

# Houston-Galveston Area Council (H-GAC) Multi-Basin Quality Assurance Project Plan

*3555 Timmons Lane, Suite 120  
Houston, Texas 77027*

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Clean Rivers Program

Water Quality Planning Division

Texas Commission on Environmental Quality

P.O. Box 13087, MC 234

Austin, Texas 78711-3087


Effective Period: FY 2018 to FY 2019


Questions concerning this QAPP should be directed to:  
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CRP Quality Assurance Officer  
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Houston, Texas 77227-2777  
(713) 499-6660  
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## A1 Approval Page

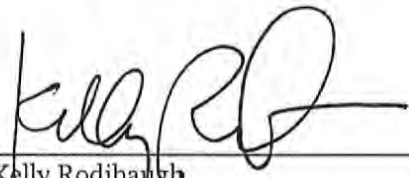
### Texas Commission on Environmental Quality

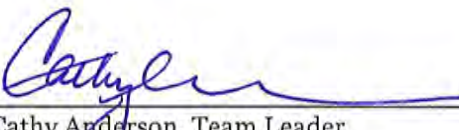
#### Water Quality Planning Division

  
\_\_\_\_\_  
Kyle Girtten, Manager  
Water Quality Monitoring and Assessment  
Section  
10/2/17  
Date

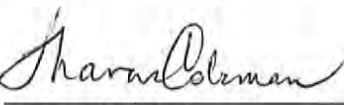
  
\_\_\_\_\_  
Sarah Eagle, Work Leader  
Clean Rivers Program  
10/2/17  
Date

  
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Kelly Rodibaugh  
Project Quality Assurance Specialist  
Clean Rivers Program  
10/2/17  
Date


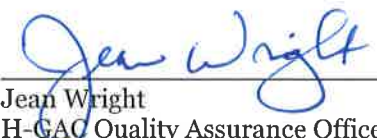
  
\_\_\_\_\_  
Kelly Rodibaugh  
Project Manager  
Clean Rivers Program  
10/2/17  
Date

  
\_\_\_\_\_  
Cathy Anderson, Team Leader  
Data Management and Analysis  
10/2/17  
Date

#### Monitoring Division

  
\_\_\_\_\_  
Sharon Coleman  
Acting Lead CRP Quality Assurance Specialist and TCEQ QA Manager  
10/2/2017  
Date

## **Houston-Galveston Area Council (H-GAC)**

	
Todd Running	Jean Wright
H-GAC Project Manager	H-GAC Quality Assurance Officer
9/29/17	9/29/17
Date	Date

Sub-tier participants (e.g., local partners, sub-participants, or other units of government) will sign the QAPP, indicating the organization's awareness of, and commitment to requirements contained in this quality assurance project plan and any amendments or added appendices of this plan. Signatures in section A1 will eliminate the need for adherence letters to be maintained. H-GAC will maintain records that indicate the approved QAPP was provided to all sub-tier participants.

## **Harris County Pollution Control Services (HCPCS)**

 9/29/17

Michael Cantu  
HCPCS CRP Project Manager

Date

 9-29-17

Bryan Kosler  
Field Quality Assurance Officer

Date

 9/29/17

Michael Cantu  
HCPCS Laboratory Manager


Date

 9/29/17

Debra Burney  
Laboratory Quality Assurance Officer

Date

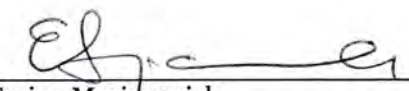
**City of Houston, Houston Health Department (HHD)**

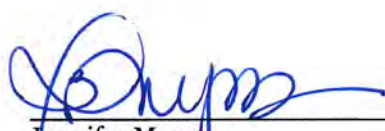
 9/27/17  
\_\_\_\_\_  
Date  
Daisy James  
CRP Project Manager

 9/27/17  
\_\_\_\_\_  
Date  
Lisa Montemayor  
HHD Field Quality Assurance Officer

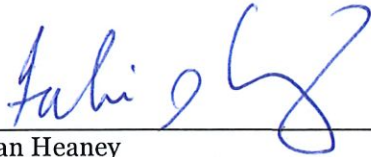
 9/26/17  
\_\_\_\_\_  
Date  
Larry Seigler  
HHD CRP Laboratory Director

 9/26/17  
\_\_\_\_\_  
Date  
Roger Sealy  
HHD Laboratory Quality Assurance Officer

 9/26/2017  
\_\_\_\_\_  
Date  
Emina Marjanovich  
HHD Lab Inorganic Chemistry Section Technical Supervisor

 9/27/2017  
\_\_\_\_\_  
Date  
Jennifer Meyers  
HHD lab Microbiology Section Technical Supervisor

## City of Houston, Drinking Water Operations (DWO)



9-28-2017

Fabian Heaney  
DWO Laboratory Director

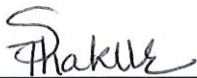
Date



9/28/17

Desta Takie  
DWO Field Quality Assurance Officer

Date



9/28/17

Shubha Thakur  
DWO CRP Project Manager, Laboratory Manager,  
and Laboratory Quality Assurance Officer

Date

## ***San Jacinto River Authority (SJRA)***

 9-29-17

Shane Simpson  
SJRA Project Manager,  
Field Quality Assurance Officer

Date



**Environmental Institute of Houston, University of Houston –  
Clear Lake (EIH)**



Dr. George Guillen  
EIH CRP Project Manager

9/28/17

Date




Jenny Oakley  
EIH Field Quality Assurance Officer

9-28-17

Date



## ***Texas Research Institute for Environmental Studies (TRIES)***



26 Sept 2017

Dr. Chad Hargrave  
TRIES Project Manager

Date



26 September 2017

Kaitlen Gary  
TRIES Quality Assurance Officer

Date

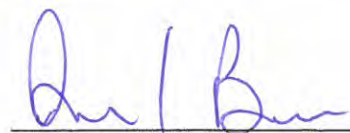


26 September 2017

Dr. Rachelle Smith  
TRIES Laboratory Manager & Quality Assurance Officer

Date

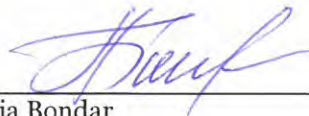
## **Eastex Environmental Laboratory**



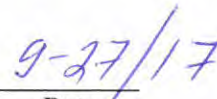
Daniel Bowen  
Eastex Lab Manager



Date



Natalia Bondar  
Eastex Lab Quality Assurance Officer



Date

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## List of Acronyms

AWRL	Ambient Water Reporting Limit
BMP	Best Management Practices
CAP	Corrective Action Plan
CE	Collecting Entity
COC	Chain of Custody
CRP	Clean Rivers Program
DMRG	Surface Water Quality Monitoring Data Management Reference Guide, December 2016, or most recent version
DM&A	Data Management and Analysis
DWO	City of Houston, Drinking Water Operations
Eastex	Eastex Environmental Laboratory
EPA	United States Environmental Protection Agency
EIH	Environmental Institute of Houston, University of Houston – Clear Lake
FWS	Flood Warning System
FY	Fiscal Year
GIS	Geographical Information System
GPS	Global Positioning System
H-GAC	Houston-Galveston Area Council
HPCPS	Harris County Pollution Control Services
HHD	City of Houston, Health Department
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
LIMS	Laboratory Information Management System
LOD	Limit of Detection
LOQ	Limit of Quantitation
MT	Monitoring Type
MPS	Measurement Performance Specifications
NCC	National Climatic Center
NELAP	National Environmental Laboratory Accreditation Program
NOAA	National Oceanic and Atmospheric Administration
NWIS	National Water Information System
QA	Quality Assurance
QM	Quality Manual
QAO	Quality Assurance Officer
QAPP	Quality Assurance Project Plan
QAS	Quality Assurance Specialist
QC	Quality Control
QMP	Quality Management Plan
RMW	Regional Monitoring Workgroup
RT	Routine Monitoring
SE	Submitting Entity
SJRA	San Jacinto River Authority
SLOC	Station Location
SOP	Standard Operating Procedure
SWQM	Surface Water Quality Monitoring
SWQMIS	Surface Water Quality Monitoring Information System
TMDL	Total Maximum Daily Load
TCEQ	Texas Commission on Environmental Quality
TNI	The NELAC Institute
TRIES	Texas Research Institute for Environmental Studies
TSWQS	Texas Surface Water Quality Standards
TWDB	Texas Water Development Board
UHCL	University of Houston – Clear Lake
USGS	United States Geological Survey
VOA	Volatile Organic Analytes

## A3 Distribution List

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

Kelly Rodibaugh, Project Manager  
Clean Rivers Program  
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(512) 239-1739

Sharon Coleman  
Acting Lead CRP Quality Assurance Specialist  
MC-165  
(512) 239-6340

Cathy Anderson  
Team Leader, Data Management and Analysis  
MC-234  
(512) 239-1805

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

Todd Running, Project Manager  
(713) 993-4549

Jean Wright, Quality Assurance Officer  
(713) 499-6660

The Houston-Galveston Area Council (H-GAC) will provide copies of this project plan and any amendments or appendices of this plan to each person on this list and to each sub-tier project participant, e.g., local partners, subparticipants, or other units of government. H-GAC will document distribution of the plan and any **amendments and appendices, maintain this documentation as part of the project's quality assurance records,** and will ensure the documentation is available for review.

Sub-Tier participants & Laboratories to receive copies of the QAPP include:

- Harris County Pollution Control Services & Laboratory
- City of Houston, Houston Health Department & Laboratory
- City of Houston, Drinking Water Operations & Laboratory
- Environmental Institute of Houston, University of Houston-Clear Lake
- San Jacinto River Authority
- Texas Research Institute for Environmental Studies & Laboratory
- Eastex Environmental Laboratory

## A4 PROJECT/TASK ORGANIZATION

### *Description of Responsibilities*

#### TCEQ

Sarah Eagle

CRP Work Leader

Responsible for Texas Commission on Environmental Quality (TCEQ) activities supporting the development and implementation of the Texas Clean Rivers Program (CRP). Responsible for verifying that the TCEQ Quality Management Plan (QMP) is followed by CRP staff. Supervises TCEQ CRP staff. Participates in the development, approval, implementation, and maintenance of written QA standards (e.g., Program Guidance, SOPs, QAPPs, QMP). Reviews and responds to any deficiencies, corrective actions, or findings related to the area of responsibility. Oversees the development of Quality Assurance (QA) guidance for the CRP. Reviews and/or approves all QA audits, corrective actions, evaluations, reports, work plans, contracts, QAPPs, and TCEQ Quality Management Plan. Enforces corrective action, as required, where QA protocols are not met. Ensures CRP personnel are fully trained.

Sharon Coleman

Acting CRP Lead Quality Assurance Specialist

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

Kelly Rodibaugh

CRP Project Manager

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

Cathy Anderson

Team Leader, Data Management and Analysis (DM&A) Team

Participates in the development, approval, implementation, and maintenance of written QA standards (e.g., Program Guidance, SOPs, QAPPs, QMP). Develops and maintains data management-related SOPs for CRP data management. Ensures DM&A staff perform data management-related tasks.

Peter Bohls

CRP Data Manager, DM&A Team

Responsible for coordination and tracking of CRP data sets from CRP Project Manager review through approval. Ensures that data are reported following instructions in the DMRG. Runs automated data validation checks in SWQMIS and coordinates data verification and error correction with CRP Project Managers. Generates SWQMIS summary reports to assist CRP **Project Managers' data review**. Identifies data anomalies and inconsistencies. Provides training and guidance to CRP and Planning Agencies on technical data issues to ensure that data are submitted according to documented procedures. Reviews QAPPs for valid stream monitoring stations. Checks validity of parameter codes, submitting entity code(s), collecting entity code(s), and monitoring type code(s). Develops and maintains data management-related SOPs for CRP data management. Coordinates and processes data correction requests. Participates in the development, implementation, and maintenance of written QA standards (e.g., Program Guidance, SOPs, QAPPs, QMP).



Kelly Rodibaugh

CRP Project Quality Assurance Specialist

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

## Houston-Galveston Area Council (H-GAC)

Todd Running

H-GAC Project Manager

Responsible for implementing and monitoring CRP requirements in contracts, QAPPs, and QAPP amendments and appendices. Coordinates basin planning activities and work of basin partners. Ensures monitoring systems audits are conducted to ensure QAPPs are followed by H-GAC local participants and that projects are producing data of known quality. Ensures that local partner agencies/subparticipants are qualified to perform contracted work. Ensures CRP project managers and/or QA Specialists are notified of deficiencies and corrective actions, and that issues are resolved. Responsible for validating that data collected are acceptable for reporting to the TCEQ.

Jean Wright

H-GAC Quality Assurance Officer

Responsible for coordinating the implementation of the QA program. Responsible for writing and maintaining the QAPP, amendments, and appendices, and monitoring their implementation. Responsible for maintaining records of QAPP distribution, including appendices and amendments. Responsible for maintaining written records of sub-tier commitment to requirements specified in this QAPP. Responsible for identifying, receiving, and maintaining project QA records. Responsible for coordinating with the TCEQ QAS to resolve QA-related issues. Notifies H-GAC Project Manager of particular circumstances which may adversely affect the quality of data. Coordinates and monitors deficiencies and corrective action. Coordinates the research and review of technical QA material and data related to water quality monitoring system design and analytical techniques. Conducts monitoring systems audits on project participants to determine compliance with project and program specifications, issues written reports, and follows through on findings. Ensures that field staff is properly trained and that training records are maintained.

Bill Hoffman

H-GAC Data Manager

Acquires and reformats data from local partner agencies to ensure that data are submitted according to documented procedures. Ensures that water quality data are properly reviewed for data anomalies and inconsistencies and verified or corrected as necessary. Runs automated data validation checks in SWQMIS and coordinates data verification and error correction with H-GAC CRP QAO and/or local partner CRP Data Managers. Coordinates and maintains records of data verification and validation performed by H-GAC. Responsible for the transfer of basin quality-assured water quality data to the TCEQ in a format compatible with SWQMIS as outlined in the most recent DMRG. Responsible for coordination and tracking of CRP data sets from local partners through the review and approval process at TCEQ. Generates SWQMIS summary reports to assist CRP Project Manager's data review. Provides training and guidance to local partner agencies on technical data. Develops and maintains data management related SOPs for H-GAC's CRP data. Maintains quality-assured data on H-GAC internet sites.

## Eastex Environmental Laboratory (Eastex)

Daniel Bowen

Laboratory Director - Eastex Environmental Laboratory (Contract Lab)

Responsible for implementing and monitoring CRP requirements as specified in CRP contracts, H-GAC's Multi-Basin QAPP, and any QAPP amendments and appendices. Responsible for producing quality analytical data for samples collected and submitted by H-GAC, EIH and any other local partner submitting CRP related samples. Responsible for sending data and COC forms to H-GAC within time specified in contract.

Natalia Bondar  
Eastex Lab QAO

Responsible for implementing and monitoring CRP requirements in contracts, QAPPs, and QAPP amendments and appendices. Checks training, competency, and re-training of technicians. Performs verification and validation procedures to confirm quality data is issued to clients. Performs other QA/QC duties and checks associated with lab activities. Responsible for ensuring that all method—and client—specific QA/QC requirements and data quality objectives are met. Responsible for the overall quality control and quality assurance of analyses performed by laboratory personnel. Ensures NELAP certification in CRP parameters. Conducts internal lab audits to ensure compliance with written SOPs, the laboratory QM/QAPP, the CRP QAPP, and NELAP, and to identify potential problems.

## Harris County Pollution Control Services (HCPCS)

Michael Cantu

CRP Project Manager / Manager-Laboratory Services

Responsible for project oversight, and maintaining communication with H-GAC Project Manager, and between field and laboratory personnel. Responsible for implementing and monitoring CRP requirements in QAPPs and QAPP amendments and appendices. Responsible for producing quality analytical data and maintaining verification of procedures establishing the level of quality.

Debra Burney

Lab Quality Assurance Officer (QAO) / CRP QAO / CRP Data Manager

Responsible for monitoring the activities of HCPCS field and laboratory personnel, ensuring that all data collected and submitted to H-GAC meet the data quality objectives of the CRP project, the Multi-Basin QAPP, and QAPP amendments and appendices. Ensures NELAP certification in CRP parameters. Conducts internal lab audits to ensure compliance with written SOPs, the laboratory QM/QAPP, the CRP QAPP, and NELAP, and to identify potential problems. Ensures both field and laboratory data are entered in appropriate spreadsheets and data bases and is reviewed and validated as required. Responsible for submitting all data to H-GAC in the correct format.

Bryan Kossler

Field Supervisor & Field QAO

Responsible for supervising the collection, preservation, handling and delivery of CRP samples. Responsible for ensuring that field measurements, sample custody, and documentation follow requirements as prescribed in H-GAC's CRP Multi-Basin QAPP, any QAPP amendments and appendices, and SWQM procedures. Trains and/or documents training of all field monitoring personnel.

## City of Houston – Houston Health Department (HHD)

Daisy James

CRP Project Manager

Responsible for meeting the requirements of the contract between H-GAC and the City of Houston Health Department, ensuring project oversight consistent with Multi-Basin QAPP requirements, And QAPP amendments and appendices, as well as communicating project status to H-GAC Project Manager. Additional responsibilities include ensuring H-GAC CRP project manager and/or H-GAC QAO are notified of circumstances that may adversely affect quality of data derived from collection and analysis of samples.

Lisa Montemayor

CRP QAO and Field Supervisor for Ambient Waters

Responsible for supervising sample collection, processing, handling, holding and reporting activities to ensure compliance with monitoring requirements outlined in H-GAC's CRP contract, CRP Multi-Basin QAPP, and QAPP amendments and appendices. Responsible for notifying the HHD Project Manager and H-GAC Quality Assurance Officer of circumstances that may adversely affect the quality of data. Responsible for working with HHD Project Manager to ensure coordination of monitoring activities. Reviews and verifies data prior to submission to H-GAC. Trains and/or documents training of all HHD monitoring personnel.

Lisa Leija

CRP Data Manager

Responsible for data entry of all CRP field and laboratory data as outlined in H-GAC's CRP contract and Multi-Basin QAPP, and any QAPP amendments and appendices. Responsible for reviewing data files for transcription inaccuracies. Reviews data for outliers and verifies reasonableness. Formats and delivers data in electronic format to H-GAC CRP Data Manager. Responsible for sending hard copies of field data sheets and COC forms to H-GAC CRP Data Manager.

## City of Houston – Houston Health Department (HHD) Laboratory

Larry Seigler

CRP Lab Director

Responsible for meeting the requirements of the contract between H-GAC and the City of Houston Health Department Holcombe Laboratory, ensures implementation is consistent with CRP QAPP requirements, QAPP amendments and appendices, and communicates project status to H-GAC Project Manager. **Ensures lab's QMP** and required monitoring systems audits are conducted to ensure QAPPs are followed and that projects are producing data of known quality. Ensures H-GAC CRP project manager and/or QA Specialist are notified of circumstances which may adversely affect quality of data derived from analysis of samples. Responsible for validating that all data collected meet the data quality objectives of the project and are suitable for reporting to the TCEQ. Ensures lab personnel are involved in coordinating basin planning activities and work with other basin partners as needed.

Emina Marjanovich

Holcombe Laboratory Inorganic Chemistry Section Technical Supervisor

Responsible for inorganic chemistry laboratory testing of samples from CRP as per CRP requirements in contracts, QAPPs, and QAPP amendments and appendices. Ensures NELAP certification in CRP parameters and that projects are producing data of known quality. Ensures that subcontractors are qualified to perform contracted work. Ensures CRP project managers, laboratory director, and/or QA Specialists are notified of circumstances which may adversely affect quality of data derived from collection and analysis of samples. Responsible for validating that all data collected meet the data quality objectives of the project and are suitable for reporting to the TCEQ.

Jennifer Meyers

Holcombe Laboratory Microbiology Section Technical Supervisor

Responsible for microbiology laboratory testing of samples from CRP as per CRP requirements in contracts, QAPPs, and QAPP amendments and appendices. Ensures NELAP certification in CRP parameters and that projects are producing data of known quality. Ensures that subcontractors are qualified to perform contracted work. Ensures CRP project managers, laboratory director, and/or QA Specialists are notified of circumstances which may adversely affect quality of data derived from collection and analysis of samples. Responsible for validating that all data collected meet the data quality objectives of the project and are suitable for reporting to the TCEQ.

Roger Sealy

Holcombe Laboratory Quality Assurance Officer

Responsible for ensuring the quality system is implemented and followed. Develops, facilitates, and conducts laboratory quality assurance audits to ensure compliance with written SOPs, the laboratory QM/QAPP, the CRP QAPP, and NELAP, and to identify potential problems. Notifies Holcombe Laboratory management of deficiencies (or opportunities for continuous improvement) and monitors corrective actions. Responsible for **keeping the laboratory's Quality Assurance Manual** current. Responsible for ensuring initial and continuing training as well as the demonstrations of capability meet NELAP acceptance criteria. Ensures NELAP certification in CRP parameters and that project is producing data of known quality. Additional responsibilities include identifying, receiving, and maintaining project laboratory quality assurance records, notifying the laboratory Director, the Project Manager, and H-GAC's Project Manager of circumstances that may adversely affect the quality of data, and validating data prior to the submission of laboratory data to H-GAC.

## City of Houston – Drinking Water Operations (DWO)

Fabian Heaney  
Laboratory Director

Responsible for producing quality analytical data and maintaining verification of procedures for establishing the level of quality as required in H-GAC's Multi-Basin QAPP, and any QAPP amendments and appendices. This position supervises, manages, and provides guidance to administrative and operational support staff regarding laboratory operations, practices/policies, quality assurance, safety/security/training, information technology, legislation/regulation, and procurement/billing functions to ensure high-quality internal and external customer service. Oversees planning, development, and supervision of operational and administrative programs. Evaluates and makes improvements to operational procedures, policies, and services provided to internal and external stakeholders/customers.

Shubha Thakur  
Laboratory Manager / CRP Project Manager  
Lab QAO / CRP QAO

Responsible for the day-to-day operations of the lab and supervision of lab personnel to produce quality analytical data as required in H-GAC's Multi-Basin QAPP, and any QAPP amendments and appendices. Develops and revises standard operating procedures (SOPs), techniques, policies, and reports. Ensures staff are properly trained or re-trained according to SOPs, laboratory techniques, NELAP acceptance criteria, and requirements of CRP Multi-Basin QAPP, and any QAPP amendment and/or appendices. Responsible for coordinating CRP activities with H-GAC Project Manager and H-GAC QA Officer. Performs verification and validation procedures to confirm quality data is issued to clients. Responsible for the overall quality control and quality assurance of analyses performed by laboratory personnel. Conducts internal lab audits to ensure compliance with written SOPs, the laboratory QM/QAPP, the CRP QAPP, and NELAP, and to identify potential problems. **Responsible for keeping the laboratory's Quality Assurance Manual** current. Ensures NELAP certification in CRP parameters.

Desta Takie  
CRP Data Manager, Field Supervisor and CRP Field Data Manager, CRP Field QAO  
Responsible for ensuring all data and associated reports meet the requirements of this QAPP by managing, reviewing, verifying, and submitting electronic data to H-GAC's CRP Data Manager. **This includes comparing** hard copy and electronic data files, and chain-of-custody forms. Responsible for supervising the collection, field preservation, handling and delivery of samples to the laboratory. Responsible for ensuring that equipment calibration, field measurements, sample custody, and documentation follow prescribed procedures in this QAPP. Trains and documents the training of all DWO monitoring personnel. Performs all associated QA/QC checks on the data and completes Data Review Checklist for accuracy, reasonableness, and completeness. Submits hard copies of field sheets, chain-of custody reports and Data Review Checklist to HGAC.

## San Jacinto River Authority (SJRA)

Shane Simpson  
CRP Project Manager / Field Supervisor / Quality Assurance Officer / Data Manager  
Responsible for project oversight and maintaining communication with H-GAC Project Manager for all samples collected from both Lake Conroe and the Woodlands area. Ensures that all program activities are conducted in accordance with established TCEQ SWQM procedures, methods and protocols, as well as requirements of H-GAC's CRP Multi-Basin QAPP, and any QAPP amendments or appendices. Ensures all monitoring personnel are properly trained and maintains documentation of same. Responsible for scheduling and ensuring that proper methods and protocols are followed during sample collection. Responsible for scheduling and ensuring all field samples and parameters are collected. Maintains and administers QA/QC checks on field equipment. Ensures water samples are transported and relinquished to City of Houston DWO Laboratory staff or other contract lab with required COC in timely manner. Responsible for ensuring that all data and associated reports meet requirements of H-GAC's Multi-Basin QAPP, and QAPP amendments and appendices. Reviews data, electronic data files, chain-of-custody forms, and Data Review Check-lists for accuracy, reasonableness, and completeness. Performs QA/QC checks on data. Reviews the Data Review Check-list for accuracy. Enters field data into an electronic data file and reviews data for accuracy and reasonableness. Enters laboratory data into an electronic data file and reviews all data for accuracy, reasonableness, completeness, and compliance with the QAPP. Responsible for reviewing and verifying data with field operations and with contract laboratory

personnel. Submits electronic data and supporting documents (field data sheets, chain-of-custody reports, and Data Review Check-lists) to the Project Manager/QAO for review.

## Environmental Institute of Houston (EIH) University of Houston Clear Lake

Dr. George Guillen

EIH CRP Project Manager,

Responsible for meeting the requirements of the contract between H-GAC and the Environmental Institute of Houston (EIH) by implementing CRP requirements, this QAPP, and any amendments and appendices to this QAPP. Ensures project oversight is consistent with QAPP requirements and communicates project status to H-GAC Project Manager. Responsible for ensuring that proper methods and protocols are followed during sample collection and that field data are properly reviewed, verified and submitted to H-GAC in a timely manner.

Jenny Oakley

CRP Data Manager, Field Supervisor & Quality Assurance Officer

Responsible for implementing and monitoring CRP requirements in contracts, QAPPs, and QAPP amendments and appendices. Responsible for entering data in spreadsheets, reviewing and verifying data with field operations. Performs required QA/QC checks on data and ensures results are acceptable for submission to H-GAC. Trains and maintains documentation of all field monitoring personnel and is responsible for ensuring that proper methods and protocols are followed during sample collection.

## Texas Research Institute for Environmental Studies (TRIES)

Dr. Chad Hargrave

CRP Project Manager

Responsible for project oversight and ensuring that all lab and field personnel are working together to meet the requirements of the contract between H-GAC and the Texas Research Institute for Environmental Studies (TRIES) Aquatics and Analytical Laboratories by implementing CRP requirements, the H-GAC Multi-Basin QAPP, and any subsequent QAPP amendments and appendices. Reviews all field and lab data, electronic data files, chain-of-custody forms, etc. for accuracy, reasonableness, and completeness. Ensures all deliverables are submitted to H-GAC in a timely manner.

Kaitlen Gary

CRP Field QAO / CRP Field Supervisor / CRP Data Manager

Works closely with TRIES CRP Project Manager to ensure all methods/protocols for sample collection and lab analyses are consistent with requirements of H-GAC CRP contract, Multi-Basin QAPP, and QAPP amendments and appendices. Responsible for coordinating all sampling trips, conducting and documenting equipment calibrations, and the training of all field personnel. Supervises and participates in all field sample collection. Responsible for entering data in spreadsheets, reviewing and verifying data with field operations and with laboratory personnel. Reviews all field and lab data, electronic data files, chain-of-custody forms, and Data Review Check-lists for accuracy, reasonableness, and completeness. Performs QA/QC checks on data. Communicates project status to H-GAC Project Manager and notifies H-GAC Project Manager and/or H-GAC QAO of circumstances that may adversely affect quality of data derived from collection and analysis of samples. Submits all necessary data and supporting documents to H-GAC.

Dr. Rachelle Smith

CRP Lab Manager / Lab QAO

Responsible for the day-to-day operations of the lab and supervision of lab personnel to produce quality analytical data per requirements of H-GAC contract, Multi-Basin QAPP, and QAPP amendments and appendices. Ensures staff are properly trained and maintains training records according to prescribed procedures and laboratory techniques. Performs verification and validation procedures to confirm quality data is issued to clients. Ensures NELAP certification in CRP parameters. Performs other QA/QC duties and checks associated with lab activities. Develops and revises standard operating procedures, techniques, policies and reports. Responsible for coordinating CRP activities with TRIES CRP Project Manager and QA Officer. Conducts internal lab audits to ensure compliance with written SOPs, the laboratory QM/QAPP, the CRP QAPP, and NELAP, and to identify potential problems.

## Project Organization Chart

Figure A4.1. Organization Chart - Lines of Communication

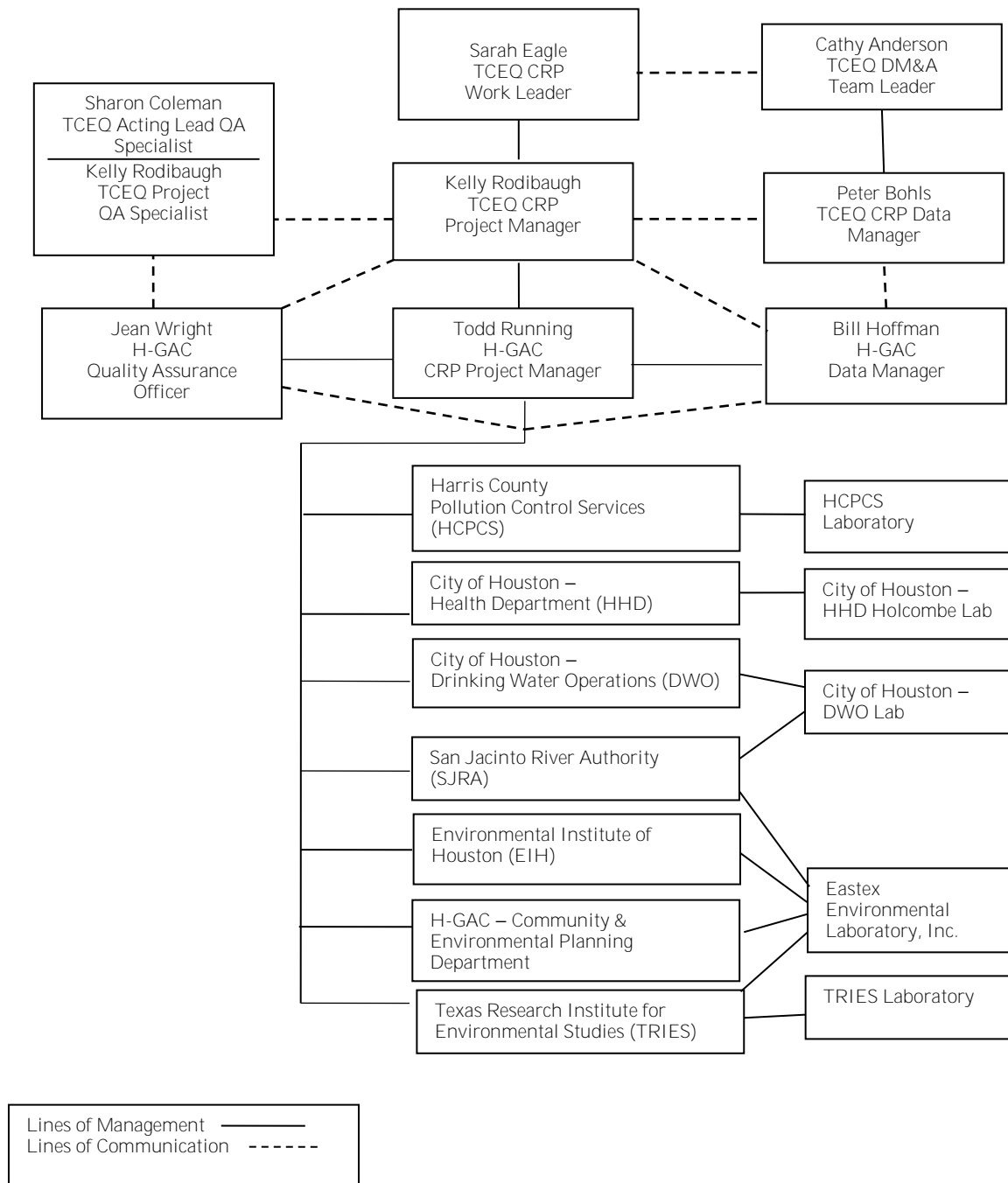


Figure A4.1a. The Houston-Galveston Area Council (H-GAC) CRP Organizational Chart.

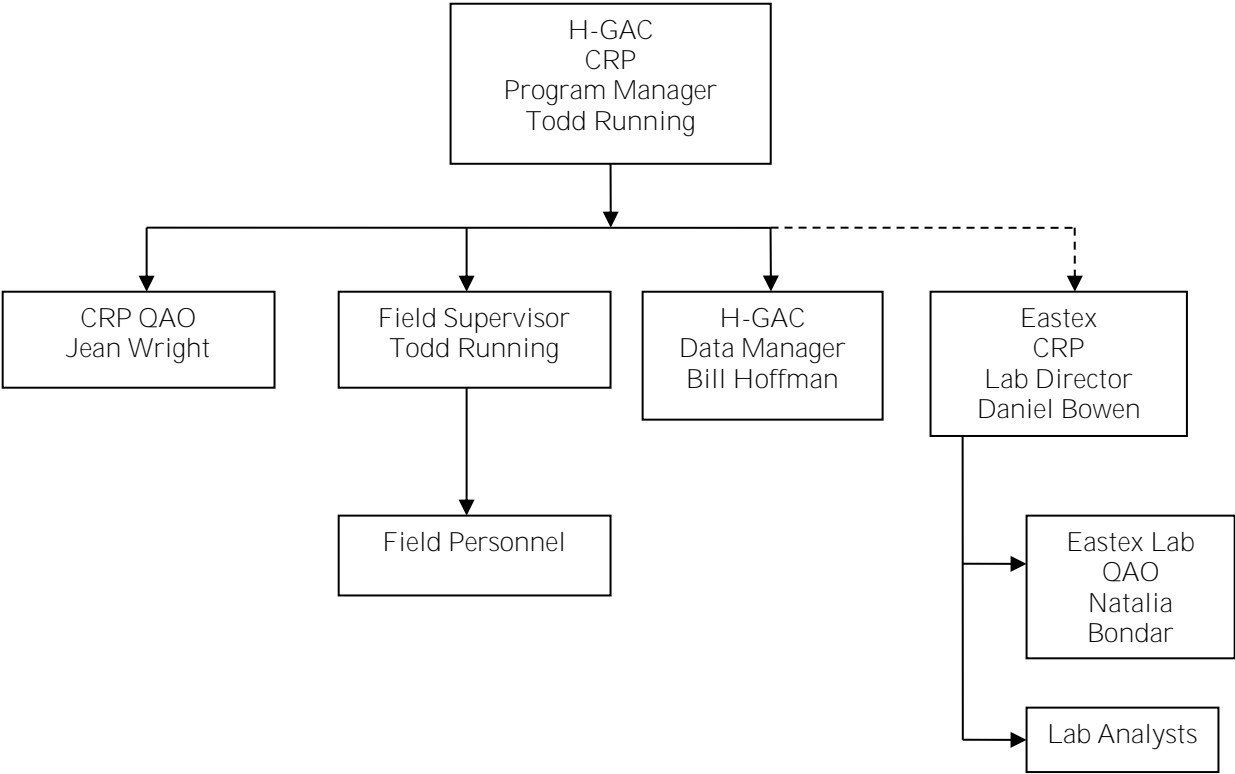




Figure A4.1b. The Harris County Pollution Control Services (HCPCS) CRP Organizational Chart.

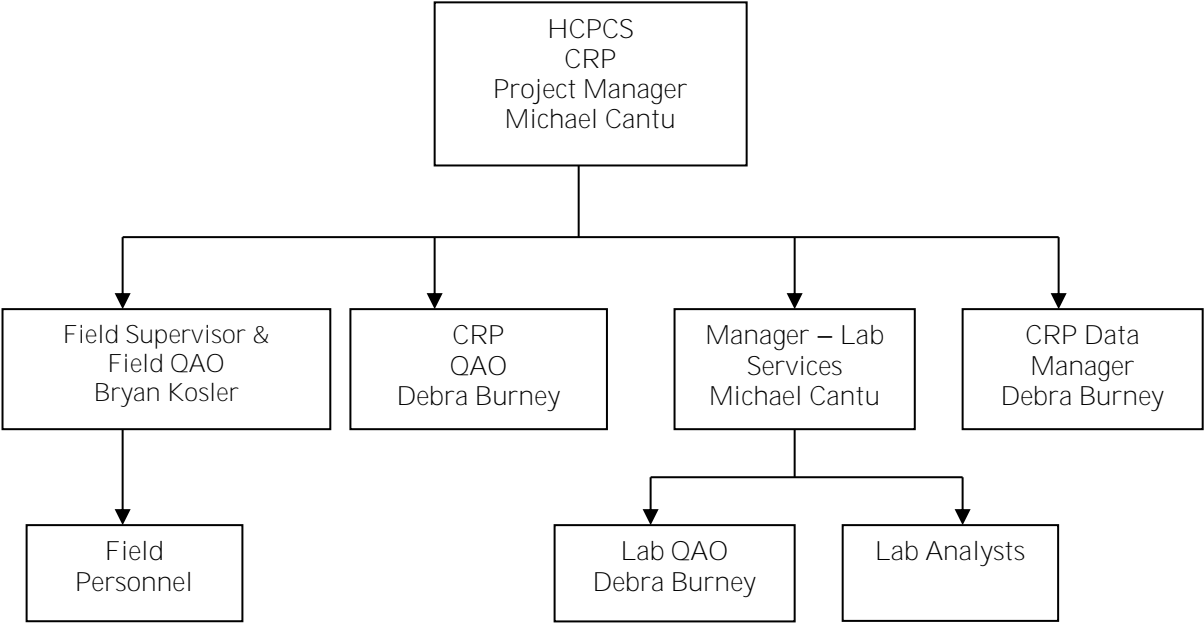


Figure A4.1c. The City of Houston, Health Department (HHD) CRP Organizational Chart.

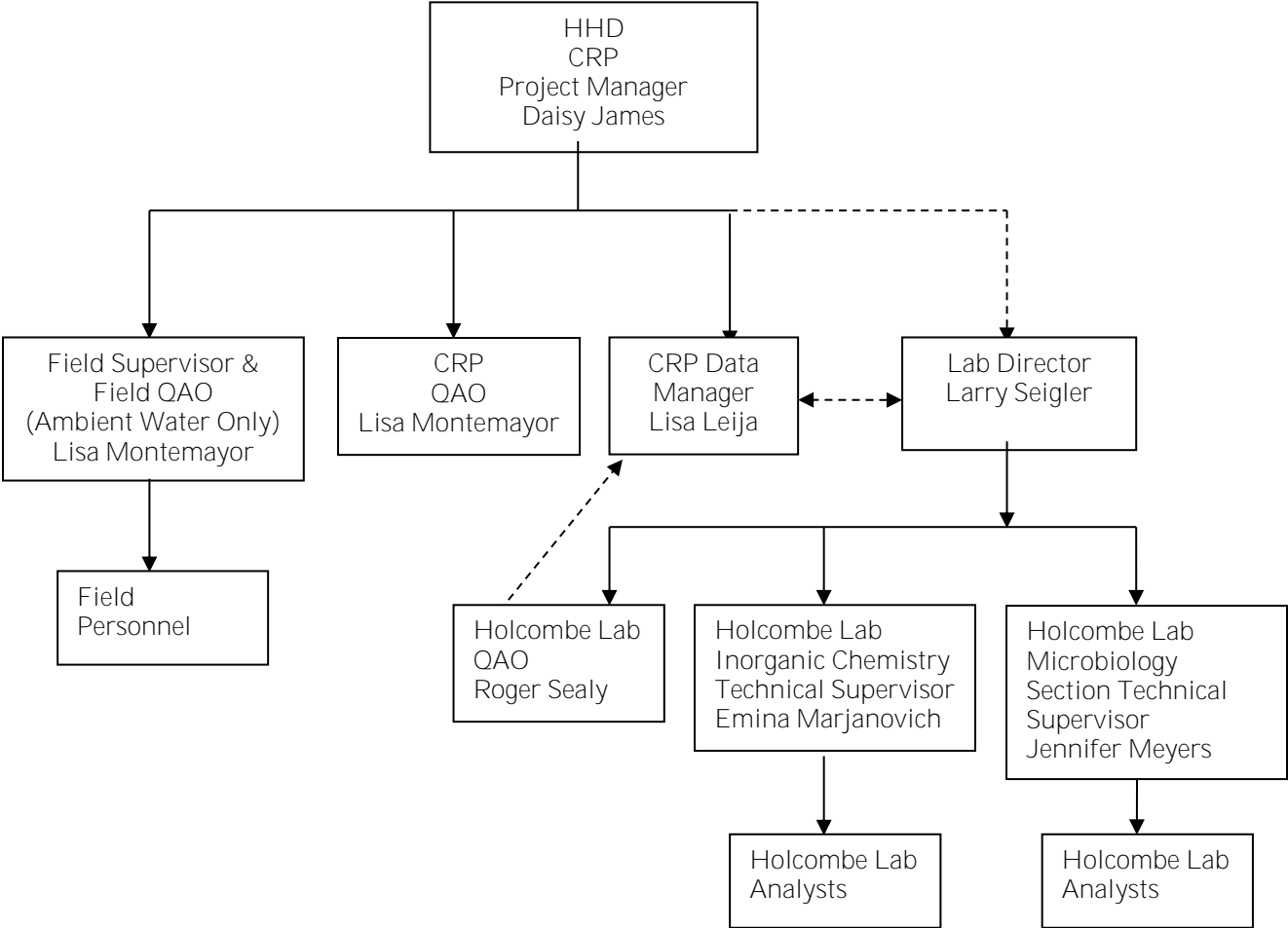


Figure A4.1d. The City of Houston, Drinking Water Operations (DWO) CRP Organizational Chart.

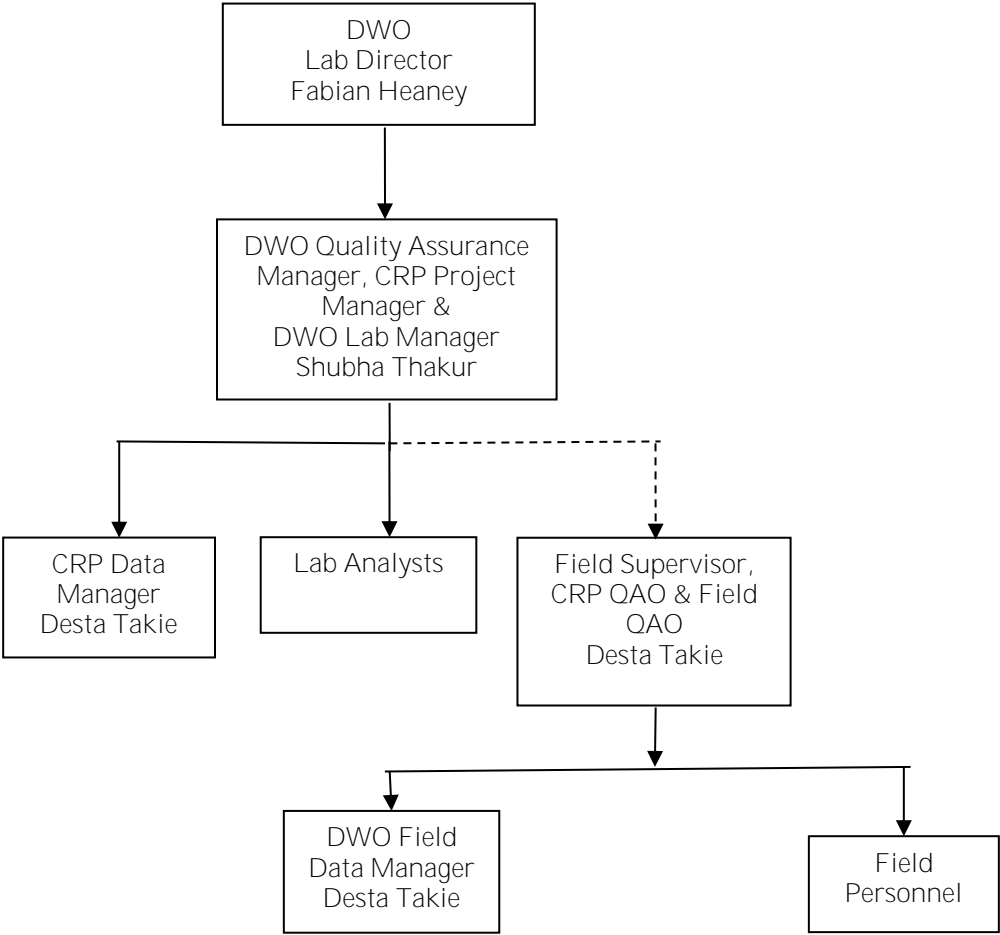


Figure A4.1e. San Jacinto River Authority (SJRA) CRP Organizational Chart.

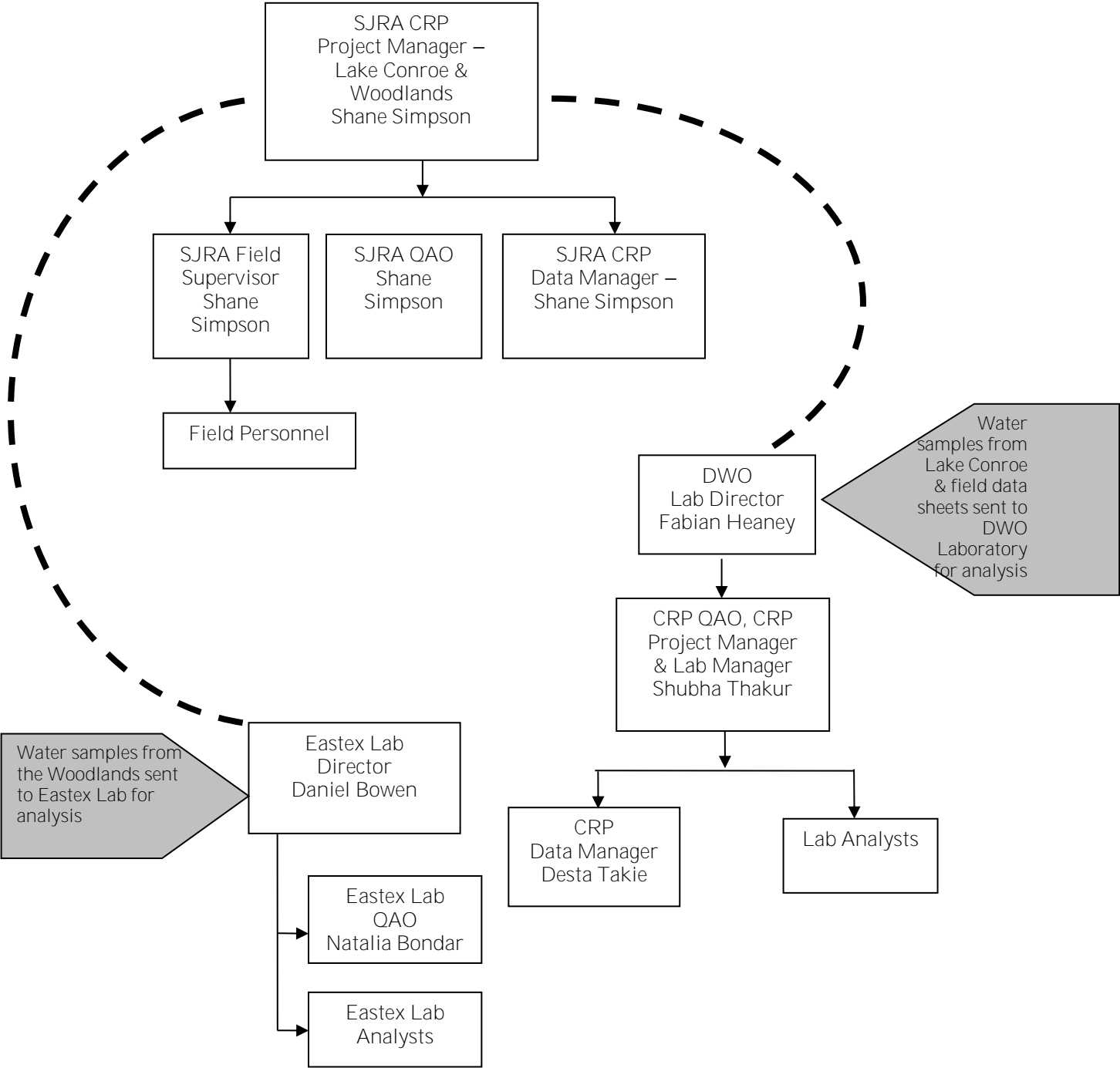


Figure A4.1f. The Environmental Institute of Houston (EI H) at the University of Houston - Clear Lake (UHCL) CRP Organizational Chart.

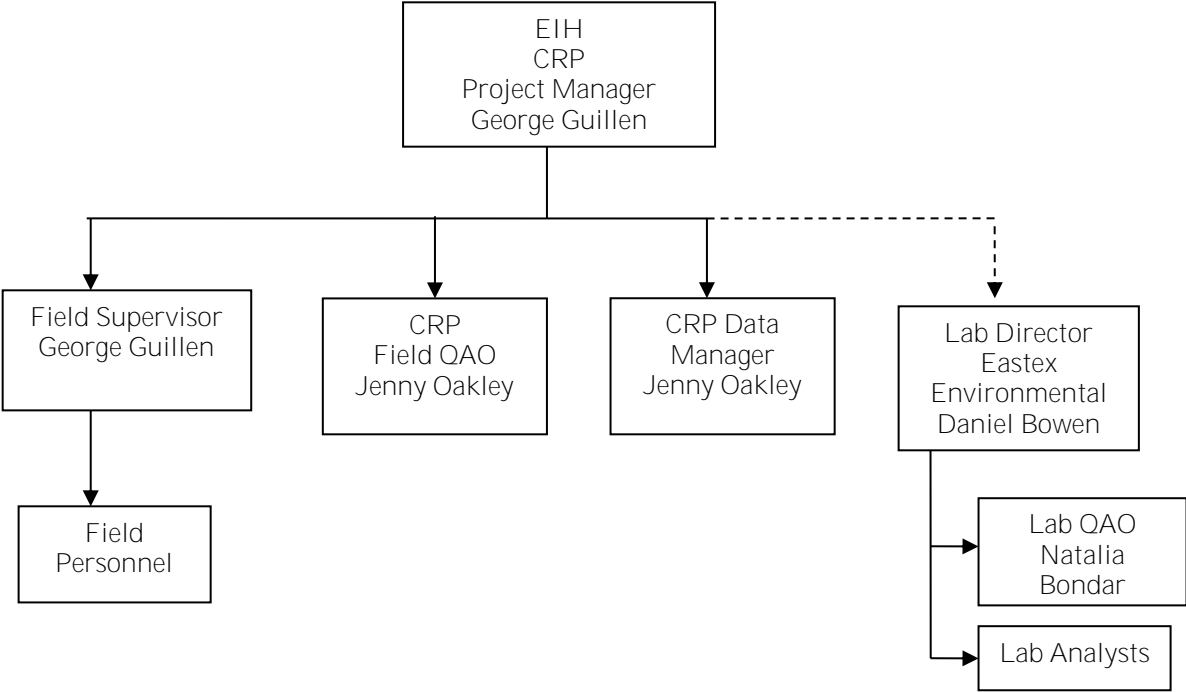
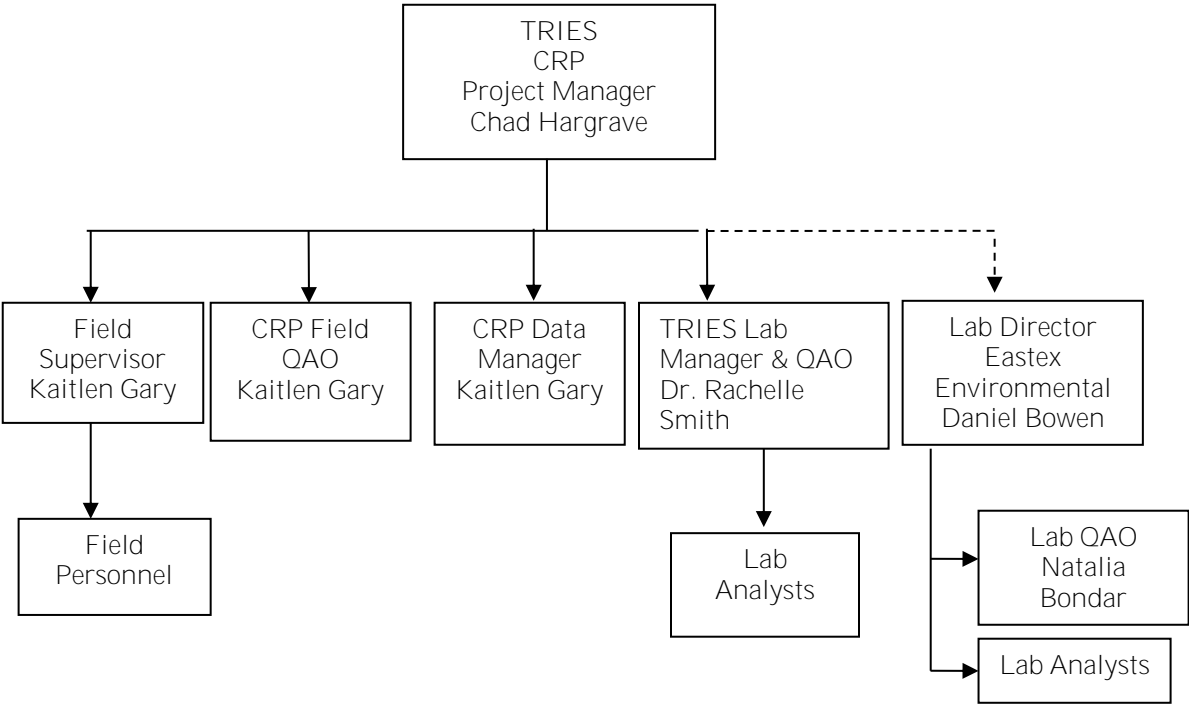


Figure A4.1g. Texas Research Institute for Environmental Studies (TRIES) CRP Organizational Chart.



## A5 Problem Definition/Background

In 1991, the Texas Legislature passed the Texas Clean River Act (Senate Bill 818) in response to growing concerns that water resource issues were not being pursued in an integrated, systematic manner. The act requires that ongoing water quality assessments be conducted for each river basin in Texas, an approach that integrates water quality issues within the watershed. The CRP legislation mandates that each river authority (or local governing entity) shall submit quality-assured data collected in the river basin to the commission. Quality-assured data in the context of the legislation means data that comply with TCEQ rules for surface water quality monitoring (SWQM) programs, including rules governing the methods under which water samples are collected and analyzed and data from those samples are assessed and maintained. This QAPP addresses the program developed between the Houston-Galveston Area Council (H-GAC) and the TCEQ to carry out the activities mandated by the legislation. The QAPP was developed and will be implemented in accordance with provisions of the TCEQ Quality Management Plan, January 2017 or most recent version (QMP).

The purpose of this QAPP is to clearly delineate H-GAC QA policy, management structure, and procedures which will be used to implement the QA requirements necessary to verify and validate the surface water quality data collected. The QAPP is reviewed by the TCEQ to help ensure that data generated for the purposes described above are scientifically valid and legally defensible. This process will ensure that data collected under this QAPP and submitted to SWQMIS have been collected and managed in a way that guarantees its reliability and therefore can be used in water quality assessments, total maximum daily load (TMDL) development, establishing water quality standards, making permit decisions and used by other programs deemed appropriate by the TCEQ. Project results will be used to support the achievement of CRP objectives, as contained in the *Clean Rivers Program Guidance and Reference Guide FY 2018 -2019*.

H-GAC is the lead agency for the Clean Rivers Program in the San Jacinto River Basin and three associated coastal basins - the Trinity-San Jacinto, the San Jacinto-Brazos and the Brazos-Colorado. In many of the state's major river basins, a legislatively created river authority leads the monitoring effort for its basin as intended by the Texas Legislature through the Clean Rivers Act. In areas not covered by a particular river authority, either a neighboring authority or some other logical regional entity is to be designated to coordinate monitoring. H-GAC is a Council of Governments (COG), the regional authority for the Gulf Coast State Planning Region, and has **been actively involved in regional water quality planning and public outreach activities since the 1970's**. In addition, many of the key agencies and individuals involved in water quality matters in the region already participate in environmental committees and programs initiated by H-GAC.

The four basins under H-GAC's oversight comprise a truly diverse region. The basins encompass three major eco-regions (South Central Plains, Gulf Coast Plains and Western Gulf Coastal Plains) and are home to over four million people. Economic activity includes petroleum refining, petrochemical production, manufacturing, transportation, commercial fishing, water-oriented recreation, agriculture (forestry, farming and ranching), aerospace and government. This region has the largest concentration of permitted wastewater discharges (municipal and industrial) in Texas. Most of the outfalls discharge to tributaries that eventually flow into Galveston Bay via the San Jacinto River and Houston Ship Channel. Galveston Bay is an estuary of state and national importance. In fact, three of the four basins overseen by H-GAC drain into or are part of the Galveston Bay system. The San Jacinto River Basin contains the most highly urbanized and industrialized portion of the Houston metropolitan area.

The 2014 State of Texas Integrated Report (which includes a List of Impaired Water Bodies and is required under Section 303d of the Clean Water Act) identifies 43 of the 51 classified segments located within H-GAC's four Clean Rivers Program basins as having an impairment(s) or water quality concern(s). This includes one segment in the Trinity-San Jacinto Coastal Basin, 15 segments in the San Jacinto River Basin (plus 54 unclassified waterbodies), seven segments in the San Jacinto-Brazos Coastal Basin (plus 20 unclassified waterbodies), and four segments in the Brazos-Colorado Coastal Basin (with three additional unclassified waterbodies), plus 16 bay/estuary segments (14 unclassified waterbodies) which are in H-GAC's monitoring area. Among the segments listed in H-GAC's basins, the identified water quality impairments are related to the following factors (with some segments listed for several reasons): elevated bacteria levels which could pose a health risk to people engaged in contact recreation activities, fish/shellfish consumption advisories issued by the Texas Department of Health with most related to dioxin and PCB concerns in the Houston Ship Channel vicinity, low dissolved oxygen, and elevated bacteria levels which trigger shellfish harvesting closures/limitations in shellfish harvesting areas.



In addition to promoting water quality data collection, the Clean Rivers Program aims to develop and maintain a multi-basin water quality monitoring program that minimizes duplicative monitoring, facilitates the assessment process, and targets monitoring to support the permitting and standards process.

**H-GAC's regional surface water quality monitoring program is a voluntary association** of local monitoring agencies, coordinated through H-GAC, under the auspices of the Texas Clean Rivers Program. Federal, state, and local agencies that conduct routine surface water quality monitoring programs within the San Jacinto River, Trinity-San Jacinto Coastal, San Jacinto-Brazos Coastal and Brazos-Colorado Coastal Basins collect surface water quality monitoring information that is used not only by their individual agencies, but will be shared among the other participants through a data clearinghouse maintained by H-GAC. The agencies that make up the regional monitoring workgroup (RMW) include the TCEQ – Region 12, Harris County Pollution Control Services (HCPCS), City of Houston Health Department (HHD), City of Houston Drinking Water Operations (DWO), San Jacinto River Authority (SJRA), the Environmental Institute of Houston (EIH) – University of Houston Clear Lake (UHCL), Harris County Flood Control District (HCFCD), the City of Houston Public Works and Engineering (PWE), the Texas Research Institute on Environmental Studies (TRIES), and the Houston-Galveston Area Council (H-GAC). Other agencies and organizations which are invited to participate or are active on the steering committee include the United States Environmental Protection Agency (EPA) - Houston Lab, the United States Geological Survey (USGS), Texas Parks and Wildlife Coastal Fisheries, Texas Parks and Wildlife Inland Fisheries, National Oceanic and Atmospheric Administration (NOAA)/National Marine Fisheries Service, Texas Water Development Board (TWDB), Texas State Soil and Water Conservation Board, United States Fish and Wildlife, and Texas Department of State Health Services.

Note: Only the agencies listed in Bold type above fall under this QAPP.

H-GAC's RMW agreed on the following six goals for the regional water quality monitoring program:

1. Expand the water quality information base to better assess the condition of water resources in the region, to determine the need for water quality management measures, and to support basic water quality management functions.
2. Generate valid, representative environmental data to accurately assess water quality conditions in the region and to support effective water quality decision-making.
3. Minimize duplication of effort and maximize coordination to make optimal use of the limited resources devoted to water quality monitoring in the region.
4. Enhance water quality monitoring and data management capabilities within the region to obtain more and better water quality information locally and to improve water quality assessment and management efforts at the regional level.
5. Make water quality data collected in the region more usable, shareable and accessible to public agencies, private firms and organizations, and the public.
6. Advocate the importance of stable, long-term monitoring to water quality management efforts in the region.

Underlying these goals and the entire planning process are several significant themes:

- a regional monitoring approach will build on and complement existing monitoring programs while still supporting the specific monitoring mandates of the various agencies;
- implementation of the Clean Rivers Program regional monitoring plan will also accomplish elements of the Galveston Bay Estuary Program's *Regional Monitoring Program for the Galveston Bay Plan*;
- a regional strategy will enable Clean Rivers Program monitoring funds to be leveraged with existing local resources;
- a regional QAPP will ensure data of defined quality for use by others, which is the motivation for agencies to coordinate their monitoring and then share the resulting data;

- the participating agencies will rely on H-GAC to serve as a regional clearinghouse for the efficient transfer, exchange, centralized access, and archiving of water quality data; and
- through the Clean Rivers Program (CRP), the various agencies can communicate to policymakers, basin interests, and the public the importance of systematic, long-term water quality monitoring and the status of existing monitoring efforts in the region.

The coordinated program (the agencies previously noted in bold font) routinely collects surface water quality data from more than 300 sites throughout the region. Sampling includes collection of physicochemical, bacteriological, biological and hydrological data at varying frequencies. The program was established to collect, store and make available water quality data, which the participating agencies require to carry out their assigned functions. The Houston-Galveston Area Council collects this data and uses it for evaluations of water quality under the Clean Rivers Program. The data is also widely used by state water quality managers, cities, counties, consultants, students and the general public. Routine samples are collected from 39 classified stream, reservoir and bay segments to monitor for the attainment of uses and numerical criteria. Numerous unclassified water bodies are also monitored for attainment of designated uses, in response to perceived risk for pollution and/or to define water quality. A map showing the locations of all fixed monitoring locations is included in Appendix C.

Beginning in July 2008, all laboratories working with the Clean Rivers Program began reporting data which was produced in accordance with NELAP (National Environmental Laboratory Accreditation Program) requirements. H-GAC continues its leadership role in coordinating efforts to ensure laboratories that perform analyses on CRP samples maintain NELAP accreditation for CRP analytes. H-GAC pays accreditation fees for two partner laboratories and purchases proficiency test samples for three partner laboratories.

## A6 Project/Task Description

In the absence of a single, regional entity that comprehensively monitors water quality across the San Jacinto River Basin and the various coastal basins in the Houston metropolitan area, the regional monitoring approach H-GAC pursues through the Clean Rivers Program involves coordinating efforts among those local agencies which monitor water quality in some portion of the area for their own specialized purposes and with their own organizational approaches. H-GAC's Multi-Basin Quality Assurance Project Plan (QAPP) is the mechanism for bringing this data into the statewide water quality database, the Surface Water Quality Monitoring Information System, or SWQMIS, maintained by TCEQ. The participation of local monitoring agencies in this regional coordination effort has been largely voluntary as these agencies have not received significant Clean Rivers Program (CRP) funding for their activities.

The local agencies involved in this regional monitoring effort are: the Harris County Pollution Control Services, the City of Houston Health Department, the City of Houston Drinking Water Operations Laboratory, the San Jacinto River Authority, the Environmental Institute of Houston at UHCL, the Texas Research Institute for Environmental Studies, and the Houston-Galveston Area Council. These organizations have a combined total of more than 300 monitoring sites throughout the multiple basins. **Each of the agencies' monitoring activities will be coordinated through the RMW.** See Appendix B for the project-related work plan tasks and schedule of deliverables for a description of work defined in this QAPP. Appendix B also contains a copy of the annual coordinated monitoring schedule (CMS) which describes the sampling design and monitoring activities pertaining to this QAPP. Appendix C contains a map of the sampling station locations. Appendices D and E **contain copies of the local programs' field monitoring sheets and Chain-of-Custody (COC) forms** respectively. A brief description of each partner's program follows.

**Harris County Pollution Control Services'** surface water quality monitoring is conducted at specific sites on the Houston Ship Channel, San Jacinto River, side bays of Galveston Bay, and in and around Clear Lake and its tributaries. Data is collected on a monthly or bi-monthly basis for informational and regulatory purposes involving municipal and industrial wastewater treatment facilities.

City of Houston – Health Department monitors area surface waters to document water quality status and trends with specific concerns for human health risks associated with the use of the waters for contact/non-contact recreation and potable water supply. Data is collected nine times per site per fiscal year.

City of Houston Drinking Water Operations monitors ambient water quality at many locations on Lake Houston and the tributaries flowing into the lake. Lake Houston is one of the primary sources of public water supply for the City of Houston. The monitoring that is conducted allows the Water Quality Control Division to assess the quality of water that will eventually be pumped into water production facilities, treated and distributed to the public as drinking water. Data is collected on a monthly or bi-monthly basis and provided to the Clean Rivers Program as detailed in this QAPP. Because Lake Conroe is also a public drinking water source, the City of Houston contracts with SJRA to collect water samples from that lake. Lake Conroe samples are also analyzed at the Drinking Water Operations Laboratory.

San Jacinto River Authority monitors surface waters in Lake Conroe, Lake Woodlands, Upper and Lower Panther Branch and Bear Branch. Data is provided to the Clean Rivers Program as detailed in this QAPP. SJRA collects routine surface water quality samples from Lake Conroe and transports samples to the DWO Lab for analysis. Water samples are collected on a monthly basis. Field data is submitted to H-GAC on a quarterly basis. Lab data from Lake Conroe is submitted to H-GAC on a quarterly basis directly from DWO Lab. SJRA also collects routine samples to establish baseline surface water quality information for Lake Woodlands and Panther Branch – a tributary of Spring Creek. That data is also shared with the Clean Rivers Program as detailed in this QAPP. Field parameters are monitored monthly while conventional, flow, and bacteriological parameters are analyzed quarterly. Total Copper and Selenium in water samples are collected and analyzed twice a year to look for changes in the concentrations of these metals in the water body over time. Data is submitted to H-GAC on a quarterly basis.

Environmental Institute of Houston is contracted by H-GAC to monitor surface water quality at more than 65 locations in the San Jacinto-Brazos Coastal Basin, the Brazos-Colorado Coastal Basin, Trinity-San Jacinto Coastal Basin, and the Bays and Estuaries (Basin 24). There are no local cities or agencies able to voluntarily monitor the waterways in those areas. Data is collected for the Clean Rivers Program on a quarterly basis for a total of four events at each site per year.

The Texas Research Institute for Environmental Studies is contracted by H-GAC to monitor ambient surface water quality at 10 sites on the Upper East Fork San Jacinto River and Winters Bayou watersheds. Data collected at these sites will supplement data currently collected in this watershed at four active CRP monitoring stations, all of which were previously established by H-GAC and the City of Houston Drinking Water Operations.

Houston-Galveston Area Council has 21 monitoring locations sampled on a quarterly basis. There are no local agencies available or willing to collect samples in the areas being targeted so H-GAC established its own monitoring program. Special studies were conducted in the past which indicate the areas are under pressure from urbanization. Routine monitoring in these areas will support future assessments and allow **H-GAC or TCEQ to evaluate if or how the streams' water quality changes over time.**

Routine monitoring is scheduled at varying frequencies, which are determined by the parameters of concern for individual streams and/or proximity to a monitoring agency's field office and lab. Water bodies are also selected for baseline monitoring if there is high public interest; if it has a high potential for impairment; or there is a need for continuous up-to-date water quality information. Frequencies vary from quarterly for some partners and parameters to monthly in more highly impacted areas (see coordinated monitoring schedule in Appendix B).

Data collected through routine monitoring is designed to characterize water quality trends and monitor progress in protecting and restoring water quality. This monitoring will provide an overall view of water quality throughout the river and coastal basins. Baseline monitoring will include the collection of basic field parameters at all sites and the collection of bacteria, flow, and conventional chemical parameters at sites where indicated. All monitoring procedures and methods will follow the guidelines prescribed in H-GAC QAPP and the most **current versions of TCEQ's *Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods, 2012 (RG-415)* and the TCEQ's *Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, 2014 (RG-416)*.**

#### *24-Hour Dissolved Oxygen (DO) monitoring by the Houston-Galveston Area Council.*

Numerous segments and unclassified waterbodies in H-GAC region have dissolved oxygen (DO) impairments or concerns for depressed DO. Using the most recent Texas Integrated Report, H-GAC identified segments and/or unclassified waterbodies which have been listed in the 303(d) List as being impaired or having concerns. Additional data is needed to confirm DO impairments on these segments and/or unclassified waterbodies. All data collected and summarized will be submitted to the TCEQ for inclusion in SWQMIS. H-GAC will conduct 24-

hour DO monitoring at six monitoring sites quarterly during the two-year contract period. Monitoring events will be planned and conducted according to **TCEQ's Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods, 2012 (RG-415)**.

The sites are located on segments/unclassified segments:

- Site 21965 – (1010C) – Spring Branch at Shakey Hollow west of Woodbranch Village in Montgomery County
- Site 20462 – (1008I) – Walnut Creek at Decker Prairie - Rosehill Rd west of Tomball, TX (Spring Creek tributary)
- Site 20463 – (1008J) – Brushy Creek at Glenmont Estates Blvd west of Tomball, TX (Spring Creek tributary)
- Site 11367 – (1015) – Lake Creek at Honea-Egypt Rd
- Site 18191 – (1015) – Lake Creek at FM 149 approximately 12.5km south of Montgomery, TX near Karen, TX
- Site 21957 – (1008A) – Mill Creek at FM 149 North of Tomball

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

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

## *Amendments to the QAPP*

Revisions to the QAPP may be necessary to address incorrectly documented information or to reflect changes in project organization, tasks, schedules, objectives, and methods. Requests for amendments will be directed from H-GAC Project Manager to the CRP Project Manager electronically. H-GAC will submit a completed QAPP Amendment document, including a justification of the amendment, a table of changes, and all pages, sections or attachments affected by the amendment. Amendments are effective immediately upon approval by the TCEQ QA Manager or designee, H-GAC Project Manager, H-GAC QAO, the CRP Project Manager, the CRP Lead QA Specialist, the CRP Project QA Specialist, and additional parties affected by the amendment. Amendments are not retroactive. No work shall be implemented without an approved QAPP or amendment prior to the start of work. Any activities under this contract that commence prior to the approval of the governing QA document constitute a deficiency and are subject to corrective action as described in section C1 of this QAPP. Any deviation or deficiency from this QAPP which occurs after the execution of this QAPP should be addressed through a Corrective Action Plan (CAP). An Amendment may be a component of a CAP to prevent future recurrence of a deviation. Amendments will be incorporated into the QAPP by way of attachment and distributed to personnel on the distribution list by H-GAC Project Manager. H-GAC will secure an adherence letter from each sub-tier project participant (e.g., local partners, sub-participant, or other units of government) affected by the **amendment stating the organization's awareness of and commitment to requirements contained in each amendment to the QAPP**. H-GAC will maintain **this documentation as part of the project's QA records, and** ensure that the documentation is available for review.

## *Special Project Appendices*

Projects requiring QAPP appendices will be planned in consultation with H-GAC and the TCEQ Project Manager and TCEQ technical staff. Appendices will be written in an abbreviated format and will reference the Basin QAPP where appropriate. Appendices will be approved by H-GAC Project Manager, H-GAC QAO, the Laboratory (as applicable), and the CRP Project Manager, the CRP Project QA Specialist, the CRP Lead QA Specialist, other TCEQ personnel, and additional parties affected by the Appendix, as appropriate. Copies of approved QAPP appendices will be distributed by H-GAC to project participants before data collection activities commence. H-GAC will secure written documentation from each sub-tier project participant (e.g., local partners, **subcontractors, subparticipants, other units of government**) **stating the organization's awareness of and commitment to requirements contained in each special project appendix to the QAPP**. H-GAC will maintain **this documentation as part of the project's QA records, and ensure that the documentation is available for review**.

## A7 Quality Objectives and Criteria

The purpose of routine water quality monitoring is to collect surface water quality data that can be used to characterize water quality conditions, identify significant long-term water quality trends, support water quality standards development, support the permitting process, and conduct water quality assessments in accordance with TCEQ's [Guidance for Assessing and Reporting Surface Water Quality in Texas, June 2015](https://www.tceq.texas.gov/assets/public/waterquality/swqm/assess/14txir/2014_guidance.pdf) or most recent version ([https://www.tceq.texas.gov/assets/public/waterquality/swqm/assess/14txir/2014\\_guidance.pdf](https://www.tceq.texas.gov/assets/public/waterquality/swqm/assess/14txir/2014_guidance.pdf)). These water quality data, and data collected by other organizations (e.g., USGS, TCEQ, etc.), will be subsequently reconciled for use and assessed by the TCEQ.

The measurement performance specifications to support the project purpose for a minimum data set are specified in Appendix A: Table A7.1 and in the text following.

### Ambient Water Reporting Limits (AWRLs)

The AWRL establishes the reporting specification at or below which data for a parameter must be reported to be compared with freshwater screening criteria. The AWRLs specified in Appendix A, Table A7.1 are the program-defined reporting specifications for each analyte and yield data acceptable for the TCEQ's water quality assessment. A [full listing of AWRLs](http://www.tceq.state.tx.us/assets/public/waterquality/crp/QA/awrlmaster.pdf) can be found at <http://www.tceq.state.tx.us/assets/public/waterquality/crp/QA/awrlmaster.pdf>.

The limit of quantitation (LOQ) 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 by the laboratory analyzing the sample.

**Analytical results shall be reported down to the laboratory's LOQ (i.e., the laboratory's LOQ for a given parameter is its reporting limit).**

The following requirements must be met in order to report results to the CRP:

- **The laboratory's** LOQ for each analyte must be at or below the AWRL as a matter of routine practice
- The laboratory must demonstrate its ability to quantitate at its LOQ for each analyte by running an LOQ check sample for each analytical batch of CRP samples analyzed.
- Control limits for LOQ check samples are found in Appendix A.

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.

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

### Bias

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

### Representativeness

Site selection, the appropriate sampling regime, the sampling of all pertinent media according to TCEQ SOPs, and use of only approved analytical methods will assure that the measurement data represents the conditions at the site. Routine data collected under CRP for water quality assessment are considered to be spatially and

temporally representative of routine water quality conditions. Water Quality data are collected on a routine frequency and are separated by approximately even time intervals. At a minimum, samples are collected over at least two seasons (to include inter-seasonal variation) and over two years (to include inter-year variation) and include some data collected during an index period (March 15- October 15). Although data may be collected during varying regimes of weather and flow, the data sets will not be biased toward unusual conditions of flow, runoff, or season. The goal for meeting total representation of the water body will be tempered by the potential funding for complete representativeness.

### Comparability

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

Comparability is also guaranteed by reporting data in standard units, by using accepted rules for rounding figures, and by reporting data in a standard format as specified in the Data Management Plan Section B10.

### Completeness

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

## A8 Special Training/Certification

Before new field personnel independently conduct field work, the local partner designated trainer (See Table A8.1 below) trains him/her in proper instrument calibration, field sampling techniques, and field analysis procedures. The QA officer (or designee) will document the successful field demonstration. The QA Officer (or designee) will retain documentation of training and the successful field **demonstration in the employee's** personnel file. The documentation will be available during monitoring systems audits.

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

Local partners, contractors and subcontractors must ensure that laboratories analyzing samples under this QAPP meet the requirements contained in the TNI Standard (2009) Volume 1, Module 2, Section 4.5.5 (concerning Subcontracting of Environmental Tests).

Table A8.1 The Designated Trainer for each Local Partner.

Local Partner Agency	Designated Trainer
Houston-Galveston Area Council	Jean Wright
Harris County Pollution Control Services	Bryan Kosler
City of Houston – Houston Health Department	Lisa Montemayor
City of Houston – Water Quality Control	Joey Eickhoff
San Jacinto River Authority	Shane Simpson
Environmental Institute of Houston	Jenny Oakley
Texas Research Institute for Environmental Studies	Kaitlen Gary

## A9 Documents and Records

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

Table A9.1a – Project Documents and Records – H-GAC

Document/Record	Location	Retention (yrs)	Format
QAPPs, amendments and appendices	H-GAC	7	Paper & electronic
Field SOPs	H-GAC	7	Paper & electronic
Laboratory Quality Manuals	H-GAC / Eastex Lab	7	Paper & electronic
Laboratory SOPs	Eastex Lab	7	Paper & electronic
QAPP distribution documentation	H-GAC / Eastex Lab	7	Paper
Field staff training records	H-GAC	7	Paper
Field equipment calibration/maintenance logs	H-GAC	7	Paper
Field instrument printouts	H-GAC	7	Paper & electronic
Field notebooks or data sheets	H-GAC	7	Paper
Chain of custody records	H-GAC / Eastex Lab	7	Paper & electronic
Laboratory calibration records	Eastex Lab	7	Paper
Laboratory instrument printouts	Eastex Lab	7	Paper
Laboratory data reports/results	H-GAC / Eastex Lab	7	Electronic
Laboratory equipment maintenance logs	Eastex Lab	7	Paper
Corrective Action Documentation	H-GAC / Eastex Lab	7	Paper & electronic



Table A9.1b – Project Documents and Records – HCPCS

Document/Record	Location	Retention (yrs)	Format
QAPPs, amendments and appendices	H-GAC / HCPCS	7	Paper
Field SOPs	HCPCS	7	Paper
Laboratory Quality Manuals	H-GAC / HCPCS	7	Current version – electronic & paper; prior versions paper only
Laboratory SOPs	HCPCS	7	Current version – electronic & paper; prior versions paper only
QAPP distribution documentation	H-GAC / HCPCS	7	Paper
Field staff training records	H-GAC / HCPCS	7	Paper
Field equipment calibration/maintenance logs	HCPCS	7	Paper
Field notebooks or data sheets	HCPCS	7	Paper
Chain of custody records	HCPCS	7	Paper
Laboratory calibration records	HCPCS Laboratory	7	Paper
Laboratory instrument printouts	HCPCS Laboratory	7	Paper
Laboratory data reports/results	H-GAC / HCPCS Laboratory	7	Paper
Laboratory equipment maintenance logs	HCPCS Laboratory	7	Paper
Corrective Action Documentation	H-GAC / HCPCS	7	Paper

Table A9.1c – Project Documents and Records – Houston – HHD

Document/Record	Location	Retention (yrs)	Format
QAPPs, amendments and appendices	H-GAC / HHD	$\geq 7$	Paper or Electronic
Field SOPs	HHD	$\geq 7$	Paper or Electronic
Laboratory Quality Manuals	Holcombe Lab / H-GAC	$\geq 7$	Current version – electronic & paper; prior versions paper only
Laboratory SOPs	Holcombe Laboratory	$\geq 7$	Current version – electronic & paper; prior versions paper only
QAPP distribution documentation	HHD / Holcombe lab / H-GAC	$\geq 7$	Paper
Field staff training records	HHD / H-GAC	$\geq 7$	Paper
Field equipment calibration/maintenance logs	HHD	$\geq 7$	Paper
Field instrument printouts	HHD	$\geq 7$	Paper
Field notebooks or data sheets	HHD / H-GAC	$\geq$	Paper
Chain of custody records	HHD / Holcombe Lab / H-GAC	$\geq 7$	Paper
Laboratory calibration records	Holcombe Lab	$\geq 7$	Paper or Electronic
Laboratory instrument printouts	Holcombe Lab	$\geq 7$	Paper or Electronic
Laboratory data reports/results	Holcombe Lab / H-GAC	$\geq 7$	Paper or Electronic
Laboratory equipment maintenance logs	Holcombe Lab	$\geq 7$	Paper
Corrective Action Documentation	Holcombe Lab / H-GAC	$\geq 7$	Paper or Electronic

Table A9.1d – Project Documents and Records – Houston – DWO

Document/Record	Location	Retention (yrs)	Format
QAPPs, amendments and appendices	H-GAC / DWO / DWO Lab	≥7	Paper
Field SOPs	DWO	≥7	Paper
Laboratory Quality Manuals	H-GAC / DWO Lab	≥7	Current version – electronic & paper; prior versions paper only
Laboratory SOPs	DWO Lab	≥7	Current version – electronic & paper; prior versions paper only
QAPP distribution documentation	DWO / H-GAC / DWO Lab	≥7	Paper
Field staff training records	DWO / H-GAC	≥7	Paper
Field equipment calibration/maintenance logs	DWO	≥7	Paper
Field notebooks or data sheets	DWO / H-GAC	≥7	Paper
Chain of custody records	DWO / H-GAC	≥7	Paper
Laboratory calibration records	DWO Lab	≥7	Paper
Laboratory instrument printouts	DWO Lab	≥7	Paper
Laboratory data reports/results	DWO Lab / H-GAC	≥7	Electronic
Laboratory equipment maintenance logs	DWO Lab	≥7	Paper
Corrective Action Documentation	H-GAC / DWO Lab	≥7	Paper

Table A9.1e – Project Documents and Records – SJRA – Lake Conroe samples only

Document/Record	Location	Retention (yrs)	Format
QAPPs, amendments and appendices	H-GAC / SJRA / DWO Lab	≥7	Paper
Field SOPs	SJRA	≥7	Paper
Laboratory Quality Manuals	DWO Lab / H-GAC	≥7	Current version – electronic & paper; prior versions paper only
Laboratory SOPs	DWO Lab	≥7	Current version – electronic & paper; prior versions paper only
QAPP distribution documentation	H-GAC / SJRA / DWO Lab	≥7	Paper
Field staff training records	H-GAC / SJRA	≥7	Paper
Field equipment calibration/maintenance logs	SJRA	≥7	Paper
Field instrument printouts	SJRA	≥7	Paper
Field notebooks or data sheets	H-GAC / SJRA	≥7	Paper
Chain of custody records	H-GAC / SJRA / DWO Lab	≥7	Paper
Laboratory calibration records	DWO Lab	≥7	Paper
Laboratory instrument printouts	DWO Lab	≥7	Paper
Laboratory data reports/results	DWO Lab / H-GAC	≥7	Paper
Laboratory equipment maintenance logs	DWO Lab	≥7	Paper
Corrective Action Documentation	H-GAC / SJRA / DWO Lab	≥7	Paper

Table A9.1f – Project Documents and Records – SJRA – Woodlands samples only

Document/Record	Location	Retention (yrs)	Format
QAPPs, amendments and appendices	H-GAC / SJRA	≥7	Paper
Field SOPs	SJRA	≥7	Paper
Laboratory Quality Manuals	H-GAC / Eastex Lab	≥7	Current version – electronic & paper; prior versions paper only
Laboratory SOPs	Eastex Lab	≥7	Current version – electronic & paper; prior versions paper only
QAPP distribution documentation	H-GAC / SJRA / Eastex Lab	≥7	Paper
Field staff training records	H-GAC / SJRA	≥7	Paper
Field equipment calibration/maintenance logs	SJRA	≥7	Paper
Field notebooks or data sheets	H-GAC / SJRA	≥7	Paper
Chain of custody records	H-GAC / SJRA /	≥7	Paper
Laboratory calibration records	Eastex Lab	≥7	Paper
Laboratory instrument printouts	Eastex Lab	≥7	Paper
Laboratory data reports/results	H-GAC / SJRA / Eastex Lab	≥7	Paper
Laboratory equipment maintenance logs	Eastex Lab	≥7	Paper
Corrective Action Documentation	H-GAC / SJRA / Eastex Lab	≥7	Paper

Table A9.1g – Project Documents and Records – EIH

Document/Record	Location	Retention (yrs)	Format
QAPPs, amendments and appendices	H-GAC / EIH / Eastex Lab	7	Paper
Field SOPs	EIH	7	Paper
Laboratory Quality Manuals	H-GAC / Eastex Lab	7	Current version – electronic & paper; prior versions paper only
Laboratory SOPs	Eastex Lab	7	Current version – electronic & paper; prior versions paper only
QAPP distribution documentation	H-GAC / EIH / Eastex Lab	7	Paper
Field staff training records	H-GAC / EIH	7	Paper
Field equipment calibration/maintenance logs	H-GAC / EIH	7	Paper/Electronic
Field instrument printouts	EIH	7	Paper
Field notebooks or data sheets	H-GAC / EIH	7	Paper/Electronic
Chain of custody records	H-GAC / EIH / Eastex Lab	7	Paper/Electronic
Laboratory calibration records	Eastex Lab	7	Paper
Laboratory instrument printouts	Eastex Lab	7	Paper
Laboratory data reports/results	H-GAC / Eastex Lab	7	Electronic
Laboratory equipment maintenance logs	Eastex Lab	7	Paper
Corrective Action Documentation	H-GAC / EIH / Eastex Lab	7	Paper

Table A9.1h – Project Documents and Records – TRIES

Document/Record	Location	Retention (yrs)	Format
QAPPs, amendments and appendices	TRIES / Eastex Lab / H-GAC	7	Paper/Electronic
Field SOPs	TRIES	7	Paper/Electronic
Laboratory Quality Manuals	TRIES / TRIES Lab / Eastex Lab / H-GAC	7	Paper/Electronic
Laboratory SOPs	TRIES Lab / Eastex Lab	7	Paper/Electronic
QAPP distribution documentation	TRIES / TRIES Lab / Eastex Lab / H-GAC	7	Paper
Field staff training records	TRIES / H-GAC	7	Paper
Field equipment calibration/maintenance logs	TRIES / H-GAC	7	Paper
Field instrument printouts	TRIES	7	Paper/Electronic
Field notebooks or data sheets	TRIES / H-GAC	7	Paper/Electronic
Chain of custody records	TRIES / TRIES Lab / Eastex Lab / H-GAC	7	Paper/Electronic
Laboratory calibration records	TRIES Lab / Eastex Lab	7	Paper
Laboratory instrument printouts	TRIES Lab / Eastex Lab	7	Paper
Laboratory data reports/results	TRIES / TRIES Lab / Eastex Lab / H-GAC	7	Paper/Electronic
Laboratory equipment maintenance logs	TRIES Lab / Eastex Lab	7	Paper
Corrective Action Documentation	TRIES / TRIES Lab / Eastex Lab / H-GAC	7	Paper/Electronic

## 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 TNI Standard (2009), Volume 1, Module 2, Section 5.10 and include the information necessary for the interpretation and validation of data. The requirements for reporting data and the procedures are provided.

Eastex is the contract lab for the analysis of all parameters in samples collected by H-GAC, EIH, and SJRA in the Lake Woodlands watershed. Eastex also analyzes TKN and chlorophyll *a* in samples collected by HCPCS, DWO, HHD, TRIES, and SJRA. Plus, Eastex analyses bacteria samples for TRIES since they are not NELAP accredited for that parameter. The results of all analyses, QA/QC data, and scanned copies of COCs are submitted at least quarterly to the H-GAC data manager. Data are reformatted as needed and combined with additional field and lab data during SAS processing and reviewed with the final datasets. For FY 2018-2019, Eastex will submit data in electronic format only. Formal lab reports will remain available upon request. Eastex lab reports include the following information.

- 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 (i.e. station information);
- 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, sample matrix, and time of sample preparation and/or analysis;
- 8) Identification of the test method used plus its LOQ and LOD;
- 9) 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 µg/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.

The information in test reports from other partners (HHPCPS, HHD, DWO, and TRIES) will be consistent with the information that is needed to prepare data submittals to TCEQ. At the very minimum, test reports (regardless of whether they are hard copy or electronic) will include the following or be available upon request:

- Sample results
- Units of measurement
- Sample matrix
- Dry weight or wet weight (as applicable)
- Station information
- Date and time of collection
- Holding time for *E. coli*
- LOQ (formerly referred to as the reporting limit), and qualification of results outside the working range (if applicable)
- LOD (formerly referred to as the method detection limit) is provided to H-GAC upon request
- Certification of NELAP compliance

Otherwise, reports should be consistent with the TNI Standard 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.



Other local partners – HCPCS, HHD, DWO, SJRA, and TRIES – share their data but review their own lab reports in-house. Local partner lab data reports are provided to H-GAC upon request only. **Each partner’s data manager works with their respective labs to receive their lab reports and input results to a database or spreadsheet which is then sent to H-GAC in an electronic format.**

### Electronic Data

H-GAC’s local partners or sub-tier participants submit data to H-GAC electronically. **Each partner’s data set is submitted with a completed Data Review Checklist (Appendix F).** See Section B10 for a description of the Data Management Process.

Data is submitted in several formats, as shown Table A9.2. Upon arrival at H-GAC, datasets are copied to partner-specific “raw data” folders on a secured network drive that is regularly backed-up by H-GAC’s IT staff. The data manager reformats the data to create an input dataset for SAS processing and saves it in a separate folder as a “working” file. **Unaltered copies of submitted data are retained in the raw data folder.** Partner-specific SAS code has been written to create Access tables for review; identify outliers and possible errors, and automate the correction, deletion, or acceptance of suspect data values; and to create properly formatted text files to be submitted to TCEQ. Many tasks previously performed manually are now performed as part of SAS processing and additional improvements to the data management process are made on an ongoing basis. While many data validation and verification tasks are now part of routine processing, data sets are still reviewed manually by H-GAC’s QAO to identify issues not found during routine processing. The data processing, verification, and review process is described in H-GAC’s Data Management Procedures (Appendix H).

The following table outlines how data is received from each local partner or sub-tier participant. All local partner data is submitted with a Data Review Checklist. The Checklist includes specific information regarding each data set. As H-GAC performs data processing and management tasks, the Data Manager compiles a Data Summary report (see example in Appendix G) that is submitted with the Event/Results text files. The Data Summary Report/Sheet will include information from the local partner Data Review Checklists as well as information about any changes to or deletions of data by H-GAC before it was submitted to TCEQ.

Table A9.2 The Software used by Local Partners to Submit Data to H-GAC.

Sub-Tier Participants	Software
HHD	MS Access
DWO	MS Excel
SJRA	MS Excel
EIH	MS Excel
HCPCS	MS Access
TRIES	MS Excel
Eastex Environmental Lab	MS Excel

Data will be submitted electronically to the TCEQ in the Event/Result file format described in the most current version of the [DMRG](https://www.tceq.texas.gov/waterquality/data-management/dmrg_index.html), which can be found at [https://www.tceq.texas.gov/waterquality/data-management/dmrg\\_index.html](https://www.tceq.texas.gov/waterquality/data-management/dmrg_index.html). A completed Data Review Checklist and Data Summary (see Appendix F) will be submitted with each data submittal.

## B1 Sampling Process Design

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

## B2 Sampling Methods

### Field Sampling Procedures

Field sampling will be conducted in accordance with the latest versions of the TCEQ Surface Water Quality Monitoring Procedures Volume 1: Physical and Chemical Monitoring Methods for Water, Sediment, and Tissue, 2012 (RG-415) and Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, 2014 (RG-416), collectively referred to as “SWQM Procedures”. Updates to SWQM Procedures are posted to the Surface Water Quality Monitoring Procedures website ([https://www.tceq.texas.gov/waterquality/monitoring/swqm\\_guides.html](https://www.tceq.texas.gov/waterquality/monitoring/swqm_guides.html)), and shall be incorporated into H-GAC’s procedures, QAPP, SOPs, etc., within 60 days of any final published update. Additional aspects outlined in Section B below reflect specific requirements for sampling under CRP and/or provide additional clarification.

Table B2.1a Sample Storage, Preservation and Handling Requirements for H-GAC. Samples Analyzed at Eastex Environmental Laboratory

Parameter	Matrix	Container	Preservation	Sample Volume	Holding Time
TSS	water	Plastic	Cool to <6°C but not frozen	1 L	7 days
Sulfate	water	Plastic	Cool to <6°C but not frozen	100 mL <sup>2</sup>	28 days
Chloride	water	Plastic	Cool to <6°C but not frozen	100 mL <sup>2</sup>	28 days
<i>E. coli</i> IDEXX Colilert	water	Sterile Plastic w/ sodium thiosulfate	Cool to <6°C but not frozen	120 mL <sup>4</sup>	8 hours <sup>1</sup>
TKN	water	Plastic	Cool to <6°C but not frozen H <sub>2</sub> SO <sub>4</sub> to pH <2	500 mL <sup>3</sup>	28 days
Ammonia-N	water	Plastic	Cool to <6°C but not frozen H <sub>2</sub> SO <sub>4</sub> to pH <2	125 mL <sup>3</sup>	28 days
Nitrite + nitrate-N	water	Plastic	Cool to <6°C but not frozen, H <sub>2</sub> SO <sub>4</sub> to pH <2	125 mL <sup>3 and 5</sup>	28 days
Nitrate-N	water	Plastic	Cool to <6°C but not frozen	100 mL <sup>2 and 5</sup>	48 hours
Nitrate-N	water	Plastic	Cool to <6°C but not frozen, H <sub>2</sub> SO <sub>4</sub> to pH <2	125 mL <sup>3 and 5</sup>	28 days
Nitrite-N	water	Plastic	Cool to <6°C but not frozen	100 mL <sup>2 and 5</sup>	48 hours
Phosphorus-P, total	water	Plastic	Cool to <6°C but not frozen H <sub>2</sub> SO <sub>4</sub> to pH <2	125 mL <sup>3</sup>	28 days

1. *E. coli* samples analyzed by SM 9223-B should always be processed as soon as possible and incubated no later than 8 hours from time of collection. When transport conditions necessitate sample incubation after 8 hours from time of collection, the holding time may be extended and samples must be processed as soon as possible and within 30 hours.

2. One 500 mL plastic container is used to collect these four parameters.

3. Four or five tests are analyzed from one 1L plastic bottle.

4. Maximum volume analyzed for *E. coli* is 50 ml allowing duplicate analyses from 1 container.

5. Eastex will run IC speciation (100 mL samples) but will analyze Nitrite+Nitrate (125 mL sample) by cadmium reduction method if IC equipment is down.

Table B2.1b Sample Storage, Preservation and Handling Requirements for HCPCS

Parameter	Matrix	Container	Preservation	Sample Volume	Holding Time
TSS	water	Plastic	Cool to <6°C but not frozen	½ Gal	7 days
Enterococci IDEXX Enterolert	water	Sterile Plastic w/ sodium thiosulfate	Cool to <6°C but not frozen	120 mL	8 hours
Ammonia-N	water	Plastic	Cool to <6°C but not frozen H <sub>2</sub> SO <sub>4</sub> to pH <2	50 mL	28 days
TKN	water	Plastic	Cool to <6°C but not frozen H <sub>2</sub> SO <sub>4</sub> to pH <2	500 mL	28 days <sup>1</sup>
Nitrite + nitrate-N	water	Plastic	Cool to <6°C but not frozen, H <sub>2</sub> SO <sub>4</sub> to pH <2	50 mL <sup>2</sup>	28 days
Phosphorus-P, total	water	Plastic	Cool to <6°C but not frozen H <sub>2</sub> SO <sub>4</sub> to pH <2	50 mL <sup>2</sup>	28 days
Chlorophyll- <i>a</i>	water	Brown plastic	Dark & iced before filtration; Dark & frozen after filtration	4 L	Filtered w/in 48 hours; after filtered, then frozen up to 23 days <sup>1</sup>

1. Eastex Environmental will pick up and analyze samples(s).

2. Three nutrient tests are collected from one 500 mL plastic container.

Table B2.1c Sample Storage, Preservation and Handling Requirements for HHD

Parameter	Matrix	Container	Preservation	Sample Volume	Holding Time
TSS	water	Plastic	Cool to <6°C but not frozen	700 mL <sup>3</sup>	7 days
Sulfate	water	Plastic	Cool to <6°C but not frozen	100 mL <sup>3</sup>	28 days
Chloride	water	Plastic	Cool to <6°C but not frozen	100 mL <sup>3</sup>	28 days
<i>E. coli</i> IDEXX Colilert-18	water	Sterile Plastic w/ sodium thiosulfate	Cool to <6°C but not frozen	120 mL/250 mL	8 hours <sup>1</sup>
Enterococci IDEXX Enterolert	water	Sterile Plastic w/ sodium thiosulfate	Cool to <6°C but not frozen	120 mL	8 hours
TKN	water	Plastic	Cool to <6°C but not frozen H <sub>2</sub> SO <sub>4</sub> to pH <2	250 mL	28 days <sup>2</sup>
Ammonia-N	water	Plastic	Cool to <6°C but not frozen H <sub>2</sub> SO <sub>4</sub> to pH <2	100 mL <sup>4</sup>	28 days
Nitrate-N	water	Plastic	Cool to <6°C but not frozen	100 mL <sup>3</sup>	48 hours
Phosphorus-P, total	water	Plastic	Cool to <6°C but not frozen H <sub>2</sub> SO <sub>4</sub> to pH <2	100 mL <sup>4</sup>	28 days

1. *E. coli* samples analyzed by SM 9223-B should always be processed as soon as possible and incubated no later than 8 hours from time of collection. When transport conditions necessitate sample incubation after 8 hours from time of collection, the holding time may be extended and samples must be processed as soon as possible and within 30 hours.

2. Eastex Environmental Lab will pick up and analyze sample(s).

3. Multiple tests are collected from one 1-liter plastic cubitainer that has not been acidified.

4. Multiple tests are conducted out of one 1 liter plastic cubitainer which has been preserved with acid.

Table B2.1d Sample Storage, Preservation and Handling Requirements for DWO

Parameter	Matrix	Container	Preservation	Sample Volume	Holding Time
TSS	water	Plastic	Cool to <6°C but not frozen	100 mL <sup>3</sup>	7 days
Sulfate	water	Plastic	Cool to <6°C but not frozen	50 mL <sup>3</sup>	28 days
Chloride	water	Plastic	Cool to <6°C but not frozen	50 mL <sup>3</sup>	28 days
<i>E. coli</i> IDEXX Colilert	water	Sterile Plastic w/ sodium thiosulfate	Cool to <6°C but not frozen	120 mL <sup>4</sup>	8 hours <sup>1</sup>
TKN	water	Plastic	Cool to <6°C but not frozen H <sub>2</sub> SO <sub>4</sub> to pH <2	500 mL	28 days <sup>2</sup>
Ammonia-N	water	Plastic	Cool to <6°C but not frozen H <sub>2</sub> SO <sub>4</sub> to pH <2	500 mL	28 days
Nitrate-N	water	Plastic	Cool to <6°C but not frozen	50 mL <sup>3</sup>	48 hours
Phosphorus-P, total	water	Brown, glass bottle	Cool to <6°C but not frozen H <sub>2</sub> SO <sub>4</sub> to pH <2	125 mL	28 days
Chlorophyll- <i>a</i>	water	Brown plastic	Dark & iced before filtration; Dark & frozen after filtration	4 L	Filtered w/in 48 hours; after filtered, then frozen up to 23 days <sup>2</sup>
Alkalinity, Total	water	Plastic	Cool to <6°C but not frozen	50 mL <sup>3</sup>	14 days

1. *E. coli* samples analyzed by SM 9223-B should always be processed as soon as possible and incubated no later than 8 hours from time of collection. When transport conditions necessitate sample incubation after 8 hours from time of collection, the holding time may be extended and samples must be processed as soon as possible and within 30 hours.

2. Eastex Environmental Lab will pick up and analyze sample(s).

3. All tests are collected in one 500 mL plastic bottle.

4. Maximum volume analyzed for *E. coli* is 50 ml allowing duplicate analyses from 1 container.

Table B2.1e Sample Storage, Preservation and Handling Requirements for SJRA Samples Collected from Lake Conroe and Analyzed by DWO Laboratory

Parameter	Matrix	Container	Preservation	Sample Volume	Holding Time
TSS	water	Plastic	Cool to <6°C but not frozen	100 mL <sup>3</sup>	7 days
Sulfate	water	Plastic	Cool to <6°C but not frozen	50 mL <sup>3</sup>	28 days
Chloride	water	Plastic	Cool to <6°C but not frozen	50 mL <sup>3</sup>	28 days
<i>E. coli</i> IDEXX Colilert	water	Sterile Plastic w/ sodium thiosulfate	Cool to <6°C but not frozen	120 mL <sup>4</sup>	8 hours <sup>2</sup>
TKN <sup>2</sup>	water	Plastic	Cool to <6°C but not frozen H <sub>2</sub> SO <sub>4</sub> to pH <2	500 mL	28 days <sup>2</sup>
Ammonia-N	water	Plastic	Cool to <6°C but not frozen H <sub>2</sub> SO <sub>4</sub> to pH <2	500 mL	28 days
Nitrate-N	water	Plastic	Cool to <6°C but not frozen	50 mL <sup>3</sup>	28 days
Phosphorus-P, total	water	Brown, glass bottle	Cool to <6°C but not frozen H <sub>2</sub> SO <sub>4</sub> to pH <2	125 mL	28 days
Chlorophyll- <i>a</i>	water	Brown plastic	Dark & iced before filtration; Dark & frozen after filtration	4 L	Filtered w/in 48 hours; after filtered, then frozen up to 23 days <sup>2</sup>
Alkalinity, Total	water	Plastic	Cool to <6°C but not frozen	50 mL <sup>3</sup>	14 days

1. *E. coli* samples analyzed by SM 9223-B should always be processed as soon as possible and incubated no later than 8 hours from time of collection. When transport conditions necessitate sample incubation after 8 hours from time of collection, the holding time may be extended and samples must be processed as soon as possible and within 30 hours.

2. Eastex Environmental Lab will pick up and analyze sample(s).

3. One 500 mL plastic bottle is collected, specified volumes withdrawn for analysis.

4. Maximum volume analyzed for *E. coli* is 50 ml allowing duplicate analyses from 1 container.

Table B2.1f Sample Storage, Preservation and Handling Requirements for SJRA Samples Collected from The Woodlands and Analyzed at Eastex Environmental Laboratory

Parameter	Matrix	Container	Preservation	Sample Volume	Holding Time
TSS	water	Plastic	Cool to <6°C but not frozen	1 L	7 days
Sulfate	water	Plastic	Cool to <6°C but not frozen	100 mL <sup>3</sup>	28 days
Chloride	water	Plastic	Cool to <6°C but not frozen	100 mL <sup>3</sup>	28 days
<i>E. coli</i> IDEXX Colilert	water	Sterile Plastic w/ sodium thiosulfate	Cool to <6°C but not frozen	120 mL <sup>5</sup>	8 hours <sup>1</sup>
Ammonia-N	water	Plastic	Cool to <6°C but not frozen Add H <sub>2</sub> SO <sub>4</sub> to pH <2	125 mL <sup>2</sup>	28 days
TKN	water	Plastic	Cool to <6°C but not frozen Add H <sub>2</sub> SO <sub>4</sub> to pH <2	500 mL	28 days
Nitrite+Nitrate -N	water	Plastic	Cool to <6°C but not frozen, Add H <sub>2</sub> SO <sub>4</sub> to pH <2	125 mL <sup>2 and 6</sup>	28 days
Nitrate-N	water	Plastic	Cool to <6°C but not frozen,	100 mL <sup>3 and 6</sup>	48 hours
Phosphorus-P, total	water	Plastic	Cool to <6°C but not frozen Add H <sub>2</sub> SO <sub>4</sub> to pH <2	125 mL <sup>2</sup>	28 days
Chlorophyll- <i>a</i>	water	Brown plastic	Dark & iced before filtration; Dark & frozen after filtration	4 L	Filtered w/in 48 hours; after filtered, then frozen up to 23 days <sup>2</sup>
Hardness, Total	water	Plastic	Cool to <6°C but not frozen Add H <sub>2</sub> SO <sub>4</sub> to pH <2	100 mL <sup>4</sup>	28 days
Copper, Total	water	Plastic	Cool to <6°C but not frozen Add HNO <sub>3</sub> to pH <2	100 mL <sup>4</sup>	6 months
Selenium, Total	water	Plastic	Cool to <6°C but not frozen Add HNO <sub>3</sub> to pH <2	100 mL <sup>4</sup>	s6 months

1. *E. coli* samples analyzed by SM 9223-B should always be processed as soon as possible and incubated no later than 8 hours from time of collection. When transport conditions necessitate sample incubation after 8 hours from time of collection, the holding time may be extended and samples must be processed as soon as possible and within 30 hours.

2. Nutrient tests are collected from one 1 L plastic bottle.

3. One 1 L plastic container is used to collect these three parameters.

4. All three “**Total Metals**” related parameters are collected in one 1-L plastic container and split at the lab for the various parameters.

5. Maximum volume analyzed for *E. coli* is 50 ml allowing duplicate analyses from 1 container.

6. Eastex will run IC speciation (100 mL samples) first but will analyze Nitrite+Nitrate (125 mL sample) by cadmium reduction method if IC equipment is down.

Table B2.1g Sample Storage, Preservation and Handling Requirements for EIH. Samples Analyzed by Eastex Environmental Laboratory

Parameter	Matrix	Container	Preservation	Sample Volume	Holding Time
TSS	water	Plastic	Cool to <6°C but not frozen	1 L	7 days
Sulfate	water	Plastic	Cool to <6°C but not frozen	100 mL <sup>3</sup>	28 days
Chloride	water	Plastic	Cool to <6°C but not frozen	100 mL <sup>3</sup>	28 days
<i>E. coli</i> IDEXX Colilert*	water	Sterile Plastic w/ sodium thiosulfate	Cool to <6°C but not frozen	120 mL <sup>4</sup>	8 hours <sup>1</sup>
Enterococci IDEXX Enterolert	water	Sterile Plastic w/ sodium thiosulfate	Cool to <6°C but not frozen	120 mL <sup>5</sup>	8 hours
TKN	water	Plastic	Cool to <6°C but not frozen H <sub>2</sub> SO <sub>4</sub> to pH <2	500 mL <sup>2</sup>	28 days <sup>5</sup>
Ammonia-N	water	Plastic	Cool to <6°C but not frozen H <sub>2</sub> SO <sub>4</sub> to pH <2	125 mL <sup>2</sup>	28 days
Nitrite + nitrate-N	water	Plastic	Cool to <6°C but not frozen, H <sub>2</sub> SO <sub>4</sub> to pH <2	125 mL <sup>3 and 6</sup>	28 days
Nitrate-N	water	Plastic	Cool to <6°C but not frozen	100 mL <sup>2 and 6</sup>	48 hours
Nitrate-N	water	Plastic	Cool to <6°C but not frozen, H <sub>2</sub> SO <sub>4</sub> to pH <2	125 mL <sup>3 and 6</sup>	28 days
Nitrite-N	water	Plastic	Cool to <6°C but not frozen	100 mL <sup>2 and 6</sup>	48 hours
Phosphorus-P, total	water	Plastic	Cool to <6°C but not frozen H <sub>2</sub> SO <sub>4</sub> to pH <2	125 mL <sup>2</sup>	28 days
Chlorophyll- <i>a</i>	water	Brown plastic	Dark & iced before filtration; Dark & frozen after filtration	4 L	Filtered w/in 48 hours; after filtered, then frozen up to 23 days <sup>5</sup>

1. *E. coli* samples analyzed by SM 9223-B should always be processed as soon as possible and incubated no later than 8 hours from time of collection. When transport conditions necessitate sample incubation after 8 hours from time of collection, the holding time may be extended and samples must be processed as soon as possible and within 30 hours.

2. Five tests are analyzed from one 1L plastic bottle.

3. One 500 mL plastic container is used to collect these three samples.

4. Maximum volume analyzed for *E. coli* is 50 ml allowing duplicate analyses from 1 container.

5. Eastex Environmental Lab will pick up and analyze sample(s).

6. Eastex will run IC speciation (100 mL samples) first but will analyze Nitrite+Nitrate (125 mL sample) by cadmium reduction method if IC equipment is down.

Table B2.1h Sample Storage, Preservation, and Handling Requirements for TRIES.  
Requirements for TRIES Samples Analyzed by the TRIES Laboratory and Eastex Environmental Laboratory

Parameter	Matrix	Container	Preservation	Sample Volume	Holding Time
TSS	water	Plastic	Cool to <6°C but not frozen	1 L	7 days
Sulfate	water	Plastic	Cool to <6°C but not frozen	100 mL <sup>2</sup>	28 days
Chloride	water	Plastic	Cool to <6°C but not frozen	100 mL <sup>2</sup>	28 days
<i>E. coli</i> IDEXX Colilert	water	Sterile Plastic w/ sodium thiosulfate	Cool to <6°C but not frozen	120 <sup>4</sup> mL	8 hours <sup>1 and 5</sup>
TKN	water	Plastic	Cool to <6°C but not frozen H <sub>2</sub> SO <sub>4</sub> to pH <2	500 mL <sup>2</sup>	28 days <sup>5</sup>
Ammonia-N	water	Plastic	Cool to <6°C but not frozen H <sub>2</sub> SO <sub>4</sub> to pH <2	125 mL <sup>3</sup>	28 days
Nitrate-N	water	Plastic	Cool to <6°C but not frozen	125 mL <sup>3 and 6</sup>	48 hours
Nitrite-N	water	Plastic	Cool to <6°C but not frozen	125 mL <sup>3 and 6</sup>	48 hours
Nitrite + nitrate-N	water	Plastic	Cool to <6°C but not frozen, H <sub>2</sub> SO <sub>4</sub> to pH <2	125 mL <sup>3 and 6</sup>	28 days <sup>5</sup>
Phosphorus-P, total	water	Plastic	Cool to <6°C but not frozen HNO <sub>3</sub> to pH <2	125 mL <sup>3</sup>	28 days

1. *E. coli* samples analyzed by SM 9223-B should always be processed as soon as possible and incubated no later than 8 hours from time of collection. When transport conditions necessitate sample incubation after 8 hours from time of collection, the holding time may be extended and samples must be processed as soon as possible and within 30 hours.

2. One 500 mL plastic container is used to collect these two samples.

3. Four or five tests are analyzed from one 1L plastic bottle.

4. Maximum volume analyzed for *E. coli* is 50 ml allowing duplicate analyses from 1 container.

5. Eastex Environmental Lab will pick up and analyze sample(s).

6. TRIES & Eastex can both run IC speciation but Eastex will analyze Nitrite+Nitrate by cadmium reduction method if IC equipment is down

## Sample Containers

Certificates from sample container manufacturers are maintained in a notebook by each of the monitoring partners as appropriate. Information about the various sample containers for each local partner is described below.

### Houston-Galveston Area Council (H-GAC)

All sample containers are provided to H-GAC by their contract lab, Eastex. The lab performs and tracks required QC procedures for all bottles purchased.

- Pre-cleaned, plastic, disposable sample containers are used for conventional parameters.
- Sterile, sealed, 120 mL plastic, disposable bottles with a sodium thiosulfate tablet added, are used for bacteriological samples.
- When preservation is required for particular parameters, the acid is added to the container in the field by field personnel immediately after samples are collected.

### Harris County Pollution Control Services (HCPCS)

All sample containers are purchased by the HCPCS Lab except as noted below. The labs perform and track all required QC procedures for the bottles they purchased and provide to the field crew.

- Pre-cleaned, plastic, disposable sample containers are used for conventional parameters.
- Sterile, sealed, 120 mL plastic, disposable bottles with a sodium thiosulfate tablet added, are used for bacteriological samples.



- Brown, polyethylene, 4-liter cubitainers are used routinely for chlorophyll-*a* samples and are provided by H-GAC's **contract lab, Eastex.**
- Pre-cleaned, plastic, disposable sample containers for the TKN samples are also provided by H-GAC's contract lab, Eastex.
- When preservation is required for particular parameters, the bottles are pre-acidified at the lab. Containers are never dipped underwater but are filled using a peristaltic pump and collected from the required depth as specified in the SWQM Procedures Volume 1 manual using an in-take tube 1 foot (0.3 meter) long.

#### City of Houston - Health Department (HHD)

All sample containers are purchased by the Bureau of Pollution Control and Prevention except as noted below. All containers are received at the field office located on Park Place. Before containers are used by field crews, a specified number of containers are pulled out for delivery to the Holcombe Lab where all QC checks and documentation are performed. The HHD Lab QAO reviews and tracks the results of all QC testing.

- Pre-cleaned, plastic, disposable sample containers are used for conventional parameters.
- Sterile, sealed, 120 or 250 mL plastic, disposable bottles with sodium thiosulfate tablet added, are used for the microbiological samples.
- Pre-cleaned, plastic, disposable sample containers for the TKN samples are provided by H-GAC's contract lab, Eastex Environmental Lab.
- When preservation is required, the preservative is added to the container in the field by field personnel immediately after the samples are collected.

#### City of Houston - Drinking Water Operations (DWO) and San Jacinto River Authority – Lake Conroe samples

All disposal sample containers are purchased by the DWO Lab except as noted below. Each lab cited below performs and tracks all required QC procedures for all bottles they purchase. SJRA-Lake Conroe samples are analyzed by the City of Houston Drinking Water Operations Lab (DWO).

- Pre-cleaned, plastic, disposable sample containers are used for conventional parameters.
- Sterile, sealed, 120 mL plastic, disposable bottles with sodium thiosulfate added, are used for bacteriological samples.
- Amber glass bottles are used to collect total phosphorus samples. These containers are thoroughly cleaned for re-use. See washing procedure following this list.
- Brown, polyethylene, 4-liter cubitainers are used routinely for chlorophyll-*a* samples and are provided by H-GAC's **contract lab, Eastex.**
- Pre-cleaned, plastic, disposable sample containers for the TKN samples are provided by H-GAC's contract lab, Eastex Environmental Lab.
- When preservation is required for particular parameters, the bottles are pre-acidified at the office. Bottles are never filled by dipping. Rather, bottles are filled by pouring from a sample collection container that has been pre-rinsed 3 times at each monitoring location.

DWO container washing procedures (excluding bacteria bottles): The bottles are sent through a mechanical wash cycle followed by an acid rinse. The procedure is as follows: The bottles are placed in a dish washing machine where it goes through a pre-wash cycle with distilled water, a wash cycle with phosphate-free soap, a deionized water (DI) rinse cycle, then an acid rinse cycle. Next, the bottles are rinsed with DI water several times making sure there is at least a three (3) volume exchange of water. Lastly, the bottles are air dried. Afterwards, the bottles are sealed prior to storage for their next use.

#### San Jacinto River Authority – The Woodlands samples

Eastex Environmental Lab is the contract lab for samples collected from The Woodlands. The lab performs and tracks required QC procedures for all bottles purchased.

- Pre-cleaned, plastic, disposable sample containers are used for conventional parameters.
- Sterile, sealed, 120 mL plastic, disposable bottles with a sodium thiosulfate tablet added, are used for bacteriological samples.
- Brown, polyethylene, 4-liter cubitainers are used for chlorophyll-*a* samples.
- When preservation is required for particular parameters, the containers are pre-acidified by the lab before being given to field personnel.
- New, certified pre-cleaned, plastic bottles are used for all “metals-in-water” samples. The vendor provides certificates for the bottles which are maintained on file by the laboratory and the lab tests at

- least one bottle from each box purchased as part of QC.
- Pre-cleaned, plastic, disposable sample containers for the TKN samples are provided by H-GAC's contract lab, Eastex Environmental Lab.

#### Environmental Institute of Houston (EIH)

All sample containers are provided to H-GAC by their contract lab, Eastex. The lab performs and tracks required QC procedures for all bottles purchased.

- Pre-cleaned, plastic, disposable sample containers are used for conventional parameters.
- Sterile, sealed, 120 mL plastic, disposable bottles with a sodium thiosulfate tablet added, are used for bacteriological samples.
- Brown, polyethylene, 4-liter cubitainers are used for chlorophyll-*a* samples.
- When preservation is required for particular parameters, the acid is added to the container in the field by field personnel immediately after samples are collected.

The TRIES Analytical Lab provides all sample containers for sample collection. The lab performs and tracks required QC procedures for all bottles purchased.

- Pre-cleaned, plastic, disposable sample containers are used for conventional parameters.
- Sterile, sealed, 120 mL plastic, disposable bottles with a sodium thiosulfate tablet added, are used for bacteriological samples.
- When preservation is required for particular parameters, the acid is added to the container in the field by field personnel immediately after samples are collected.
- Pre-cleaned, plastic, disposable sample containers for the TKN samples are provided by TRIES. Eastex performs and tracks required QC procedures for all TKN bottles.

### *Processes to Prevent Contamination*

Procedures outlined in SWQM Procedures outline the necessary steps to prevent contamination of samples. These include: direct collection into sample containers, whenever possible; and clean sampling techniques for metals. Several local partners collect samples from a bridge and must use the bucket method. All partners practice the triple rinse procedure to eliminate or at least minimize the chance of carry-over from one site to the next. Field QC samples (identified in Section B5) are collected to verify that contamination has not occurred.

### *Documentation of Field Sampling Activities*

Field sampling activities are documented on field data sheets as presented in Appendix D. Flow worksheets, aquatic life use monitoring checklists, habitat assessment forms, field biological assessment forms, and records of bacteriological analyses (if applicable) are part of the field data record. Parameters which are preferred by the SWQM and Water Quality Standards Programs are highlighted in the shell A7 document. The following will be recorded for all visits:

Station ID  
Sampling Date  
Location  
Sampling Depth  
Sampling Time  
**Sample Collector's name and signature**  
Values for all field parameters collected

Notes containing detailed observational data not captured by field parameters, including;

Water appearance  
Weather  
Biological activity  
Recreational activity  
Unusual odors  
Pertinent observations related to water quality or stream uses  
Watershed or instream activities  
Specific sample information  
Missing parameters

## 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:

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

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

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

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

## B3 Sample Handling and Custody

### *Sample Tracking*

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

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

Date and time of collection  
Site identification  
Sample matrix  
Number of containers  
Preservative used  
Was the sample filtered  
Analyses required  
Name of collector  
Custody transfer signatures and dates and time of transfer  
Bill of lading, if applicable

### *Sample Labeling*

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

Site identification  
Date and time of collection  
Preservative added, if applicable  
Indication of field-filtration for metals, as applicable  
Sample type (i.e., analyses) to be performed

## Sample Handling

Upon collection, all local partners immediately immerse their samples in coolers containing ice. If a temperature blank is carried (it is not required), it shall be placed on top of the samples instead of buried in the ice. **Samples are transported to each local partner's lab by the person who collected the samples or, in the case of EIH, H-GAC, and SJRA samples from The Woodlands area, the 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 <6 °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 Manuals (QM) kept on file with H-GAC.** For TKN and chlorophyll *a* samples, all samples are transferred to a lab courier who signs the chain of custody form and transports the samples to the contract lab for processing and analysis. References for each local partner's field and lab sample handling procedure are listed in the following table.

**Table B3.1. Sample Handling References for Local Monitoring Partners.**

<b>Monitoring Entity</b>	<b>Reference to Sample Handling</b>
Houston-Galveston Area Council	H-GAC's <b>Standard Operating Procedures (SOP) Manual for Conducting Surface Water Quality Monitoring</b> references the most current <i>TCEQ Surface Water Quality Monitoring Procedures Volumes 1 &amp; 2</i> <b>plus specific SOP's</b> pertaining to H-GAC monitoring activities only. Eastex Environmental Laboratory QM, most current version, covers samples relinquished to the lab.
Harris County Pollution Control Services	Harris County Pollution Control Services Department Standard Operating Procedure – <i>Procedures for Sample Custody, Login, Tracking, Data Entry and Reporting</i> . Most current version.
City of Houston, Health Department	<b>Holcombe Lab's Environmental Laboratory</b> Services QM, Section 22 – Sample Management, most current version.
City of Houston, Drinking Water Operations Laboratory And San Jacinto River Authority – Lake Conroe samples	DWO - Environmental Sampling SOP, most recent revision.
San Jacinto River Authority – The Woodlands area samples	<b>SJRA's Sample Custody Standard Operating Procedure, October 2007.</b> Eastex Environmental Laboratory QM, most current version, covers samples relinquished to the lab.
Environmental Institute of Houston	<b>EIH's Standard Operating Procedures (SOP) Manual for Conducting Surface Water Quality Monitoring</b> references the most current <i>TCEQ Surface Water Quality Monitoring Procedures Volume 1 &amp; 2</i> <b>plus additional/specific SOP's</b> pertaining to EIH's monitoring activities only. Eastex Environmental Laboratory QM, most current version, covers samples relinquished to the lab.
TRIES	<b>TRIES's Standard Operating Procedures (SOP) Manual for Conducting Surface Water Quality Monitoring</b> references the most current <i>TCEQ Surface Water Quality Monitoring Procedures Volumes 1</i> <b>plus specific SOP's</b> pertaining to TRIES monitoring activities only.  TRIES Laboratory QM, or most current version, covers the handling of all samples analyzed. Eastex Environmental Laboratory QM, most current version, covers samples relinquished to the lab.

## *Sample Tracking Procedure Deficiencies and Corrective Action*

All deficiencies associated with COC procedures, as described in this QAPP, are immediately reported to H-GAC 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 Project Manager in consultation with H-GAC QAO will determine if the procedural violation may have compromised the validity of the resulting data. Any failures that have reasonable potential to compromise data validity will invalidate data and the sampling event should be repeated. The resolution of the situation will be reported to the TCEQ CRP Project Manager in the project progress report. CAPs will be prepared by H-GAC QAO and submitted to TCEQ CRP Project Manager along with project progress report.

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

## **B4 Analytical Methods**

The analytical methods, associated matrices, and performing laboratories are listed in Appendix A. The authority for analysis methodologies under CRP is derived from the 30 Tex. Admin. Code ch. 307, in that data generally are generated for comparison to those standards and/or criteria. The Texas Surface Water Quality Standards state “Procedures for laboratory analysis must be in accordance with the most recently published edition of the book entitled Standard Methods for the Examination of Water and Wastewater, the TCEQ Surface Water Quality Monitoring Procedures as amended, 40 CFR 136, or other reliable procedures acceptable to the TCEQ, and in accordance with chapter 25 of this title.”

Laboratories collecting data under this QAPP must be NELAP-accredited in accordance with 30 TAC Chapter 25. 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. Standard preparation is fully documented and maintained in a dedicated log book. Each record 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 prepared standard is labeled in a way that will trace the standard 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, they will document the problem on the field data sheet or laboratory record and complete the analysis. If the problem is not resolvable, it is conveyed to the **partner’s** Laboratory Supervisor, who will make the determination and notify H-GAC 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 H-GAC Data Manager. H-GAC QAO will include this information in the CAP and submit with the Progress Report which is sent to the TCEQ CRP Project Manager.

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

**The TCEQ has determined that analyses associated with the qualifier codes (e.g., “holding time exceedance”, “sample received unpreserved”, “estimated value”) may have unacceptable measurement uncertainty associated with them. This will immediately disqualify analyses from submittal to SWQMIS. Therefore, data with these types of problems will not be reported to the TCEQ. Additionally, any data collected or analyzed by means other than those stated in the QAPP or is suspect for any reason, will not be submitted for loading and storage in SWQMIS. However, when data is rejected or otherwise lost, its absence will be described in the data summary**

report submitted with the corresponding data set, and a corrective action plan (as described in section C1) may be implemented.

## B5 Quality Control

### *Sampling Quality Control Requirements and Acceptability Criteria*

The minimum field QC requirements, and program-specific laboratory QC requirements, are outlined in SWQM Procedures. Specific requirements are outlined below. Field QC sample results are submitted with the laboratory data report (see Section A9.).

#### **Field blank**

Field blanks are required for total metals-in-water samples when collected without sample equipment (i.e., as grab samples). For other types of samples, they are optional. A field blank is prepared in the field by filling a clean container with pure deionized water and appropriate preservative, if any, for the specific sampling activity being undertaken. Field blanks are used to assess contamination from field sources, such as airborne materials, containers, or preservatives. The frequency requirement for field blanks for total metals-in-water samples is specified in the SWQM Procedures. A field blank is collected during each monitoring run when ‘metals –in-water’ samples are collected. For SJRA, this is twice a year.

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

Field blanks are associated with batches of field samples. In the event of a field blank failure for one or more target analytes, all applicable data associated with the field batch may need to be qualified as not meeting project QC requirements, and these qualified data will not be reported to the TCEQ. These data include all samples collected on that day during that sample run and should not be confused with the laboratory analytical batch.

### *Laboratory Measurement Quality Control Requirements and Acceptability Criteria*

#### **Batch**

A batch is defined as environmental samples that are prepared and/or analyzed together with the same process and personnel, using the same lot(s) of reagents. A preparation batch is composed of one to 20 environmental samples of the same NELAP-defined matrix, meeting the abovementioned criteria and with a maximum time between the start of processing of the first and last sample in the batch to be 25 hours. An analytical batch is composed of prepared environmental samples (extract, digestates, or concentrates) which are analyzed together as a group. An analytical batch can include prepared samples originating from various environmental matrices and can exceed 20 samples.

#### **Method Specific QC requirements**

QC samples, other than those specified later this section, are run (e.g., sample duplicates, surrogates, internal standards, continuing calibration samples, interference check samples, positive control, negative control, and media blank) as specified in the methods and in SWQM Procedures. 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.

#### **Comparison Counting**

For routine bacteriological samples, repeat counts on one or more positive samples are required, at least monthly. If possible, compare counts with an analyst who also performs the analysis. Replicate counts by the same analyst should agree within 5 percent, and those between analysts should agree within 10 percent. Record the results.

### Limit of Quantitation (LOQ)

The laboratory will analyze a calibration standard (if applicable) at the LOQ published in Appendix A, Table A7, on each day calibrations are performed. In addition, an LOQ check sample will be analyzed with each analytical batch. Calibrations including the standard at the LOQ listed in Appendix A will meet the calibration requirements of the analytical method or corrective action will be implemented.

### LOQ Check Sample

An LOQ check sample consists of a sample matrix (e.g., deionized water, sand, commercially available tissue) free from the analytes of interest spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes. It is used to establish intra-laboratory bias to assess the performance of the measurement system at the lower limits of analysis. The LOQ check sample is spiked into the sample matrix at a level less than or equal to the LOQ published in Appendix A, Table A7, for each analyte for each analytical batch of CRP samples run. If it is determined that samples have exceeded the high range of the calibration curve, samples should be diluted or run on another curve. For diluted or high concentration samples run on batches with calibration curves that do not include the LOQ published in Appendix A, Table A7, a check sample will be run at the low end of the calibration curve.

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

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

$$\%R = S_R / S_A \times 100$$

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

### Laboratory Control Sample (LCS)

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

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

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

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

$$\%R = S_R / S_A \times 100$$

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

### Laboratory Duplicates

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

For most parameters except bacteria, precision is evaluated using the relative percent difference (RPD) between duplicate LCS results as defined by 100 times the difference (range) of each duplicate set, divided by the average value (mean) of the set. For duplicate results,  $X_1$  and  $X_2$ , the RPD is calculated from the following equation: (If other formulas apply, adjust appropriately.)

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

For bacteriological parameters, precision is evaluated using the results from laboratory duplicates. Bacteriological duplicates are analyzed on a 10% frequency (or once per preparation batch, whichever is more frequent). Sufficient volume should be collected to analyze laboratory duplicates from the same sample container.

The base-10 logarithms of the results from the original sample and its duplicate are calculated. The absolute value of the difference between the two base-10 logarithms is calculated and compared to the precision criterion in Appendix A, Table A7.1a-h.

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

The precision criterion in Appendix A, Table A7.1a-h for bacteriological duplicates applies only to samples with concentrations > 10 MPN.

**Matrix spike (MS)** – Matrix spikes are prepared by adding a known quantity of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available.

Matrix spikes indicate the effect of the sample on the precision and accuracy of the results generated using the selected method. Matrix-specific QC samples indicate the effect of the sample matrix on the precision and accuracy of the results generated using the selected method. The information from these controls is sample/matrix specific and would not normally be used to determine the validity of the entire batch. The frequency of matrix spikes is specified by the analytical method, or a minimum of one per preparation batch, whichever is greater. To the extent possible, matrix spikes prepared and analyzed over the course of the project should be performed on samples from different sites.

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

The percent recovery of the matrix spike is calculated using the following equation, where %R is percent recovery,  $S_{SR}$  is the concentration measured in the matrix spike,  $S_R$  is the concentration in the parent sample, and  $S_A$  is the concentration of analyte that was added:

$$\%R = \frac{S_{SR} - S_R}{S_A} \times 100$$

Matrix spike recoveries are compared to the acceptance criteria published in the mandated test method. If the matrix spike results are outside established criteria, the data for the analyte that failed in the parent sample is not acceptable for use under this project and will not be reported to TCEQ. The result from the parent sample associated with that failed matrix spike will be considered to have excessive analytical variability and will be qualified by the laboratory as not meeting project QC requirements. Depending on the similarities in composition of the samples in the batch, H-GAC may consider excluding all of the results in the batch related to the analyte that failed recovery.

For Eastex Laboratory, H-GAC's contract lab, matrix spike recoveries are compared to the same acceptance criteria established for the associated LCS recoveries, rather than the matrix spike recoveries published in the mandated test method. The EPA 1993 methods (i.e. ammonia-nitrogen, ion chromatography, TKN) that establish matrix spike recovery acceptance criteria are based on recoveries from drinking water that has very low



interferences and variability and do not represent the matrices sampled in the CRP. If the matrix spike results are outside laboratory-established criteria, there will be a review of all other associated quality control data in that batch. If all of quality control data in the associated batch passes, it will be the decision of the laboratory QAO or H-GAC QAO and Data Manager to report the data for the analyte that failed in the parent sample to TCEQ or to determine that the result from the parent sample associated with that failed matrix spike is considered to have excessive analytical variability and does not meet project QC requirements. Depending on the similarities in composition of the samples in the batch, H-GAC may consider excluding all of the results in the batch related to the analyte that failed recovery.

Measurement performance specifications for matrix spikes for each partner lab are discussed below.

- Harris County Pollution Control Services (HCPCS) The measurement performance specification for matrix spikes is recovery between 75 and 125 percent. If a spike recovery is outside this range, the result is qualified in the QC narrative contained in the data submittal checklist. In addition, the laboratory applies control chart techniques to monitor performance, and establishes updated internal control limits for matrix spike recovery on an annual basis.
- The City of Houston, HHD Holcombe Lab has a matrix spike recovery requirement of 80-120 percent unless specifically stated for the parameter. A spike that falls outside laboratory limits is reanalyzed. If the spike fails a second time, another sample within the same set is prepared as a spike and analyzed. When several different matrix spikes fall outside stated limits, matrix interference is likely. If the required matrix spike recovery is not met, the data affected are qualified and flagged as exceeding control limits.
- The City of Houston, DWO Lab The recovery of matrix spikes for the samples analyzed in DWO laboratory is between 80 to 120 percent. If a spike recovery is outside this range, the result is qualified in the QC narrative contained in the data submittal checklist. In addition, the laboratory applies control chart techniques to monitor performance.
- Eastex uses matrix spike recovery limits of 80-120 for parameters where a spike solution is available. These recoveries are monitored with QC charts to help determine interferences or detect trends. Matrix spikes that fail to meet these guidelines are reanalyzed if possible. An alternate sample may be used to help determine whether the problem was specific to that sample. If matrix spikes are not achievable within 80-120 % recovery then this recovery is flagged as exceeding the control limit on the QC report.
- TRIES Lab uses matrix spike recovery limits of 75-125 percent which are published in the mandated test method where a spike solution is required. Matrix spikes that fail to meet these guidelines are reanalyzed if possible, or an alternate sample may be used to help determine whether the problem was specific to that sample. If matrix spikes are not achievable within method acceptance criteria, the data are reported with appropriate data qualifying codes on the analytical report. Control Carts are monitoring for laboratory performance.

### Method blank

A method blank is a sample of matrix similar to the batch of associated samples (when available) that is free from the analytes of interest and is processed simultaneously with and under the same conditions as the samples through all steps of the analytical procedures, and in which no target analytes or interferences are present at concentrations that impact the analytical results for sample analyses. The method blanks are performed at a rate of once per preparation batch. The method blank is used to document contamination from the analytical process. The analysis of method blanks should yield values less than the LOQ. For very high-level analyses, the blank value should be less than 5% of the lowest value of the batch, or corrective action will be implemented. Samples associated with a contaminated blank shall be evaluated as to the best corrective action for the samples (e.g. reprocessing, data qualifying codes). In all cases the corrective action must be documented.

The method blank shall be analyzed at a minimum of one per preparation batch. In those instances, for which no separate preparation method is used (e.g., VOA) the batch shall be defined as environmental samples that are analyzed together with the same method and personnel, using the same lots of reagents, not to exceed the analysis of 20 environmental samples.

## *Quality Control or Acceptability Requirements Deficiencies and Corrective Actions*

Analytical QC excursions are evaluated by H-GAC's Project Manager, in consultation with H-GAC QAO and Data Manager. 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 Project Manager, QAO, and Data Manager will be relied upon in evaluating results. Rejecting sample results based on wide variability is a possibility. Field blanks for trace elements and trace organics are scrutinized very closely. Field blank values exceeding the acceptability criteria will automatically invalidate the sample. Notations of blank contamination are noted in the quarterly report and the final QC Report. Equipment blanks for metals analysis are also scrutinized very closely.

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

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

## **B6 Instrument/Equipment Testing, Inspection, and Maintenance**

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

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

## **B7 Instrument Calibration and Frequency**

Field equipment calibration requirements are contained in the SWQM Procedures. Post-calibration error limits and the disposition resulting from error are adhered to. Data collected from field instruments that do not meet the post-calibration error limits specified in the SWQM Procedures will not be submitted for inclusion into SWQMIS.

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

## **B8 Inspection/Acceptance of Supplies and Consumables**

No special requirements for acceptance are specified for field sampling supplies and consumables. Reference to the laboratory QM may be appropriate for laboratory-related supplies and consumables.

## **B9 Acquired Data**

Non-directly measured data, secondary data, or acquired data involves the use of data collected under another project, and collected with a different intended use than this project. The acquired data still meets the quality requirements of this project, and is defined below. The following data source(s) will be used for this project:

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

or parameter code 74069 Flow Estimate depending on the proximity of the monitoring station to the USGS gage station.

Rainfall data will be acquired from multiple sources to report parameter code 72053 (Days Since Precipitation Event) with each set of water quality data submitted to TCEQ. Each partner will use the internet source that best addresses the rainfall events occurring closest to but upstream of or within the drainage area affecting their various monitoring stations. Historical rainfall data is accessible on these web sites to determine the correct value for parameter 72053, “Days since precipitation event”. **These sites include:**

- National Oceanic and Atmospheric Administration’s (NOAA’s) National Climatic Data Center (NCDC) (<http://www.ncdc.noaa.gov/>). The NCDC is responsible for preserving, monitoring, assessing, and providing public access to the nation’s climate and historical weather data and information
- Weather Underground (<http://www.wunderground.com/>) which collects and maintains precipitation data from numerous sources in the selected area
- The Harris County Flood Control District (HCFCD) operates a Flood Warning System (FWS) (<http://www.harriscountyfws.org/>) which measures rainfall amounts and monitors water levels in bayous and major streams on a real-time basis to inform the public of dangerous weather conditions. The system relies on 133 gage stations strategically placed on bayous and their tributaries throughout the greater Harris County area.
- The USGS National Water Information System (NWIS) web interface can also be used to determine when a significant change in flow occurred at the various flow gages operated around the greater Houston region. The web site <http://waterdata.usgs.gov/tx/nwis/current/?type=flow> can display discharge data in graph or tabular format to determine days when runoff affected the stream.

Reservoir stage data are available from the United States Geological Survey (USGS), International Boundary and Water Commission (IBWC), and the United States Army Corps of Engineers (USACE) websites. These data are preliminary and subject to revision. The Texas Water Development Board (TWDB) derives reservoir storage (in acre-feet) from these stage data (elevation in feet above mean sea level), by using the latest rating curve datasets available. These data are published at the TWDB website at <http://waterdatafortexas.org/reservoirs/statewide>. The web application uses real time gaged observations 7 AM reading each day (or closest reading available) from 119 major reservoirs to approximate daily storage for each reservoir, as well as daily total storage for water planning regions, river basins and the state of Texas. These instantaneous data are updated to mean daily data for all previous days.

## B10Data Management

### *Data Management Process*

Data is received by H-GAC from all partners, including H-GAC’s own data monitoring program. Each partner has a paragraph below which gives a brief description of their data submission process.

When data is 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 Data Manager and H-GAC’s QAO before being submitted to TCEQ in the format specified in the SWQM Data Management Reference Guide, December 2016 or later, for review by the TCEQ CRP Program Manager. H-GAC’s full data procedure is described in Appendix H – Data Management Process.

- H-GAC’s field sheets are kept in a three-ring binder at H-GAC office. The calibration sheets, field sheets, and COCs are reviewed by the QAO. If there are nonconformances such as failed calibration, the QAO writes instructions in a different colored ink on the related field sheet regarding data entry. Then the instructions are initialed and dated.

Electronic data from datasondes and flow-measurement devices are downloaded into a raw data folder. These electronic files are saved as Excel files for later processing or proprietary formats developed by manufacturers of the flow measurement devices. Field data are entered in an Access database by H-GAC staff and saved in a secured network drive (“Working Data”) that is backed by H-GAC Data

Services on a regular basis. Final field data is reviewed for accuracy and completeness by either H-GAC Data Manager or QAO (but not the person who performed the original data entry). After review, data is **exported from the database in Excel format into the “Working” data folder**. Laboratory analysis is performed by Eastex Laboratory and submitted directly to H-GAC in Excel format. The data is saved in a **“Raw Data” folder and copied into a master “Input” file for later processing**. The field data Excel file in the **“Working” data folder becomes the input file for SAS processing**. Datasonde data are also copied to the **“Input” file for later processing**.

SAS code has been written to process both the field and laboratory datasets. Following initial SAS processing and investigation of flagged records, a draft Data Summary is compiled by H-GAC DM. Details of any data changes are documented in the Data Summary. All SAS output is saved on secured network drives that are backed up regularly by Data Services staff. The DM provides the QAO with the draft Data Summary for review. H-GAC QAO review of the datasets and the Data Summary is documented and provided to H-GAC DM for further investigation, verification, or change. This record of the QAO review is retained with the data package. See H-GAC’s **Data Management Flow Chart** to see the various tables and Flagged Records reports that are created during the Data review process.

- Harris County Pollution Control Services (HCPCS) submits two Access tables to H-GAC containing laboratory and field data. These tables are exported from the department database and are reviewed by Lab Manager, the QAO and the Sample Administrator for accuracy, consistency, and reasonableness (as indicated by inter-parameter correlations, historical parameter results, and screening values established by the TCEQ). Documented non-conformances from QAPP, SOP, and HCPCS Quality Manual requirements that may impact the data and problems encountered in collection or analysis of the samples are evaluated and addressed in the data submittal checklist. A Data Review Checklist is generated for each data packet. The checklist is prepared by the QAO and reviewed and approved by the Supervisor – Wet Chemistry, a representative of the field collection team, and the Sample Administrator.
- The City of Houston HHD field personnel and data manager enter laboratory and field data into an Access database. Print-outs of any data from field equipment memory are printed out to be saved with field forms. The data manager reviews all data entries for accuracy then checks for outliers. A Data Review Checklist is generated for each data packet. Data is then submitted to the Laboratory QAO for additional review before being submitted to HGAC. The data management process is explained in the **lab’s QM - Section 23.8 Data Review**.
- City of Houston DWO & Lake Houston field personnel turn in the chain of custody and field form to the sample receiver in the lab. The data manager enters only the final laboratory data into an Excel workbook. The data manager reviews all data entries for accuracy then checks for outliers. A Data Review Checklist is generated for this data set. The data packet is then submitted to the Laboratory QAO for additional review. All comments are documented on the Data Review Checklist before being submitted to HGAC. The field data is entered into the database at the Lake Houston office and reviewed the data for accuracy and completeness. The Field Supervisor reviews at least 10% of the data for accuracy, completeness, reasonableness and outliers. The Field supervisor completes a Data Review Checklist for that data set before it is submitted to H-GAC independent of the lab data.
- SJRA collects samples from Lake Conroe and the Lake Woodlands watershed. Lake Conroe laboratory samples are submitted to the City of Houston DWO Lab for analysis, while Woodlands samples are sent to Eastex Laboratory. DWO staff receive, process, and report the data in the same manner as described above. Electronic data files from the field datasondes are sent directly to H-GAC’s **Data Manager** for import during data processing. Additional field data are input to an Access database **by SJRA’s Data Manager**, where it is reviewed, formatted, and exported in Excel format for submission to H-GAC. H-GAC’s **Data Manager merges the field data with the profile data and rechecks for outliers and formatting**. H-GAC’s **QAO checks the data for accuracy and reasonableness**. SJRA keeps the original field sheets. Copies of field sheets, COCs, calibration logs, and a Data Review Checklist are sent to H-GAC with every data submittal for Lake Conroe samples.

- The EIH field QAO or assigned field staff enter field data collected by their program into an Excel spreadsheet. All supporting QA data is input to spreadsheets as well. The EIH field QAO and the EIH CRP Project Manager review more than 10% of the data for accuracy, completeness, and reasonableness. A Data Review checklist is generated while data is being reviewed. Then, it is submitted to H-GAC along with electronic data. H-GAC downloads scanned field sheets and COCs from the EIH FTP site for review during data processing. **H-GAC's Data Manager receives electronic data files from Eastex Lab and merges lab data with field data during data processing, prior to review and submission to TCEQ.**
- TRIES field QAO, TRIES Lab QAO submits all field and lab data to the TRIES Data Manager. The data manager completes all data entry into an Excel spreadsheet with tabs for field data and lab data. Any supporting QA data is input to a separate spreadsheet. The TRIES field QAO, TRIES Lab QAO and the TRIES CRP Project Manager review more than 10% of data for accuracy, completeness, and reasonableness. A Data Review Checklist is completed by the data manager and submitted to the TRIES CRP Project Manager for final approval. The data manager then submits the Excel spreadsheet for both the field and lab data along with hard copies of the field sheets and COCs to H-GAC. Analytes analyzed by Eastex Laboratory are submitted directly to H-GAC for processing.

### Data Dictionary

Terminology and field descriptions are included in the 2016 DMRG, or most recent version. A table outlining the entities that will be used when submitting data under this QAPP is included below for the purpose of verifying which entity codes are included in this QAPP.

Table B10.1 –Sampling Entity Data Submission Codes

Name of Monitoring Entity	Tag Prefix	Submitting Entity	Collecting Entity
Houston-Galveston Area Council	I	HG	HG
Harris County Pollution Control Services	I	HG	HC
City of Houston – Health Department	I	HG	HH
City of Houston – Drinking Water Operations	I	HG	HW
San Jacinto River Authority	I	HG	SJ
Environmental Institute of Houston – University of Houston Clear Lake	I	HG	UI
Texas Research Institute for Environmental Studies - SHSU	I	HG	TF

### 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. Files that are changed prior to processing are saved in the **“Working Data” folders**. **The “SAS Data Processing” network folder holds all input and output from SAS processing. The “Input” folder contains the file imported into SAS. An Access database is produced during SAS processing for each dataset and exported to the “Access” folder. The database contains multiple tables used to aid review of the data, identify possible problems, and document verification of outliers and changes to data that are flagged during processing. Text files in the format required by SWQMIS are exported during SAS processing to the “Output” folder.** All changes, validation, and verification actions on the data are documented in a Data Review Summary Report which accompanies each data set submittal (Appendix G).

Copies of e-mails and communications with partners are printed and filed with the data set to facilitate traceability of reported results to raw data.

Each partner has a paragraph below briefly discussing their data control mechanisms.

- Harris County Pollution Control Services (HCPCS) Details of the mechanisms for review and correction of errors and preventing loss of data are described in the HCPCS Laboratory Services Quality Manual, (most current version). All field data sheets are given to the HCPCS Data Manager who applies the same review, correction of errors, and prevention of loss of data as the lab data. A Data Review Checklist is completed for each set of data submitted to H-GAC.
- City of Houston HHD Details of the Holcombe Laboratory protocols for data reductions and review are described in their Environmental Laboratory Services Quality Manual, Section 23, (most current version). All field data is gathered by the HHD Data Manager who inputs the data to their database, checks all data for outliers and reasonableness. Then, the data is reviewed by a second individual for transcription accuracy. A Data Review Checklist is completed for each set of data submitted to H-GAC.
- City of Houston DWO Details of their Laboratory protocols for data reductions and review are described in their Quality Management Plan, Section 7, (most recent revision). All field data sheets are turned over at the Lake Houston office for data input to Excel spreadsheets. The DWO Data Manager reviews the data for outliers and accuracy. Then, the Field QAO reviews the data for transcription accuracy and reasonableness. A Data Review Checklist is completed for each set of data submitted to H-GAC.
- Eastex Lab Details of their protocols for data reduction and review are described in the Eastex Laboratory Quality Assurance Manual, (most recent version), Sections 8.1. A Data Review Checklist is completed for each set of data submitted to H-GAC. Eastex sends data results from CRP monitoring to H-GAC.
- San Jacinto River Authority Lake Conroe water samples are sent to DWO lab where all analyses are performed and lab data are managed (See City of Houston DWO above). A copy of the field data sheet is sent to the lab as well as H-GAC's Data Manager. SJRA inputs field data to a MS EXCEL spreadsheet and submits to H-GAC Data Manager. Profile data from the Hydrolab Surveyor is downloaded and sent to H-GAC directly. **H-GAC's Data Manager inputs the data to an Access database, merges the related data sets, and reviews the data for outliers.** H-GAC QAO reviews the data for accuracy and reasonableness. A Data Summary Sheet is submitted to TCEQ with each data set from Lake Conroe. A Data Review Checklist is completed by SJRA for field data and by DWO Lab or Eastex Lab for lab analyses. DWO Lab data manager performs all data entry & data management for Lake Conroe lab data only.

Woodlands samples are sent to Eastex Lab for analysis. (See Eastex Lab details above.) Field data sheets are collected and information input to EXCEL spreadsheets by the SJRA Data Manager who also checks the data for outliers and reasonableness. The field QAO or a second employee reviews the data for transcription accuracy. A Data Review Checklist is completed for each set of data submitted to H-GAC. SJRA performs data management for all Woodlands data.

- Environmental Institute of Houston (EIH) water samples are sent to Eastex Lab for analysis. (See Eastex Lab details above.) Field data sheets are collected and information input to EXCEL spreadsheets by the EIH Data Manager who also checks the data for outliers and reasonableness. The EIH Field QAO also reviews the data for transcription accuracy and reasonableness. A Data Review Checklist is completed for each set of data submitted to H-GAC.
- H-GAC water samples are sent to Eastex Lab for analysis. (See Eastex lab details above.) Field data sheets are collected by the assigned staff for input to an Access Database, and are reviewed for outliers. **H-GAC's QAO reviews the data for transcription accuracy and reasonableness prior to SAS processing.** A Data Summary Sheet is prepared by the Data Manager after SAS processing for submission to TCEQ with the text files.
- TRIES Details of the protocols for data reductions and review are described in their TRIES Analytical Lab Quality Manual, Section 27 (most current version). The TRIES Data Manager collects all field data sheets and immediately inputs data into an Excel spreadsheet while also checking for data outliers and reasonableness. The TRIES CRP Project Manager also reviews the data for transcription accuracy and reasonableness. A Data Review Checklist is completed for each set of data submitted to H-GAC.

## *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 correspondence or reports related to the data set are to be printed and placed in the packet of information. Including but not limited to the QAO review comments, the draft and final Data Summary Reports/Sheets. 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.

Each local agency submits electronic data along with hard copies of field sheets and COC forms. In addition, the **local agency is required to submit a “Data Review Checklist” (Appendix F) to H-GAC.** Electronic data is stored in folders on 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 may be stored off-site storage according to H-GAC procedures. All data is maintained for at least seven (7) years by H-GAC and all local partners.

Each partner has a paragraph below briefly discussing their Record Keeping and Data Storage practices.

- Harris County Pollution Control Services (HCPCS) Details of the HCPCS records management and data storage procedures may be found in section 6 of the HCPCS Laboratory Services Quality Manual, (most current version). The laboratory data manager manages all the data – hard copy and electronic – for both field and lab.
- City of Houston HHD Holcombe Laboratory Details of their protocols for records management and data storage procedures are described in their Environmental Laboratory Services Quality Manual, Section 6 and Section 15, (most current version). HHD field data is housed and electronically stored at HHD offices located Park Place, Houston. Electronic data is stored in an Access Database which is maintained by the HHD data manager.
- City of Houston DWO Laboratory Details of their protocols for records management and data storage procedures are described in their Quality Management Plan, Section 13, (most recent revision). Original DWO field data is stored at their field office located at Lake Houston. Copies of all field sheets are given to the lab to be kept with lab analysis paperwork. Electronic data is stored in an Excel spreadsheet by the field supervisor.
- San Jacinto River Authority (SJRA) will store all hard copies of field and lab data in the Program **Manager’s** Lake Conroe office. Electronic data will be stored in a shared computer server at the same location. Electronic data from the Woodlands samples will be kept in EXCEL workbooks and spreadsheets at the Lake Conroe office. Hard copies will be moved from The Woodlands offices to Lake Conroe and kept in the Program Manager’s office.
- Environmental Institute of Houston (EIH) stores hard copy and electronic data at their offices on the UHCL campus. Electronic data is stored in Excel spreadsheets and various workbooks. The data manager maintains the files.
- Eastex Environmental Lab Details of the Eastex *Electronic Record Storage* system is described in the **Laboratory’s Quality Assurance Manual, (most current version), Sections 8.4.**
- TRIES Details of the protocols for records management and data storage procedures are described in their TRIES Analytical Lab Quality Manual, Sections 16.1 & 16.2 (most current version). All field data will be stored electronically in an Excel spreadsheet and in hard copy format at TRIES. The TRIES Data Manager and the TRIES Lab QAO will maintain the data.

## *Data Handling, Hardware, and Software Requirements*

H-GAC maintains several networked computers to store and manage CRP 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 another computer if an alternate SAS Operator is needed.

## *Information Resource Management Requirements*

Data will be managed in accordance with the TCEQ DMRG, and applicable H-GAC information resource management policies. See Appendix I for H-GAC's **C&E Department Geospatial Data Management Plan**.

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 SWQMIS database.

**Positional data obtained by CRP grantees using a GPS will follow the TCEQ's OPP 8.11 and 8.12 policy regarding the collection and management of positional data.** All positional data entered into SWQMIS will be collected by a GPS certified individual with an agency approved GPS device to ensure that the agency receives reliable and accurate positional data. Certification can be obtained in any of three ways: completing a TCEQ training class, completing a suitable training class offered by an outside vendor, or by providing documentation of sufficient GPS expertise and experience. Contractors must agree to adhere to relevant TCEQ policies when entering GPS-collected data.

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



## C1 Assessments and Response Actions

The following table presents the types of assessments and response actions for data collection activities applicable to the QAPP. **For more information see the “Project Oversight” section of The Clean Rivers Program Guidance and Reference Guide FY 2018-2019.**

Table C1.1 Assessments and Response Requirements

Assessment Activity	Approximate Schedule	Responsible Party	Scope	Response Requirements
Status Monitoring Oversight, etc.	Continuous	H-GAC	Monitoring of the project status and records to ensure requirements are being fulfilled	Report to TCEQ in Quarterly Report
Monitoring Systems Audit of H-GAC	Dates to be determined by TCEQ QA	TCEQ	Field sampling, handling and measurement; facility review; and data management as they relate to CRP	30 days to respond in writing to the TCEQ to provide corrective actions
Monitoring Systems Audit of Program Local Partners and subparticipants	Dates to be determined by H-GAC (at least once per contract period)	H-GAC	Field sampling, handling and measurement; facility review; and data management as they relate to CRP	30 days to respond in writing to H-GAC. PA will report problems to TCEQ in Progress Report.
Laboratory Assessment	Dates to be determined by TCEQ	TCEQ Laboratory Assessor	Analytical and quality control procedures employed at the laboratory and the contract laboratory	30 days to respond in writing to the TCEQ to provide corrective actions

### *Corrective Action Process for Deficiencies*

Deficiencies are any deviation from the QAPP, *SWQM Procedures*, SOPs, or **the DMRG**. Deficiencies may invalidate resulting data and require corrective action. Repeated deficiencies should initiate a CAP. Corrective action for deficiencies may include for samples to be discarded and re-collected. Deficiencies are documented in logbooks, field data sheets, etc. by field or laboratory staff, are communicated to H-GAC QAO and/or Data Manager (or other appropriate staff), and should be subject to periodic review so their responses can be uniform, and their frequency tracked. It is the responsibility of H-GAC Project Manager, in consultation with H-GAC QAO, to ensure that the actions and resolutions to the problems are documented and that records are maintained in accordance with this QAPP. In addition, these actions and resolutions will be conveyed to the CRP Project Manager both verbally and in writing in the project progress reports and by completion of a CAP.

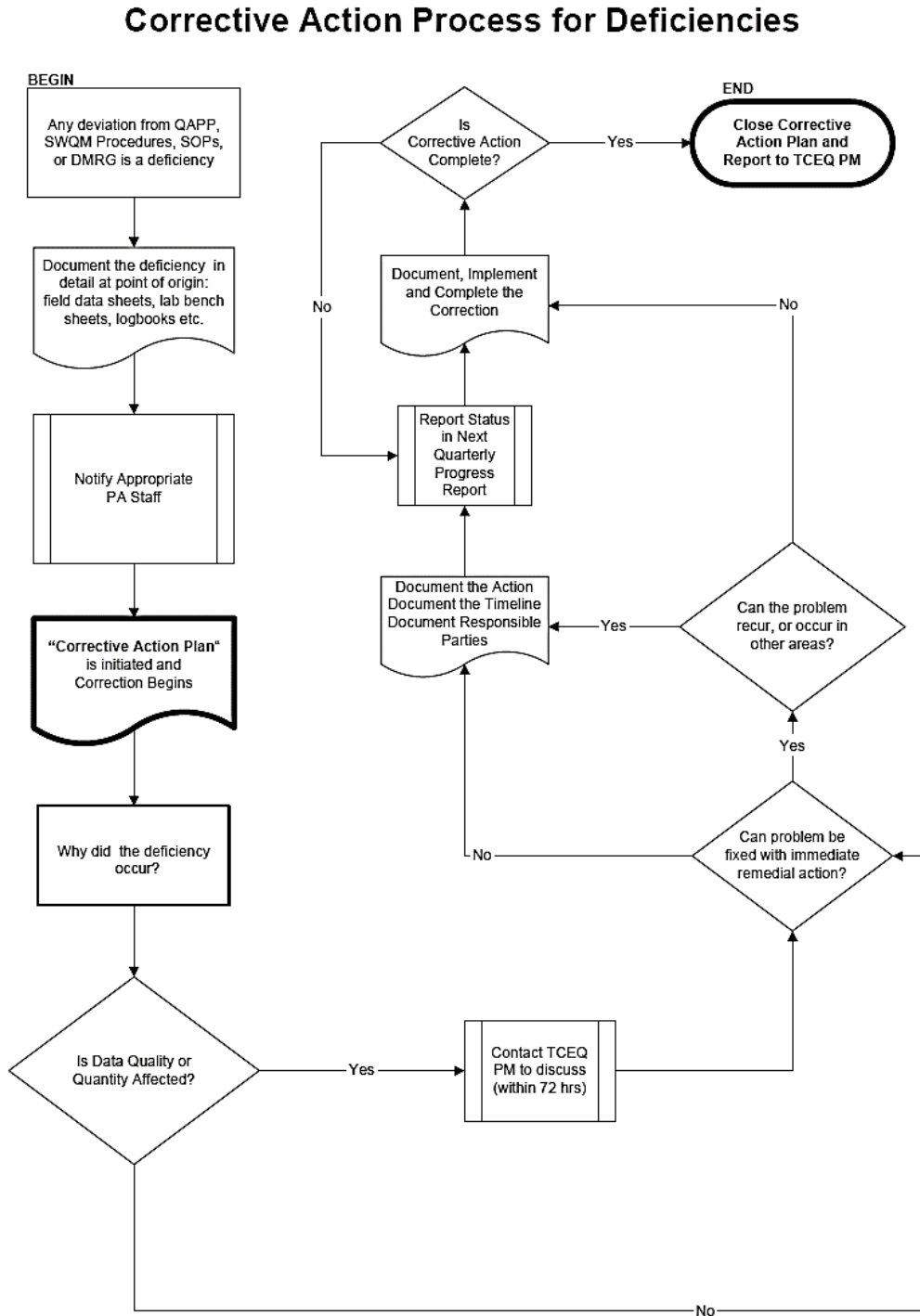
### *Corrective Action*

CAPs should:

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

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

Figure C1.1 Corrective Action Process for Deficiencies



Status of CAPs will be included with quarterly progress reports. In addition, significant conditions 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.

H-GAC Project Manager or designee is responsible for implementing corrective actions and tracking deficiencies and corrective actions in a pre-CAP log. Records of audit findings and corrective actions are maintained by H-GAC 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 TCEQ QMP and in agreements in contracts between participating organizations.

## C2 Reports to Management

Table C2.1 QA Management Reports

Type of Report	Frequency (daily, weekly, monthly, quarterly, etc.)	Projected Delivery Date(s)	Person(s) Responsible for Report Preparation	Report Recipients
Quarterly project reports & invoices from local partners	quarterly	Within 10 days of end of quarter	Local partner project manager	Project manager on H-GAC's CRP team
H-GAC CRP Staff meeting	Bi-Weekly	Verbal updates only	H-GAC CRP team members	H-GAC CRP Project Mgr & staff
Nonconformance & Corrective Action Reports	As needed	With quarterly reports to TCEQ or sooner depending on severity	H-GAC QAO	TCEQ Project Mgr
TCEQ Quarterly Progress Report	Quarterly	15 <sup>th</sup> day of the month following the end of the quarter	H-GAC Project Mgr	TCEQ Project Mgr
Monitoring System Audit Report & Response	Once per contract period	<b>Copies of MSA's to be included with quarterly report to TCEQ</b>	H-GAC QAO	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	H-GAC Data Manager	TCEQ Project Mgr

### *Reports to H-GAC Project Management*

H-GAC CRP QAO is required to report the status of implementation of the procedures discussed in this project plan and, thereby, the status of data quality. This information is gathered during quarterly meetings of the Regional Monitoring Group. Local program representatives are required to give oral presentations which include information about their monitoring activities. The local programs that receive CRP funds to support data collection activities are also required to submit written quarterly reports summarizing their monitoring activities. H-GAC schedules bi-weekly meetings to update the CRP manager and team members regarding status of deliverables and tasks.

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

H-GAC Project Manager and 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 required under the Clean Rivers Program. The results of field and laboratory annual monitoring system audits will be detailed in reports to the local program managers and/or the person who directly supervises field activities. This information will also be reported to the TCEQ by means of status reports to be included in the quarterly progress reports. Responses from local agencies regarding the audit reports and findings will also be included in the quarterly progress reports to TCEQ.

## *Reports to TCEQ Project Management*

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

### **Progress Report**

Summarizes H-GAC's activities for each task; reports monitoring status, problems, delays, deficiencies, status of open CAPs, and documentation for completed CAPs; 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 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).

## *Reports by TCEQ Project Management*

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

The procedures for verification and validation of data are described in Section D2 below. Local agency data managers and H-GAC CRP Data Manager are responsible for ensuring that field data are properly reviewed, verified, and submitted in the required format to the project database. Likewise, the Laboratory Managers of HPCPS, HHD, DWO, SJRA, EIH, and Eastex laboratories are responsible for ensuring that laboratory data are reviewed, verified, and submitted in the required format to H-GAC CRP project database. Finally, H-GAC CRP 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 staff is listed in the first two columns of Table D2.1, respectively. Potential errors are identified by examination of documentation and by manual, examination of corollary or unreasonable data, or computer-assisted. 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 for storage in SWQMIS. Field and laboratory reviews, verifications, and validations are documented.

After the field and laboratory data are reviewed, another level of review is performed once the data are combined into a data set. This review step as specified in Table D2.1 is performed by H-GAC Data Manager and QAO. Data review, verification, and validation tasks to be performed on the data set include, but are not limited to, the confirmation of 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 F) covers three main types of review: data format and structure, data quality review, and documentation review. The Data Review Checklist is transferred with the water quality data submitted to the TCEQ to ensure that the review process is being performed.

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

If any requirements or specifications of the CRP are not met, based on any part of the data review, the responsible party should document the nonconforming activities and submit the information to H-GAC Data Manager with the data in the Data Summary (See Appendix F). All failed QC checks, missing samples, missing analytes, missing parameters, and suspect results should be discussed in the Data Summary.

## Table D2.1: Data Review Tasks

**Table D2.1a: Data Review Tasks for the Houston-Galveston Area Council (H-GAC)**

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 instrument pre- and post-calibration results within limits	H-GAC QAO		
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	
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

**Table D2.1b: Data Review Tasks for Harris County Pollution Control Services (HCPCS)**

HCPCS Data to be Verified	Field Task	Laboratory & Task	Lead Organization Data Manager Task
Sample documentation complete; samples labeled, sites identified	Sr. Investigator	Sample Administrator	
Field instrument pre- and post-calibration results within limits	Sr. Investigator		H-GAC Data Mgr &/or H-GAC QAO
Field QC samples collected for all analytes as prescribed in the TCEQ <i>SWQM Procedures Manual</i>	Sr. Investigator	Manager-Laboratory Services & QAO	
Standards and reagents traceable		Supervisor –Wet Lab; & QAO	
Chain of custody complete/acceptable	Sr. Investigator	Manager- Lab Services, Sample Administrator; & QAO	H-GAC Data Mgr
NELAP Accreditation is current		Manager- Laboratory Services & QAO	
Sample preservation and handling acceptable	Sr. Investigator	Supervisor –Wet Lab & QAO	
Holding times not exceeded		Supervisor –Wet Lab & QAO	H-GAC Data Mgr
Collection, preparation, and analysis consistent with SOPs and QAPP	Sr. Investigator	Supervisor –Wet Lab & QAO	
Field documentation (e.g., biological, stream habitat) complete	Sr. Investigator	Sample Administrator & QAO	
Instrument calibration data complete	Sr. Investigator	QAO	
Bacteriological records complete		Supervisor –Wet Lab & QAO	
QC samples analyzed at required frequency		Supervisor –Wet Lab & QAO	H-GAC Data Mgr
QC results meet performance and program specifications		Supervisor –Wet Lab & QAO	
Analytical sensitivity (Minimum Analytical Levels/Ambient Water Reporting Limits) consistent with QAPP		Supervisor –Wet Lab & QAO	
Results, calculations, transcriptions checked		Supervisor –Wet Lab & QAO	
Laboratory bench-level review performed		Supervisor –Wet Lab & QAO	
All laboratory samples analyzed for all parameters		Supervisor –Wet Lab & QAO	
Corollary data agree		Manager- Lab Services & QAO	
Nonconforming activities documented		Supervisor –Wet Lab & QAO	H-GAC QAO
Outliers confirmed and documented; reasonableness check performed		Manager- Lab Services & QAO	H-GAC Data Mgr & H-GAC QAO
Dates formatted correctly		QAO & Sample Administrator	H-GAC Data Mgr
Depth reported correctly	Sr. Investigator	QAO	H-GAC Data Mgr
TAG IDs correct			H-GAC Data Mgr
TCEQ Station ID number assigned			H-GAC Data Mgr
Valid parameter codes			H-GAC Data Mgr
Codes for submitting entity(ies), collecting entity(ies), and monitoring type(s) used correctly			H-GAC Data Mgr
Time based on 24-hour clock	Sr. Investigator	QAO & Sample Administrator	H-GAC Data Mgr
Absence of transcription error confirmed		Sample Administrator & QAO	H-GAC Data Mgr
Absence of electronic errors confirmed		Sample Administrator & QAO	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)		Sample Administrator & QAO	H-GAC Data Mgr & H-GAC QAO
Field QC results attached to data review checklist		QAO	H-GAC Data Mgr
Verified data log submitted			H-GAC Data Mgr
10% of data manually reviewed		Supervisor –Wet Lab & QAO	H-GAC Data Mgr & H-GAC QAO

**Table D2.1c: Data Review Tasks for City of Houston – Houston Health Department (HHD)**

HHD Data to be Verified	Field Task	Laboratory Task (Holcombe Lab)	Lead Organization Data Manager Task
Sample documentation complete; samples labeled, sites identified	Field QAO	Appropriate Analytical Staff	
Field instrument pre- and post-calibration results within limits	Field QAO		H-GAC Data Mgr &/or H-GAC QAO
Field QC samples collected for all analytes as prescribed in the TCEQ <i>SWQM Procedures Manual</i>	Field Personnel on each run		
Standards and reagents traceable	Field QAO	Lab Supervisors, Lab QAO, Analysts	
Chain of custody complete/acceptable	Data Manager	Receiving analyst – rotation schedule	H-GAC Data Mgr
NELAP Accreditation is current		Laboratory Director	
Sample preservation and handling acceptable		Lab Supervisors & Lab QAO	
Holding times not exceeded		Lab Supervisors, Lab QAO, Analysts	H-GAC Data Mgr
Collection, preparation, and analysis consistent with SOPs and QAPP	Field QAO	Lab Supervisors, Lab QAO & Analysts	
Field documentation (e.g., biological, stream habitat) complete	Data Manager		
Instrument calibration data complete	Data Manager	Lab Supervisors, Lab QAO, & Analysts	
Bacteriological records complete		Lab Supervisors or Analysts	
QC samples analyzed at required frequency		Lab QAO	H-GAC Data Mgr
QC results meet performance and program specifications		Lab Director	
Analytical sensitivity (Minimum Analytical Levels/Ambient Water Reporting Limits) consistent with QAPP		Lab Supervisors & Lab QAO	
Results, calculations, transcriptions checked		Analysts & Lab Supervisors	
Laboratory bench-level review performed		Lab Supervisors & Lab QAO	
All laboratory samples analyzed for all parameters		Lab QAO	
Corollary data agree		Lab Supervisors & Lab QAO	
Nonconforming activities documented	Field QAO	Lab Supervisors & Lab QAO	H-GAC QAO
Outliers confirmed and documented; reasonableness check performed	Field QAO & Data manager		H-GAC Data Mgr & H-GAC QAO
Dates formatted correctly	Data Manager		H-GAC Data Mgr
Depth reported correctly	Field QAO		H-GAC Data Mgr
TAG IDs correct			H-GAC Data Mgr
TCEQ Station ID number assigned			H-GAC Data Mgr
Valid parameter codes		Lab Supervisors	H-GAC Data Mgr
Codes for submitting entity(ies), collecting entity(ies), and monitoring type(s) used correctly			H-GAC Data Mgr
Time based on 24-hour clock	Data Manager		H-GAC Data Mgr
Absence of transcription error confirmed	Data Manager	Lab Supervisors	H-GAC Data Mgr
Absence of electronic errors confirmed	Data Manager	Lab Supervisors	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)	Field QAO	Lab QAO & Lab Director	H-GAC Data Mgr & H-GAC QAO
Field QC results attached to data review checklist		Lab QAO	H-GAC Data Mgr
Verified data log submitted			H-GAC Data Mgr
10% of data manually reviewed	Data Manager		H-GAC Data Mgr & H-GAC QAO



**Table D2.1d: Data Review Tasks for City of Houston – Drinking Water Operations (DWO)**

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

**Table D2.1e: Data Review Tasks for San Jacinto River Authority-samples from Lake Conroe and analyzed by DWO Lab**

Data to be Verified	Field Task (SJRA-Lake Conroe data)	Laboratory Task (DWO Lab)	Lead Organization Data Manager Task
Sample documentation complete; samples labeled, sites identified	Field QAO	Sample Custodian	
Field instrument pre- and post-calibration results within limits	Field QAO		H-GAC Data Mgr &/or H-GAC QAO
Field QC samples collected for all analytes as prescribed in the TCEQ <i>SWQM Procedures Manual</i>	Field QAO	Sample Custodian	
Standards and reagents traceable	Field QAO	Lab Supervisor	
Chain of custody complete/acceptable	Field QAO	Sample Custodian	H-GAC Data Mgr
NELAP Accreditation is current		QA Mgr.	
Sample preservation and handling acceptable		QA Mgr.	
Holding times not exceeded		QA Mgr.	H-GAC Data Mgr
Collection, preparation, and analysis consistent with SOPs and QAPP		QA Mgr.	
Field documentation (e.g., biological, stream habitat) complete	Field QAO	Sample Custodian	
Instrument calibration data complete	Data Manager	Chemists	
Bacteriological records complete		Microbiologist I	
QC samples analyzed at required frequency		QA Mgr.	H-GAC Data Mgr
QC results meet performance and program specifications		QA Mgr.	
Analytical sensitivity (Minimum Analytical Levels/Ambient Water Reporting Limits) consistent with QAPP		QA Mgr.	
Results, calculations, transcriptions checked		Lab Mgr.	
Laboratory bench-level review performed		Lab Mgr.	
All laboratory samples analyzed for all parameters		Lab Supervisor	
Corollary data agree		QA Mgr.	
Nonconforming activities documented	Field QA Officer	Lab Mgr.	H-GAC QAO
Outliers confirmed and documented; reasonableness check performed	Data Manager	Lab Mgr.	H-GAC Data Mgr & H-GAC QAO
Dates formatted correctly	Data Manager	Data Manager	H-GAC Data Mgr
Depth reported correctly	Data Manager	Data Manager	H-GAC Data Mgr
TAG IDs correct		Data Manager	H-GAC Data Mgr
TCEQ Station ID number assigned		Data Manager	H-GAC Data Mgr
Valid parameter codes		Data Manager	H-GAC Data Mgr
Codes for submitting entity(ies), collecting entity(ies), and monitoring type(s) used correctly		Data Manager	H-GAC Data Mgr
Time based on 24-hour clock	Data Manager	Data Manager	H-GAC Data Mgr
Absence of transcription error confirmed	Data Manager	QA Mgr.	H-GAC Data Mgr
Absence of electronic errors confirmed	Data Manager	QA Mgr.	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)		QA Mgr.	H-GAC Data Mgr & H-GAC QAO
Field QC results attached to data review checklist		QA Mgr.	H-GAC Data Mgr
Verified data log submitted		Lab Mgr.	H-GAC Data Mgr
10% of data manually reviewed		Lab Mgr. or QA Mgr.	H-GAC Data Mgr & H-GAC QAO

**Table D2.1f: Data Review Tasks for San Jacinto River Authority-samples from The Woodlands area and analyzed by Eastex Lab**

Data to be Verified	Field Task (SJRA – Woodlands data)	Laboratory Task (Eastex Lab)	Lead Organization Data Manager Task
Sample documentation complete; samples labeled, sites identified	Field Supervisor	Sample Custodian	
Field instrument pre- and post-calibration results within limits	QAO		H-GAC Data Mgr &/or H-GAC QAO
Field QC samples collected for all analytes as prescribed in the TCEQ <i>SWQM Procedures Manual</i>	QAO		
Standards and reagents traceable		Lab QAO	
Chain of custody complete/acceptable	QAO	Sample Custodian	H-GAC Data Mgr
NELAP Accreditation is current		Lab QAO	
Sample preservation and handling acceptable		Sample Custodian	
Holding times not exceeded		Lab QAO	H-GAC Data Mgr
Collection, preparation, and analysis consistent with SOPs and QAPP	Field Supervisor	Lab QAO	
Field documentation (e.g., biological, stream habitat) complete	QAO		
Instrument calibration data complete	QAO	Lab QAO	
Bacteriological records complete		Lab QAO	
QC samples analyzed at required frequency	QAO	Lab QAO	H-GAC Data Mgr
QC results meet performance and program specifications	QAO	Lab QAO	
Analytical sensitivity (Minimum Analytical Levels/Ambient Water Reporting Limits) consistent with QAPP		Lab QAO	
Results, calculations, transcriptions checked		Tech. Dir.	
Laboratory bench-level review performed		Head Technician	
All laboratory samples analyzed for all parameters		Lab QAO	
Corollary data agree		Lab QAO	
Nonconforming activities documented	Field Supervisor & QAO	Lab QAO	H-GAC QAO
Outliers confirmed and documented; reasonableness check performed	QAO	Lab QAO	H-GAC Data Mgr & H-GAC QAO
Dates formatted correctly	QAO		H-GAC Data Mgr
Depth reported correctly	QAO		H-GAC Data Mgr
TAG IDs correct			H-GAC Data Mgr
TCEQ Station ID number assigned			H-GAC Data Mgr
Valid parameter codes			H-GAC Data Mgr
Codes for submitting entity(ies), collecting entity(ies), and monitoring type(s) used correctly			H-GAC Data Mgr
Time based on 24-hour clock	QAO		H-GAC Data Mgr
Absence of transcription error confirmed	QAO	Tech. Dir.	H-GAC Data Mgr
Absence of electronic errors confirmed	QAO	Tech. Dir.	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
Field QC results attached to data review checklist	QAO		H-GAC Data Mgr
Verified data log submitted			H-GAC Data Mgr
10% of data manually reviewed	QAO	Tech. Dir.	H-GAC Data Mgr & H-GAC QAO

**Table D2.1g: Data Review Tasks for Environmental Institute of Houston (EIH) with samples analyzed by Eastex Lab**

EIH Data to be Verified	Field Task	Eastex Lab Task	Lead Organization Data Manager Task
Sample documentation complete; samples labeled, sites identified	Field QAO	Sample Custodian	
Field instrument pre- and post-calibration results within limits	Field QAO		H-GAC Data Mgr &/or H-GAC QAO
Field QC samples collected for all analytes as prescribed in the TCEQ <i>SWQM Procedures Manual</i>	Field QAO		
Standards and reagents traceable	Field QAO	Lab QAO	
Chain of custody complete/acceptable	Field QAO	Sample Custodian	H-GAC Data Mgr
NELAP Accreditation is current		Lab QAO	
Sample preservation and handling acceptable		Sample Custodian	
Holding times not exceeded	Field QAO & CRP Project Mgr	Lab QAO	H-GAC Data Mgr
Collection, preparation, and analysis consistent with SOPs and QAPP	Field QAO	Lab QAO	
Field documentation (e.g., biological, stream habitat) complete	Field QAO & CRP Project Mgr		
Instrument calibration data complete	Field QAO or sample collector	Lab QAO	
Bacteriological records complete	Field QAO or sample collector	Lab QAO	
QC samples analyzed at required frequency	Field QAO or sample collector	Lab QAO	H-GAC Data Mgr
QC results meet performance and program specifications	Field QAO & CRP Project Mgr	Lab QAO	
Analytical sensitivity (Minimum Analytical Levels/Ambient Water Reporting Limits) consistent with QAPP	Field QAO & CRP Project Mgr	Lab QAO	
Results, calculations, transcriptions checked	Field QAO & CRP Project Mgr	Tech. Dir.	
Laboratory bench-level review performed		Head Technician	
All laboratory samples analyzed for all parameters		Lab QAO	
Corollary data agree		Lab QAO	
Nonconforming activities documented		Lab QAO	H-GAC QAO
Outliers confirmed and documented; reasonableness check performed	Field QAO & CRP Project Mgr	Lab QAO	H-GAC Data Mgr & H-GAC QAO
Dates formatted correctly	Field QAO & CRP Project Mgr		H-GAC Data Mgr
Depth reported correctly	Field QAO & CRP Project Mgr		H-GAC Data Mgr
TAG IDs correct			H-GAC Data Mgr
TCEQ Station ID number assigned			H-GAC Data Mgr
Valid parameter codes			H-GAC Data Mgr
Codes for submitting entity(ies), collecting entity(ies), and monitoring type(s) used correctly			H-GAC Data Mgr
Time based on 24-hour clock			H-GAC Data Mgr
Absence of transcription error confirmed		Tech. Dir.	H-GAC Data Mgr
Absence of electronic errors confirmed		Tech. Dir.	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
Field QC results attached to data review checklist	Field QAO & CRP Project Mgr		H-GAC Data Mgr
Verified data log submitted	Field QAO & CRP Project Mgr		H-GAC Data Mgr
10% of data manually reviewed	Field QAO & CRP Project Mgr	Tech. Dir.	H-GAC Data Mgr & H-GAC QAO

**Table D2.1h: Data Review Tasks for the Texas Research Institute for Environmental Studies (TRIES)**

TRIES Data to be Verified	Field Task	TRIES Lab Task	Laboratory Task (Eastex Lab)	Lead Organization Data Manager Task
Sample documentation complete; samples labeled, sites identified	TRIES QAO	Sample Custodian (analysts)	Sample Custodian.	
Field instrument pre- and post-calibration results within limits	TRIES QAO			
Field QC samples collected for all analytes as prescribed in the TCEQ <i>SWQM Procedures Manual</i>	TRIES QAO			
Standards and reagents traceable	TRIES QAO	Lab QAO	Lab QAO	
Chain of custody complete/acceptable	TRIES QAO	Sample Custodian (analysts)	Sample Cust.	H-GAC Data Mgr
NELAP Accreditation is current		LAB QAO	Lab QAO	
Sample preservation and handling acceptable	TRIES QAO	Sample Custodian (analysts)	Sample Custodian.	
Holding times not exceeded		Sample Custodian (analysts)	Lab QAO	H-GAC Data Mgr
Collection, preparation, and analysis consistent with SOPs and QAPP	TRIES QAO	Lab QAO	Lab QAO	
Field documentation (e.g., biological, stream habitat) complete	TRIES QAO			
Instrument calibration data complete	TRIES QAO	Lab QAO	Lab QAO	
Bacteriological records complete		Lab QAO	Lab QAO	
QC samples analyzed at required frequency	TRIES QAO	Lab QAO	Lab QAO	H-GAC Data Mgr
QC results meet performance and program specifications		Lab QAO	Lab QAO	
Analytical sensitivity (Minimum Analytical Levels/Ambient Water Reporting Limits) consistent with QAPP		Lab QAO	Lab QAO	
Results, calculations, transcriptions checked	TRIES QAO	Analysts/Peer Review	Technical Director	
Laboratory bench-level review performed		Lab QAO	Head Technician	
All laboratory samples analyzed for all parameters		Lab QAO	Lab QAO	
Corollary data agree		Lab QAO	Lab QAO	H-GAC Data Mgr
Nonconforming activities documented	TRIES QAO	Lab QAO	Lab QAO	H-GAC QAO
Outliers confirmed and documented; reasonableness check performed	TRIES QAO	Lab QAO	Lab QAO	H-GAC Data Mgr & H-GAC QAO
Dates formatted correctly	TRIES Data Mgr	Lab QAO		H-GAC Data Mgr
Depth reported correctly	TRIES Data Mgr			H-GAC Data Mgr
TAG IDs correct	TRIES Data Mgr			H-GAC Data Mgr
TCEQ Station ID number assigned	TRIES Data Mgr			H-GAC Data Mgr
Valid parameter codes	TRIES Data Mgr			H-GAC Data Mgr & H-GAC QAO
Codes for submitting entity(ies), collecting entity(ies), and monitoring type(s) used correctly	TRIES Data Mgr			H-GAC Data Mgr
Time based on 24-hour clock	H-GAC Data Mgr	Lab QAO		H-GAC Data Mgr
Absence of transcription error confirmed	TRIES Data Mgr & TRIES QAO	Lab QAO	Technical Director	H-GAC Data Mgr
Absence of electronic errors confirmed	TRIES Data Mgr & TRIES 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)	TRIES Data Mgr & TRIES QAO			H-GAC Data Mgr & H-GAC QAO

TRIES Data to be Verified	Field Task	TRIES Lab Task	Laboratory Task (Eastex Lab)	Lead Organization Data Manager Task
Field QC results attached to data review checklist	TRIES Data Mgr & TRIES QAO			H-GAC Data Mgr
Verified data log submitted	TRIES Data Mgr			H-GAC Data Mgr
10% of data manually reviewed	TRIES Data Mgr & TRIES QAO	Lab 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 which do not meet requirements will not be submitted to SWQMIS nor will be considered appropriate for any of the uses noted in Section A5.