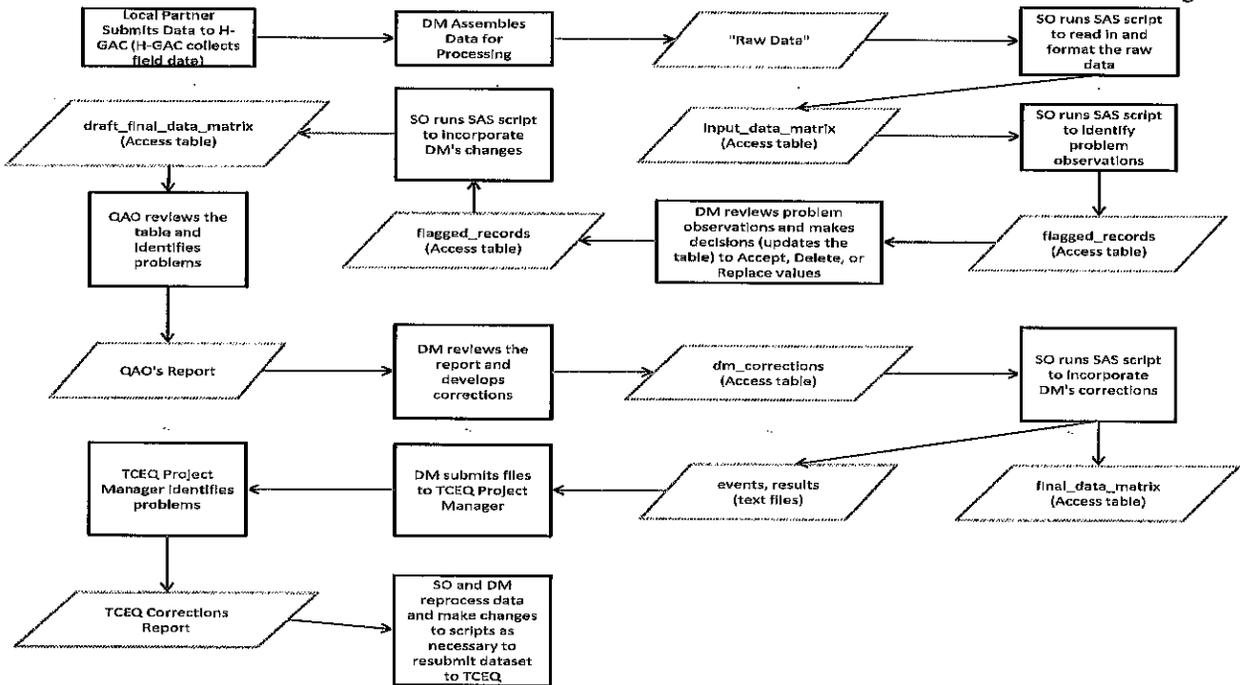
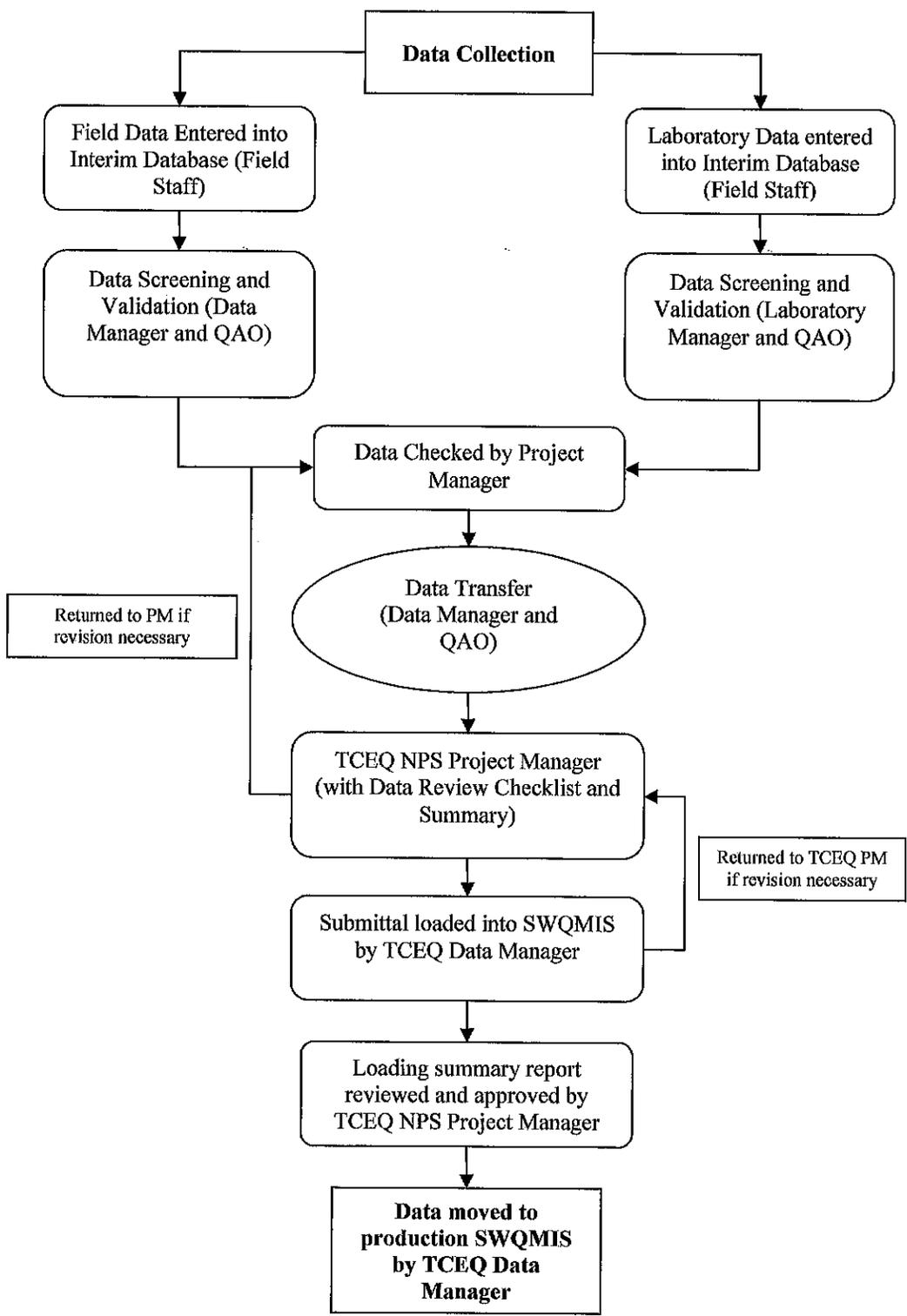


Figure AF.2 - Draft NPS Data Management Process Flow Chart



APPENDIX G: CORRECTIVE ACTION STATUS TABLE

APPENDIX H: CORRECTIVE ACTION PLAN FORM

Deficiency / Nonconformance / Corrective Action Report		
Report No.:	Issued by:	Date Issued:
Description of deficiency		
Is the deficiency a nonconformance and why? (If yes, complete report. If no, indicate the date of closure.)		
Root cause of nonconformance		
Programmatic impact of nonconformance to include impact on existing TRACS data.		
Does the seriousness of the nonconformance require immediate reporting to the TCEQ? If so, to whom and when was it report?		
Corrective action to address the nonconformance and prevent its recurrence.		
Proposed completion date for each action		
Individual(s) responsible for each action		
Method of Verification		
Date "Correction Action Report" Closed		

**ATTACHMENT 1 – EXAMPLE LETTER TO DOCUMENT ADHERENCE TO THE
QAPP**

TO: (name)
(organization)

FROM: (name)
(organization)

RE: Houston-Galveston Area Council, Westfield Estates Watershed Protection Plan
Monitoring QAPP

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

(address)

I acknowledge receipt of the Westfield Estates Watershed Monitoring QAPP. I understand that the document describes quality assurance, quality control, data management and reporting, and other technical activities that must be implemented to ensure the results of work performed will satisfy stated performance criteria.

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

Signature

Date

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