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

3555 Timmons Lane, Suite 120
Houston, Texas 77027

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 2022 to FY 2023

Questions concerning this QAPP should be directed to:
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CRP Quality Assurance Officer
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jean.wright@h-gac.com

A1 Approval Page

Texas Commission on Environmental Quality

Water Quality Planning Division

9/1/2021

Kyle Girten, Manager — Date
Water Quality Monitoring and Assessment Section

Rebecca DuPont 09/01/2021

Rebecca DuPont, Work Leader — Date
Clean Rivers Program

Rebecca DuPont 09/01/2021

Rebecca DuPont, — Date
Acting Project Quality Assurance Specialist
Clean Rivers Program

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Jenna Wadman, Project Manager — Date
Clean Rivers Program

Cathy S. Anderson 09/01/2021

Cathy Anderson, Team Leader — Date
Data Management and Analysis

Monitoring Division

09/01/2021

Sharon Coleman — Date
TCEQ Quality Assurance Manager

Dana D. Squires 09/01/2021

Dana Squires — Date
Lead CRP Quality Assurance Specialist

Todd Running 08/31/2021

Todd Running Date
H-GAC Project Manager

Jean Wright 8/31/2021

Jean Wright Date
H-GAC Quality Assurance Officer

Harris County Pollution Control Services (HCPCS)

Mohammed Serageldin 08/31/2021

Dr. Mohammed Serageldin Date
HCPCS CRP Project Manager

Bryan Kosler 8/31/2021

Bryan Kosler Date
HCPCS CRP Field Quality Assurance Officer

Mohammed Serageldin 08/31/2021

Dr. Mohammed Serageldin Date
HCPCS Laboratory Manager

Ericka Jackson 8/31/2021

Ericka Jackson Date
HCPCS Quality Assurance Officer

City of Houston, Houston Health Department (HHD)

8/31/2021

Nguyen Ly — Date
CRP Project Manager

Darryl S. Tate 08/31/2021

Darryl Tate — Date
HHD CRP Field Quality Assurance Officer

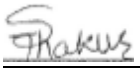
8-31-21

Roger Sealy — Date
HHD BLS Lab Manager

8.31.2021

Kimyattia Smith — Date
HHD BLS Lab Quality Assurance Officer

City of Houston, Drinking Water Operations (DWO)

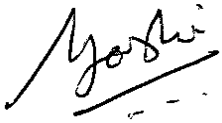


8/31/2021

Shubha Thakur Date
CRP Project Manager & DWO Laboratory Director

8/31/2021

Harold Longbaugh Date
DWO Laboratory Manager



8/31/2021

Narendra Joshi Date
DWO Laboratory Quality Assurance Manager

Desta G. Takie 8/31/2021

Desta Takie Date
DWO CRP Field Quality Assurance Officer

San Jacinto River Authority (SJRA)

8-31-21

Shane Simpson — Date
SJRA CRP Project Manager and
Field Quality Assurance Officer

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

8/31/2021

Dr. George Guillen — Date
EIH CRP Project Manager

8/31/2021

Jenny Oakley — Date
EIH CRP Quality Assurance Officer

Texas Research Institute for Environmental Studies (TRIES)

1 Sept. 2021

Dr. Chad Hargrave — Date
TRIES CRP Project Manager

Ashley Morgan-Olvera *31Aug2021*

Ashley Morgan-Olvera — Date
TRIES Quality Assurance Officer

Dr. Rachelle Smith. *31 Aug 2021*

Dr. Rachelle Smith — Date
TRIES Laboratory Manager & Quality Assurance Officer

Eastex Environmental Laboratory, Inc. (Coldspring, TX)

Tiffany Guerrero 9/1/2021

Tiffany Guerrero Date
Eastex Lab Technical Director

Samantha Plunkett 9/1/2021

Samantha Plunkett Date
Eastex Lab Quality Assurance Officer

A2 Table of Contents

List of Acronyms

AWRL	Ambient Water Reporting Limit
BMP	Best Management Practices
BTLIMS	Bin Technology Laboratory Information Management System
CAP	Corrective Action Plan
CE	Collecting Entity
COC	Chain of Custody
CRP	Clean Rivers Program
DI	Deionized Water
DM	Data Manager
DMRG	Surface Water Quality Monitoring Data Management Reference Guide, July 2019, or most recent version
DM&A	Data Management and Analysis
DWO	City of Houston, Drinking Water Operations
Eastex	Eastex Environmental Laboratory (Facility in Coldspring, TX only)
EPA	United States Environmental Protection Agency
FY	Fiscal Year
EIH	Environmental Institute of Houston, University of Houston – Clear Lake
GIS	Geographical Information System
GPS	Global Positioning System
H-GAC	Houston- Galveston Area Council
HCPCS	Harris County Pollution Control Services
HHD	City of Houston Health Department
HHD-BLS	Houston Health Department – Bureau of Laboratory Services
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
LIMS	Laboratory Information Management System
LOD	Limit of Detection
LOQ	Limit of Quantitation
Mgr	Manager
MT	Monitoring Type
NELAP	National Environmental Laboratory Accreditation Program
PM	Project Manager
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
RT	Routine Monitoring
RMW	Regional Monitoring Workgroup
SAS	Statistical Analysis Software
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

A3 Distribution List

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

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Houston-Galveston Area Council
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Houston, Texas 77027

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(713) 993-4549
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(713) 499-6660
Email: Jean.Wright@h-gac.com

The 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., subcontractors, subparticipants, or other units of government. The 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 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

Rebecca DuPont
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. 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 approves all QA audits, corrective actions, 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.

Dana Squires
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. 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 audit records for the CRP.

Jenna Wadman
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). Coordinates the review and approval of CRP QAPPs. Ensures maintenance of QAPPs. Assists CRP Lead QA Specialist in conducting Basin Planning Agency audits. Verifies QAPPs are being followed by contractors and that projects are producing data of known quality. Coordinates project planning with the Basin Planning Agency Project Manager. Reviews and approves data and reports produced by contractors. Notifies QA Specialists of circumstances which may adversely affect the quality of data derived from the collection and analysis of samples. Develops, enforces, and monitors corrective action measures to ensure contractors meet deadlines and scheduled commitments.

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). Ensures DM&A staff perform data management-related tasks.

Sarah Kirkland
CRP Data Manager, DM&A Team
Responsible for coordination and tracking of CRP data sets from initial submittal through CRP Project Manager review and approval. Ensures that data are reported following instructions in the Data Management Reference Guide, July 2019 or most current version (DMRG). Runs automated data validation checks in the Surface Water Quality Management Information System (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).

Rebecca DuPont
Acting 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 basin planning agency participants and that projects are producing data of known quality. Ensures that 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. Ensures that data collected is validated and are acceptable for reporting to the TCEQ. Supervises field monitoring with assistance from QAO to ensure all monitoring activities are completed as stated in the QAPP.

Jean Wright
H-GAC Quality Assurance Officer
Responsible for coordinating the implementation of the QA program. Responsible for writing and maintaining the Multi-Basin QAPP and monitoring its implementation. Responsible for maintaining records of QAPP distribution, including appendices and amendments. Responsible for maintaining written records of sub-tier commitment to requirements specified in this QAPP. Responsible for identifying, receiving, and maintaining project QA records. Responsible for coordinating with the TCEQ QAS to resolve QA-related issues. Notifies the H-GAC Project Manager of particular circumstances which may adversely affect the quality of data. Coordinates and monitors deficiencies and corrective action. Responsible for validating that data collected are acceptable for reporting to the TCEQ. 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.

Jessica Casillas
H-GAC Data Manager
Responsible for ensuring that field data are properly reviewed and verified. Responsible for the transfer of basin quality-assured water quality data to the TCEQ in a format compatible with SWQMIS. Coordinates and maintains records of data verification and validation. Maintains quality-assured data on H-GAC internet sites.

Eastex Environmental Laboratory (Eastex) (Coldspring, TX, facility only)

Tiffany Guerrero
Laboratory Technical Director - Eastex Environmental Lab (Contract Lab)
Responsible for the overall performance, administration, and reporting of analyses performed by Eastex Environmental Laboratory (Coldspring, TX). Responsible for supervision of laboratory personnel involved in generating analytical data for the project. Ensures that laboratory personnel have adequate training and a thorough knowledge of this QAPP and related SOPs. Responsible for oversight of all laboratory operations ensuring that all QA/QC requirements are met, documentation is complete and adequately maintained, and results are reported accurately.

Samantha Plunkett
Eastex Lab QAO
Responsible for the overall quality control and quality assurance of analyses performed by Eastex Environmental Laboratory (Coldspring, TX). Monitors the implementation of the QM/QAPP within the laboratory to ensure complete compliance with QA data quality objectives, as defined by this QAPP. Coordinates and monitors deficiencies and corrective actions. Conducts in-house audits to ensure compliance with written SOPs and to identify potential problems. Responsible for supervising and verifying all aspects of the QA/QC in the laboratory.

Harris County Pollution Control Services (HCPCS)

Dr. Mohammed Serageldin
CRP Project Manager / Manager-Laboratory Services
Responsible for overall performance, administration, and reporting of analyses performed by HCPCS Laboratory. Responsible for supervision of laboratory personnel involved in generating analytical data for the project. Ensures that laboratory personnel have adequate training and a thorough knowledge of this QAPP and related SOPs. Responsible for oversight of all laboratory operations ensuring that all QA/QC requirements are met, documentation is complete and adequately maintained, and results are reported accurately. Additionally, the lab director will review and verify all laboratory data for integrity and continuity, reasonableness and conformance to project requirements, and will confirm data is validated against the data quality objectives listed in Appendix A of this QAPP.

Ericka Jackson
Lab Quality Assurance Officer (QAO) / CRP Data Manager
Responsible for monitoring the activities of HCPCS laboratory personnel, ensuring that all data collected meet the data quality objectives of the project. Ensures both field and laboratory data are entered into appropriate spreadsheets and data bases and is reviewed and validated as required. Responsible for submitting all data to H-GAC in the correct format. Responsible for the overall quality control and quality assurance of analyses performed by HCPCS Laboratory. Monitors the implementation of the QM/QAPP within the laboratory to ensure complete compliance with QA data quality objectives, as defined by this QAPP. Conducts in-house audits to ensure compliance with written SOPs and to identify potential problems. Responsible for supervising and verifying all aspects of the QA/QC in the laboratory. Responsible for coordinating the implementation of the QA program. Responsible for identifying, receiving, and maintaining project QA records. Responsible for coordinating with the H-GAC QAO to resolve QA-related issues. Notifies the H-GAC QAO of particular circumstances which may adversely affect the quality of data. Coordinates and monitors deficiencies and corrective action. Responsible for ensuring that field and laboratory data collected by or submitted to H-GAC CRP are properly reviewed, verified, and validated. Formats and delivers data in the format described in the DMRG, most recent version, to H-GAC CRP Data Manager.

Bryan Kosler
CRP Field Supervisor & CRP Field QAO
Responsible for monitoring the activities of HCPCS field personnel, ensuring that all data collected meet the data quality objectives of the project. Responsible for supervising the collection, preservation, handling and delivery of samples. Responsible for ensuring that field measurements, sample custody, and documentation follow procedures described in this QAPP. Notifies the HCPCS lab QA staff of particular circumstances which may adversely affect the quality of data. Responsible for coordinating with H-GAC QAO to resolve field related issues. Trains all field monitoring personnel.

City of Houston – Houston Health Department (HHD)

Nguyen Ly
CRP Project Manager
Ensures all routine monitoring is conducted in support of the QAPP and the monitoring schedule. Responsible for implementing and monitoring CRP requirements in QAPPs and QAPP amendments and appendices. Coordinates basin planning activities with the H-GAC Project Manager and/or QAO. Ensures H-GAC Quality Assurance Officer is notified of deficiencies and corrective actions, and that issues are resolved.

Darryl Tate
CRP Field Supervisor & CRP Field QAO
Responsible for scheduling all CRP monitoring activities, QA program and for coordinating with the H-GAC QA staff to resolve monitoring and QA-related issues. Responsible for supervising the collection, preservation, handling and delivery of samples. Responsible for ensuring that field measurements, sample custody, and documentation follow procedures described in this QAPP. Notifies the HHD CRP Project Manager and/or H-GAC QAO or other staff of circumstances which may adversely affect the quality of data. Coordinates and monitors deficiencies and corrective actions. Coordinates the research and review of technical QA material and data related to water quality monitoring system design and analytical techniques. Ensures that field staff is properly trained and that training records are maintained.

Jane Marzano
CRP Data Manager
Responsible for ensuring that field data are properly reviewed and verified. Formats and delivers data in in the format described in the most recent version of the DMRG to the H-GAC CRP Data Manager. Responsible for sending hard or scanned copies of field data sheets and COC forms to H-GAC CRP Data Manager.

City of Houston – Houston Health Department – Bureau of Laboratory Services (HHD-BLS)

Roger Sealy
HHD-BLS Lab Manager
Responsible for overall performance, administration, and reporting of analyses performed by HHD-BLS. Responsible for supervision of laboratory personnel involved in generating analytical data for the project. Ensures that laboratory personnel have adequate training and a thorough knowledge of this QAPP and related SOPs. Communicates QA issues to HHD CRP Field QAO, HHD CRP Data Manager, and/or HGAC QAO, HGAC Data Manager. Responsible for oversight of all laboratory operations ensuring that all QA/QC requirements are met, documentation is complete and adequately maintained, and results are reported accurately. Responsible party for ensuring that laboratory staff are trained and that training records are maintained. Additionally, the lab manager will review and verify all laboratory data for integrity and continuity, reasonableness and conformance to project requirements, and will confirm data is validated against the data quality objectives listed in Appendix A of this QAPP. Provides a final review of lab data against Appendix A of this QAPP, NELAC standards and method requirements prior to submission to HGAC.

Kimyattia Smith
HHD-BLS Lab Quality Assurance Officer
Responsible for the overall quality control and quality assurance of analyses performed by HHD-BLS. Monitors the implementation of the QM/QAPP within the laboratory to ensure complete compliance with QA data quality objectives, as defined by the QAPP. Communicates QA issues to HHD BLS Lab Manager, HHD BLS Data Manager, HHD CRP Data Manager, and/or HGAC QAO or HGAC Data Manager as needed. Ensures that all lab QA/QC requirements are met, that documentation is complete and adequately maintained, and results are reported accurately. Conducts in-house audits to ensure compliance with written SOPs and to identify potential problems. Responsible for supervising and verifying all aspects of the QA/QC in the laboratory. Coordinates and monitors deficiencies and corrective actions. Validates data against the quality objectives listed in Appendix A of this QAPP.

City of Houston – Drinking Water Operations (DWO)

Shubha Thakur
CRP Project Manager / Laboratory Director

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 City of Houston Drinking Water Operations Laboratory participants and that projects are producing data of known quality. Ensures H-GAC project manager, H-GAC QAO, and/or HGAC data manager are notified of deficiencies and corrective actions, and that issues are resolved.

Harold Longbaugh
Laboratory Manager

Responsible for overall performance, administration and reporting of analyses by City of Houston Drinking Water Operations Laboratory. Responsible for supervision of laboratory personnel involved in generating analytical data for the project. Ensures that laboratory personnel have adequate training and a thorough knowledge of this QAPP and related SOPs. Responsible for oversight of all laboratory operations ensuring that all QA/QC requirements are met, documentation is complete and adequately maintained, and results are reported accurately. Responsible for reviewing & validating field data submitted on COCs & laboratory data against raw data entered in BTLIMS.

Narendra Joshi
Lab QA Manager / CRP Lab Data Manager

Responsible for overall quality control and quality assurance of analyses performed by City of Houston Drinking Water Operations Laboratory. Monitors the implementation of the QM/QAPP within the laboratory to ensure complete compliance with QA data quality objectives, as defined by the QAPP. Conducts in-house audits to ensure compliance with written SOPs and to identify potential problems. Responsible for supervising and verifying all aspects of the QA/QC in the laboratory. Responsible for training and keeping record of lab personnel to produce quality analytical data. Communicates any QA issues with laboratory manager and laboratory director. Responsible for coordinating and monitoring deficiencies and corrective actions. Responsible for coordinating with the H-GAC QAO to resolve QA-related issues. Notifies the City of Houston Drinking Water Operations Project Manager and laboratory manager of particular circumstances which may adversely affect the quality of data. Responsible for reviewing at least 10% of laboratory data against raw data entered in BTLIMS. Coordinates and maintains records of data verification and validation. Responsible for sending analytical data with required QA/QC and Data Review Checklist to HGAC CRP Data Manager.

Desta Takie
CRP Field Supervisor / CRP Field QAO / CRP Field Data Manager

Responsible for supervising the collection, preservation, handling and delivery of samples. Responsible for ensuring that field measurements, sample custody, and documentation follow procedures described in the this QAPP. Notifies the DWO Lab QA Manager of particular circumstances which may adversely affect the quality of data. Responsible for verifying and validating data files against measurement performance specifications and other requirements in the QAPP. Formats and delivers field data in the format described in the most recent revision of the DMRG to H-GAC CRP Data Manager. Submits hard copies of field sheets, chain-of custody reports and Data Review Checklist to HGAC CRP Data Manager. Trains all field monitoring personnel and maintains training records.

San Jacinto River Authority (SJRA)

Shane Simpson
CRP Project Manager / CRP Field Supervisor / CRP Quality Assurance Officer

Responsible for conducting routine monitoring in support of this QAPP. Responsible for implementing and monitoring CRP requirements in QAPPs, and QAPP amendments and appendices. Coordinates basin planning activities with the H-GAC. Ensures H-GAC CRP project manager and/or QAO are notified of deficiencies and corrective actions, and that issues are resolved. Responsible for supervising the collection, preservation, handling and delivery of samples. Responsible for ensuring that field measurements, sample custody, and documentation follow procedures described in this QAPP. Notifies the H-GAC QAO of particular circumstances which may adversely affect the quality of data. Trains all field monitoring personnel and maintains training records. Responsible for coordinating the implementation of the QA program. Responsible for identifying, receiving, and maintaining project QA records. Responsible for coordinating with the H-GAC QA staff to resolve QA-related issues. Coordinates and monitors deficiencies and corrective actions. Responsible for data entry of all field data.

Randy Acreman
CRP Data Manager

Responsible for verifying and validating data files against measurement performance specifications and other requirements in this QAPP. Formats and delivers data in the format described in the DMRG, most recent version, to H-GAC CRP Data Manager. Submits electronic data and supporting documents (field data sheets, chain-of-custody reports, and Data Review Checklists) to the H-GAC CRP Data Manager.

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

Dr. George Guillen
EIH CRP Project Manager

Responsible for conducting routine monitoring in support of this QAPP. Responsible for implementing and monitoring CRP requirements in, QAPPs, and QAPP amendments and appendices. Coordinates basin planning activities with the H-GAC.

Jenny Oakley
CRP QAO / Data Manager / Field Supervisor

Responsible for verifying and validating data files against measurement performance specifications and other requirements in this QAPP. Formats and delivers data in the format described in the DMRG, most recent version, to H-GAC CRP Data Manager. Trains all field monitoring personnel and maintains training records. Ensures H-GAC CRP project manager and/or QAO are notified of deficiencies and corrective actions, and that issues are resolved. Responsible for coordinating the implementation of the QA program. Responsible for identifying, receiving, and maintaining project QA records. Responsible for coordinating with the H-GAC QA staff to resolve QA-related issues. Coordinates and monitors deficiencies and corrective actions.

Texas Research Institute for Environmental Studies (TRIES)

Dr. Chad Hargrave
CRP Project Manager

Responsible for conducting routine monitoring in support of this QAPP. Responsible for implementing and monitoring CRP requirements in QAPPs, and QAPP amendments and appendices. Coordinates basin planning activities with the H-GAC. Ensures H-GAC CRP project manager and/or QAO are notified of deficiencies and corrective actions, and that issues are resolved.

Ashley Morgan-Olvera
Field QAO / Field Supervisor / Data Manager

Responsible for supervising the collection, preservation, handling and delivery of samples. Responsible for ensuring that field measurements, sample custody, and documentation follow procedures described in this QAPP. Notifies the H-GAC QAO of particular circumstances which may adversely affect the quality of data. Responsible for verifying and validating field and laboratory data against measurement performance specifications and other requirements in this QAPP. Formats and delivers data in the format described in the DMRG, most recent version, to H-GAC CRP Data Manager. Trains all field monitoring personnel and maintains training records.

Dr. Rachelle Smith
Lab Manager / Lab QAO

Responsible for the overall quality control and quality assurance of analyses performed by TRIES Lab. Monitors the implementation of the QM/QAPP within the laboratory to ensure complete compliance with QA data quality objectives, as defined by this QAPP. Coordinates and monitors deficiencies and corrective actions. Conducts in-house audits to ensure compliance with written SOPs and to identify potential problems. Responsible for supervising and verifying all aspects of the QA/QC in the laboratory.

Project Organization Charts

Figure A4.1. Organization Chart - Lines of Communication

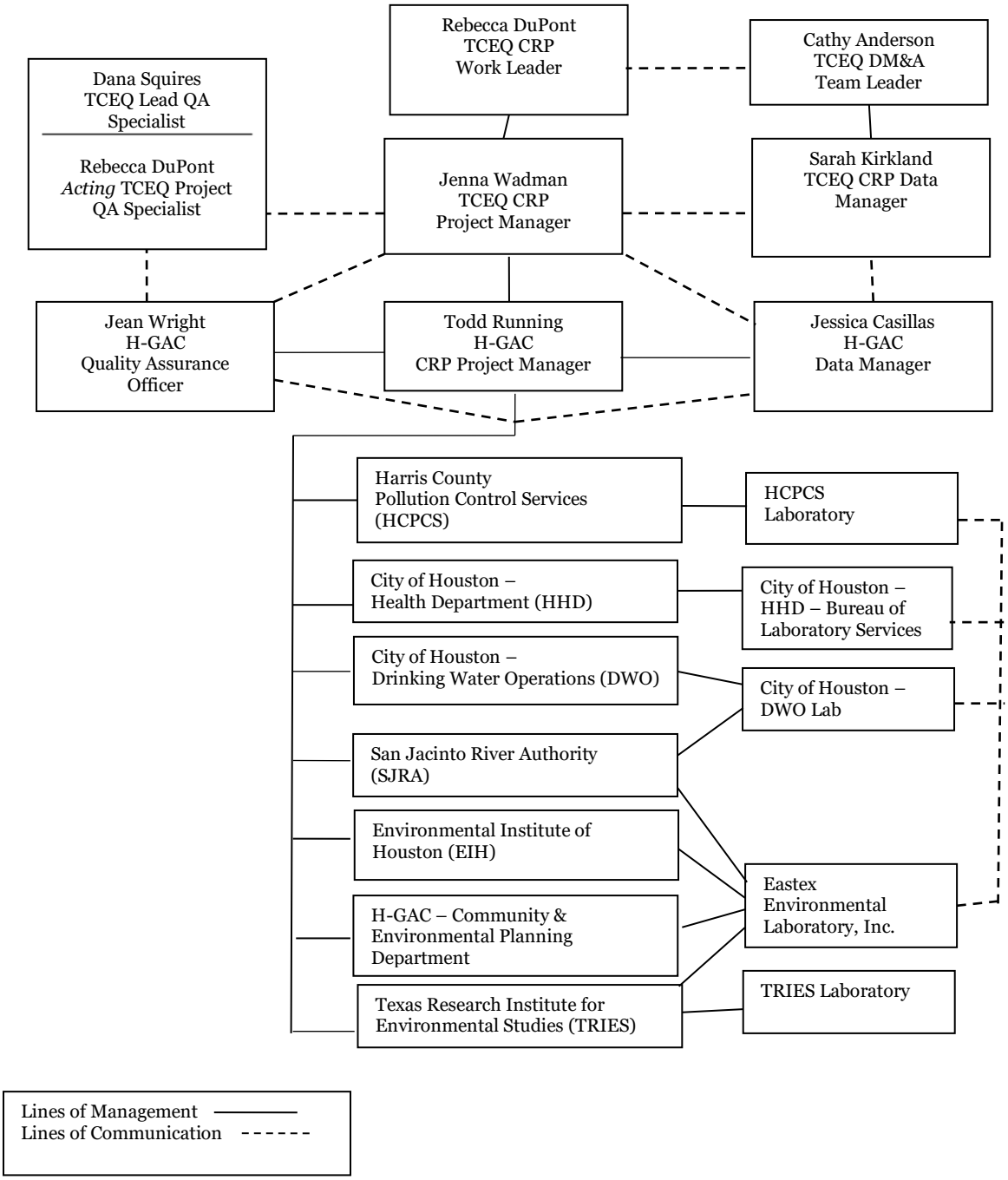


Figure A4.1a. The Houston-Galveston Area Council (H-GAC) CRP Organizational Chart.

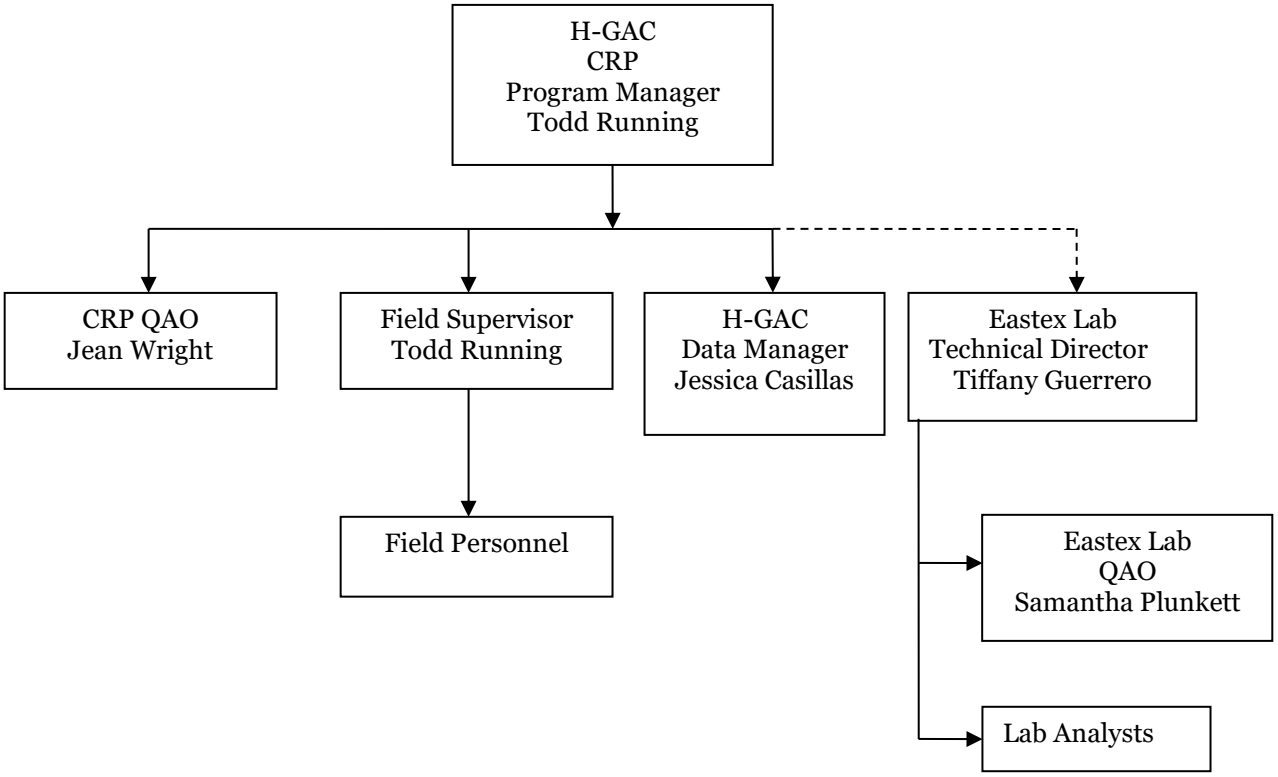


Figure A4.1b. The Harris County Pollution Control Services (HCPCS) CRP Organizational Chart.

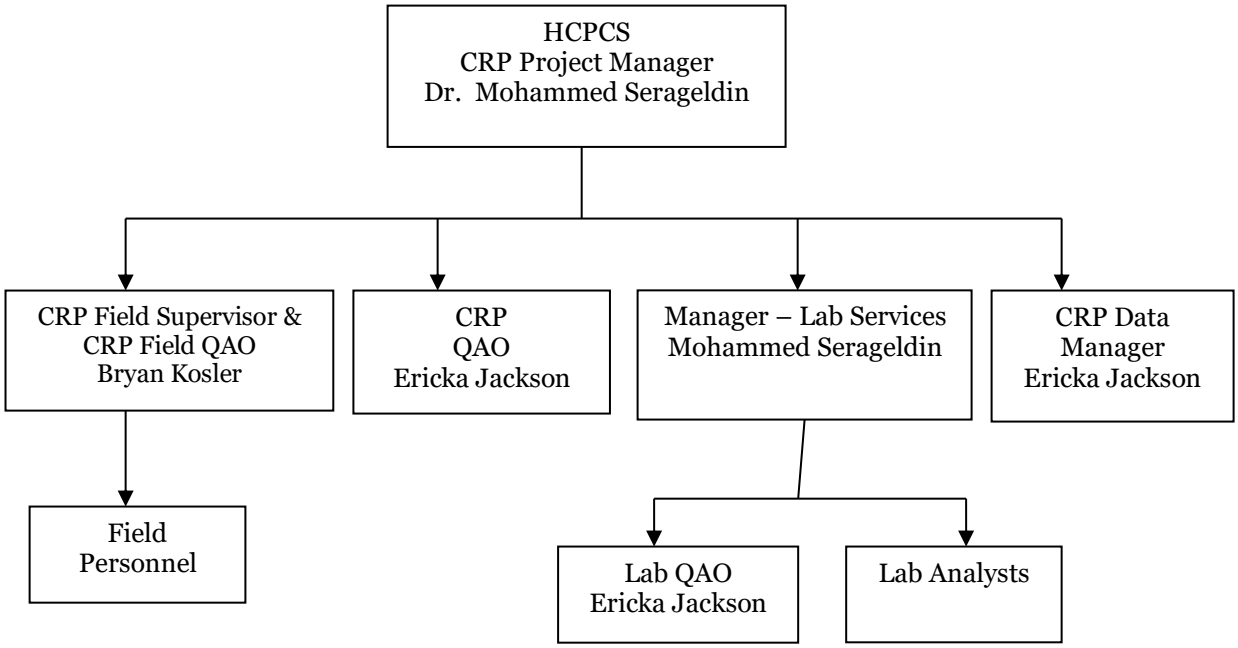


Figure A4.1c. The City of Houston, Health Department (HHD) CRP Organizational Chart.

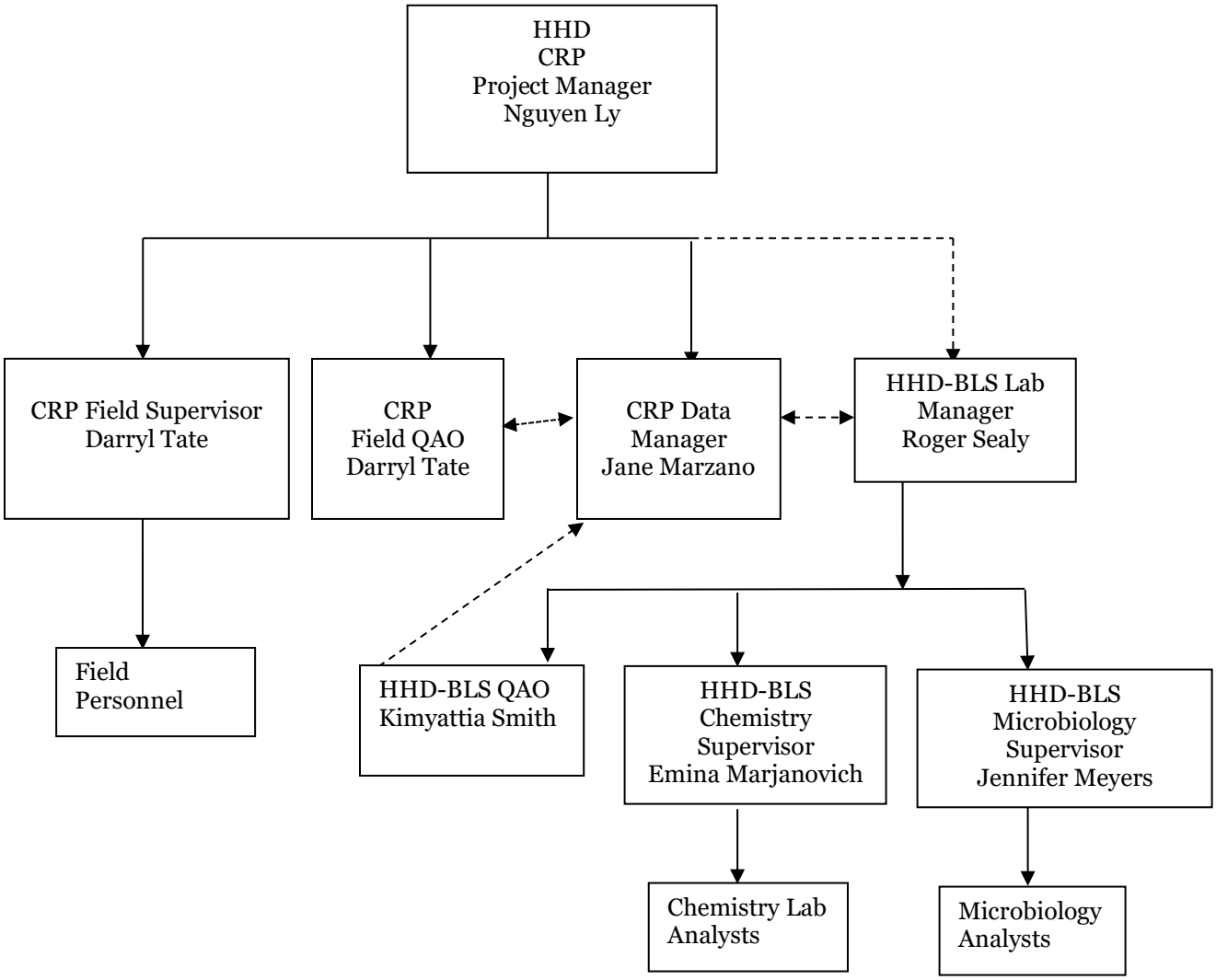


Figure A4.1d. The City of Houston, Drinking Water Operations (DWO) CRP Organizational Chart.

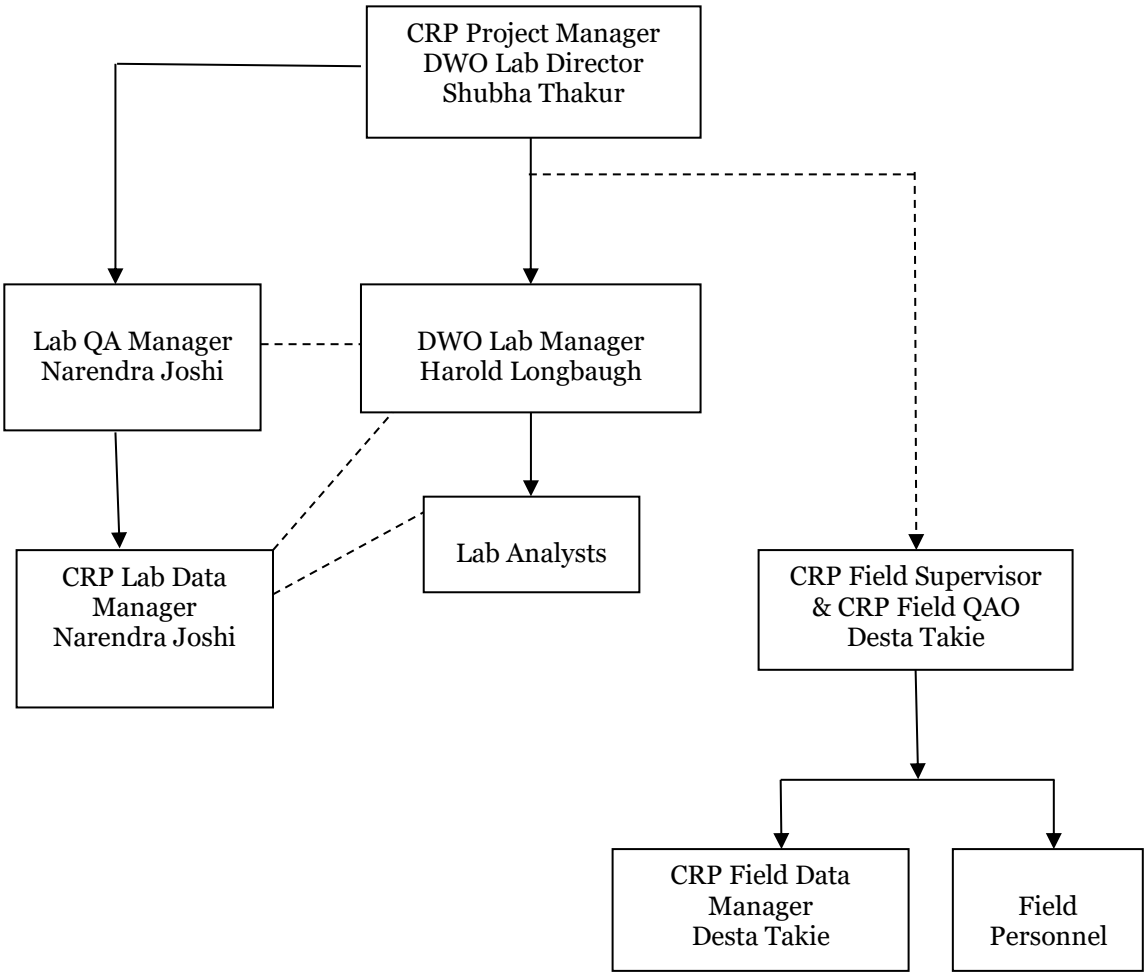


Figure A4.1e. San Jacinto River Authority (SJRA) CRP Organizational Chart.

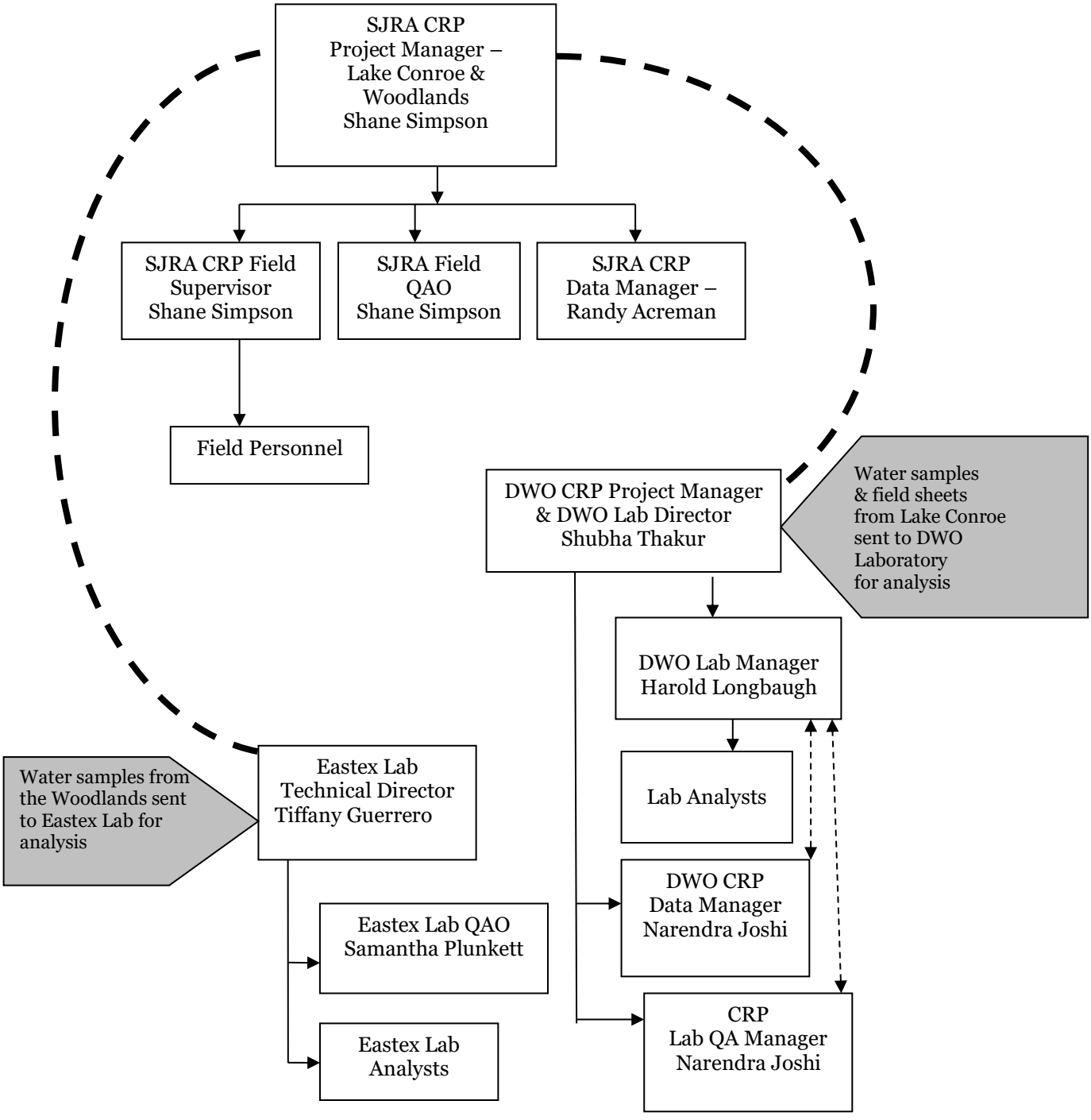


Figure A4.1f. The Environmental Institute of Houston (EIH) at the University of Houston - Clear Lake (UHCL) CRP Organizational Chart.

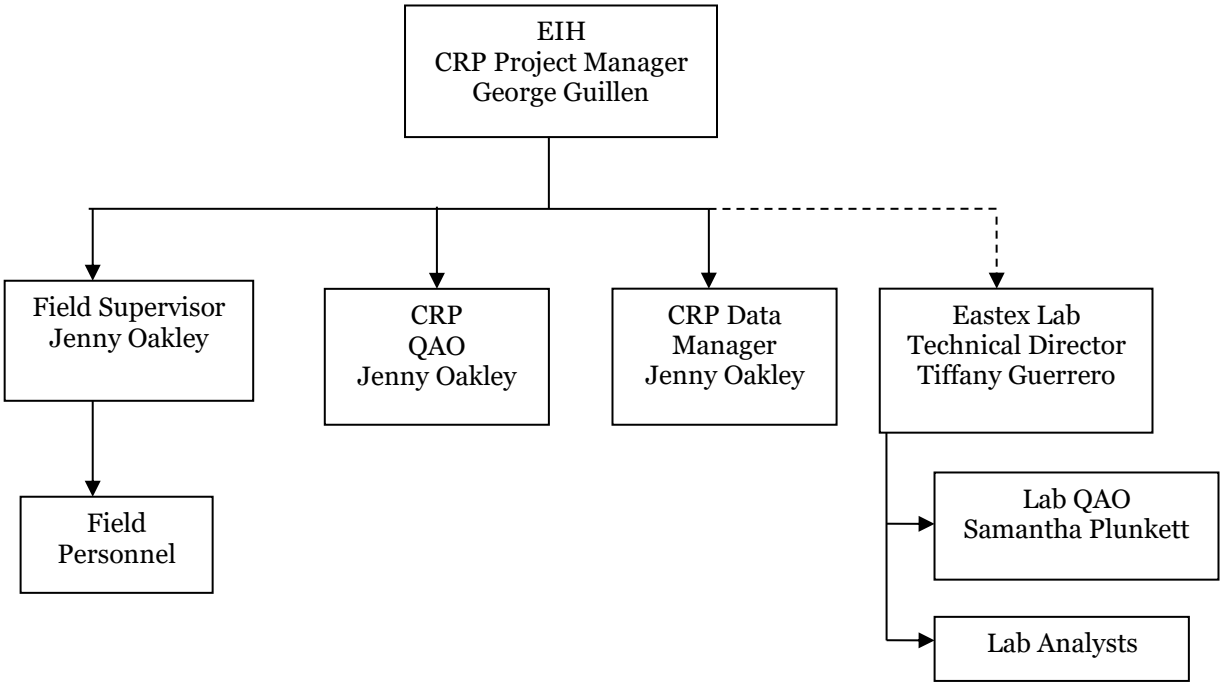
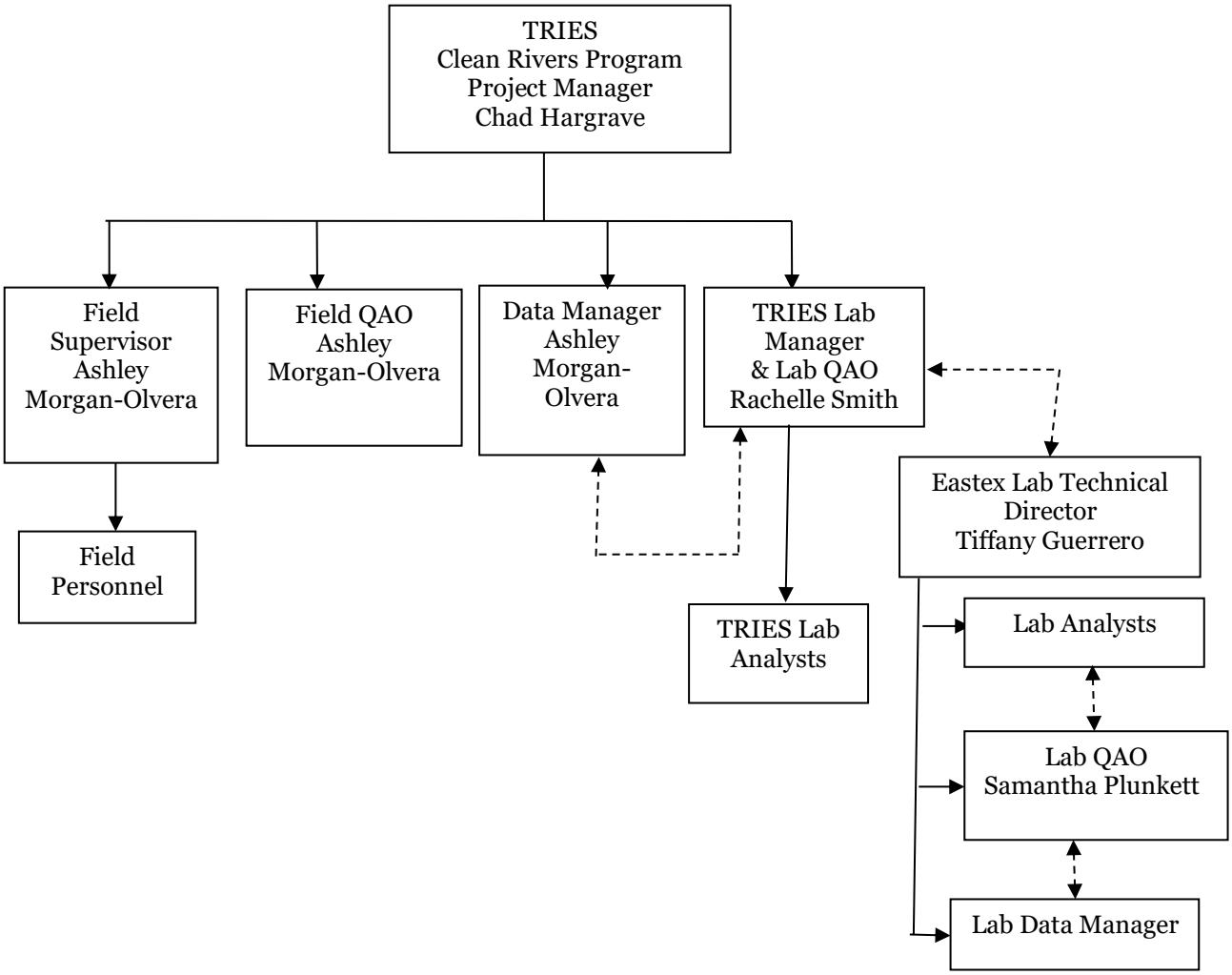


Figure A4.1g. Texas Research Institute for Environmental Studies (TRIES) CRP Organizational Chart.



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 8 2019 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 of known and documented quality, deemed acceptable for their intended use. 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) and water quality standards development, permit decisions, and other program activities 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 2022-2023*.

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.

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 the individual agencies but will be shared among the other participants through a data clearinghouse maintained by H-GAC. The agencies that submit data through the H-GAC Clean Rivers Program are 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– University of Houston Clear Lake (EIH), the Texas Research Institute on Environmental Studies (TRIES), and the Houston-Galveston Area Council (H-GAC).

The coordinated program routinely collects surface water quality data from more than 300 sites throughout the region. Sampling includes collection of physicochemical, bacteriological, 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 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 and presumed 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.

Since July of 2008, all laboratories working with the Clean Rivers Program have been 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.

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.

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.

Houston-Galveston Area Council monitoring locations are sampled on a quarterly basis. These areas are under pressure from increasing 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.

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 on the north shore. 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 six 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 Houston 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 City of Houston – DWO Lab for analysis. Monthly water samples are collected from Lake Conroe. 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, Panther Branch and Bear Branch – tributaries of Spring Creek. That data is also shared with the Clean Rivers Program as detailed in this QAPP. Field parameters, including flow from one USGS flow gage, are monitored monthly while conventional and bacteriological parameters are analyzed quarterly. Data is submitted to H-GAC on a quarterly basis.

Environmental Institute of Houston is contracted by H-GAC to monitor surface water quality 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). Generally, data is collected for the Clean Rivers Program on a quarterly basis for a total of four events at each site per year. However, certain stations are sampled monthly due requests from a local partner or due to TCEQ Permitting Section requests.

The **Texas Research Institute for Environmental Studies** is contracted by H-GAC to monitor ambient surface water quality on the Upper East Fork San Jacinto River and Winters Bayou watersheds. Field parameters, conventional and bacteria samples are collected at every site every quarter. Flow data is collected at every site as long as the stream is wadeable.

Routine monitoring is scheduled at varying frequencies, which are determined by the parameters of concern for individual streams. 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).*

24-Hour Dissolved Oxygen (DO) monitoring by the Houston-Galveston Area Council and the Environmental Institute of Houston.

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 DO 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. H-GAC and/or EIH will conduct 24-hour DO monitoring at seven monitoring sites quarterly during the two-year contract period. Monitoring events will be planned and conducted according to the most current version of 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 11405 – (1113A) – Armand Bayou at Fairmont Parkway along median at midpoint between bridges
- Site 16675 – (1013C) – Unnamed Trib of Buffalo Bayou at Glenwood Cemetery Rd 160 M W of intersection of Lubbock St and Sawyer St. in central Houston
- Site 11490 – (1110_01) – Oyster Creek at Hwy 35 west of Angleton in Brazoria County
- Site 11493 – (1110_03) – Oyster Creek at FM 1462 west of Rosharon in Brazoria County
- Site 21709 – (0901A) – Cary Bayou immediately upstream of Raccoon Drive bridge in Baytown
- Site 22232 – (0801E) – Cotton Bayou 10 meter upstream of westbound I-10 frontage road in Mont Belvieu
- Site 21734 – (1105E) – Brushy Bayou at FM 213 (east of Angleton in Brazoria County)

Permit Support monitoring by the Houston-Galveston Area Council (H-GAC) and the Environmental Institute of Houston (EIH).

During FY2022, EIH will collect field parameters (including sonde) and discharge measurements at one station in segment 1102G (Marys Creek). At least ten monitoring events will be conducted at the station with a goal of collecting 12 events.

- Site 18636 – (1102G) – Unnamed trib of Marys Creek 8 M downstream of Thalerfield Dr, E of Old Chocolate Bayou Rd/Brazoria CR 89

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 the H-GAC Project Manager and/or QAO to the CRP Project Manager electronically. The H-GAC will submit a completed QAPP Amendment document, including a justification of the amendment, a table of changes, and all pages, sections, and attachments affected by the amendment. Amendments are effective immediately upon approval by the H-GAC Project Manager, the 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 will 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 Multi-Basin QAPP by way of attachment and distributed to personnel on the distribution list by the H-GAC Project Manager or designee. If adherence letters are required, the H-GAC will secure an adherence letter from each sub-tier project participant (e.g., subcontractors, 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 Multi-Basin QAPP. Regardless, the 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 the H-GAC PM and/or QAO and the TCEQ Project Manager and TCEQ technical staff. Appendices will be written in an abbreviated format and will reference the Multi-Basin QAPP where appropriate. Appendices will be approved by the H-GAC Project Manager, the H-GAC QAO, the Laboratory (as applicable), and the CRP Project Manager, the CRP Project QA Specialist, the CRP Lead QA Specialist and additional parties affected by the Appendix, as appropriate. Copies of approved QAPP appendices will be distributed by the H-GAC to project participants before data collection activities commence. The H-GAC will secure written documentation from each sub-tier project participant (e.g., 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 or the local partner and lab may choose to sign the QAPP amendment. The 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 or most recent version (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., United States Geological Survey (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.

Ambient Water Reporting Limits (AWRLs)

For surface water to be evaluated for compliance with Texas Surface Water Quality Standards ("TSWQS") and screening levels, data must be reported at or below specified reporting limits. To ensure data are collected at or below these reporting limits, required ambient water reporting limits ("AWRL") have been established. A full listing of AWRLs can be found at https://www.tceq.texas.gov/assets/public/waterquality/crp/QA/awrlmaster.pdf .

The limit of quantitation (LOQ) is the minimum reporting limit, 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) as specified in Appendix A.

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

- The laboratory's LOQ for each analyte must be set at or below the AWRL.
- Once the LOQ is established in the QAPP, that is the reporting limit for that parameter until such time as the laboratory amends the QAPP and lists an updated LOQ.
- 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.
- When reporting data, no results may be reported below the LOQ stated in this QAPP.
- Measurement performance specifications 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), Matrix Spike/Matrix Spike Duplicate (MS/MSD), or sample/duplicate (DUP) pairs, as applicable. 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 the systematic or persistent distortion of a measurement process, which causes errors in one direction (i.e., the expected sample measurement is different from the sample's true value). Bias is a statistical measurement of correctness and includes multiple components of systematic error. 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 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, comparable monitoring and collection methods, and use of only approved analytical methods will assure that the measurement data represents the conditions at the site. Routine data collected under CRP are considered to be spatially and temporally representative of ambient 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 maximum representation of the water body will be tempered by funding availability.

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 as described in this QAPP and in TCEQ guidance. 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 in Section B10.

Completeness

The completeness of the data describes 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's 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 local partner's QA Officer (or designee) will retain documentation of training and the successful field demonstration in the employee's personnel file (or other designated location) and ensure that the documentation will be available during monitoring systems audits.

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

Local Partner Agency	Designated Trainer
Houston-Galveston Area Council	Jean Wright
Harris County Pollution Control Services	Bryan Kosler
City of Houston – Houston Health Department	Darryl Tate
City of Houston – Drinking Water Operations	Desta Takie
San Jacinto River Authority	Shane Simpson
Environmental Institute of Houston	Jenny Oakley
Texas Research Institute for Environmental Studies	Ashley Morgan-Olvera

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

Contractors and subcontractors must ensure that laboratories analyzing samples under this QAPP meet the requirements contained in The NELAC Institute Standard (TNI) (2016) Volume 1, Module 2, Section 4.5.5 (concerning Subcontracting of Environmental Tests).

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	Eastex Lab	≥7	Paper & electronic
Laboratory SOPs	Eastex Lab	≥7	Paper & electronic
QAPP distribution documentation	H-GAC / Eastex Lab	≥7	Paper & electronic
Field staff training records	H-GAC	≥7	Paper & electronic
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	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	HCPCS / H-GAC	7	Paper
Field SOPs	HCPCS	7	Paper
Laboratory Quality Manuals	HCPCS Laboratory	7	Paper &/or electronic
Laboratory SOPs	HCPCS Laboratory	7	Paper &/or electronic
QAPP distribution documentation	HCPCS / H-GAC	7	Paper
Field staff training records	HCPCS	7	Paper
Field equipment calibration/maintenance logs	HCPCS	7	Paper
Field instrument printouts	HCPCS	7	Paper &/or electronic
Field notebooks or data sheets	HCPCS / H-GAC	7	Paper
Chain of custody records	HCPCS Laboratory / H-GAC	7	Paper
Laboratory calibration records	HCPCS Laboratory	7	Paper
Laboratory instrument printouts	HCPCS Laboratory	7	Paper
Laboratory data reports/results	HCPCS Laboratory	7	Paper &/or electronic
Laboratory equipment maintenance logs	HCPCS Laboratory	7	Paper
Corrective Action Documentation	HCPCS / HCPCS Laboratory / H-GAC	7	Paper

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

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

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

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

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

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

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

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

Table A9.1g Project Documents and Records – EIH

Document/Record	Location	Retention (yrs)	Format
QAPPs, amendments and appendices	EIH / Eastex Lab / H-GAC	7	Paper
Field SOPs	EIH	7	Paper
Laboratory Quality Manuals	Eastex Lab	7	Paper &/or electronic
Laboratory SOPs	Eastex Lab	7	Paper &/or electronic
QAPP distribution documentation	EIH / Eastex Lab / H-GAC	7	Paper
Field staff training records	EIH	7	Paper
Field equipment calibration/ maintenance logs	EIH	7	Paper &/or electronic
Field instrument printouts	EIH	7	Paper
Field notebooks or data sheets	EIH / H-GAC	7	Paper &/or electronic
Chain of custody records	EIH / Eastex Lab / H-GAC	7	Paper &/or electronic
Laboratory calibration records	Eastex Lab	7	Paper
Laboratory instrument printouts	Eastex Lab	7	Paper
Laboratory data reports/results	Eastex Lab	7	Electronic
Laboratory equipment maintenance logs	Eastex Lab	7	Paper
Corrective Action Documentation	EIH / Eastex Lab / H-GAC	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 &/or electronic
Field SOPs	TRIES	7	Paper &/or electronic
Laboratory Quality Manuals	TRIES Lab / Eastex Lab	7	Paper &/or electronic
Laboratory SOPs	TRIES Lab / Eastex Lab	7	Paper &/or electronic
QAPP distribution documentation	TRIES / TRIES Lab / Eastex Lab / H-GAC	7	Paper
Field staff training records	TRIES	7	Paper
Field equipment calibration/maintenance logs	TRIES	7	Paper
Field instrument printouts	TRIES	7	Paper &/or electronic
Field notebooks or data sheets	TRIES / H-GAC	7	Paper &/or electronic
Chain of custody records	TRIES / TRIES Lab / Eastex Lab / H-GAC	7	Paper &/or electronic
Laboratory calibration records	TRIES Lab / Eastex Lab	7	Paper
Laboratory instrument printouts	TRIES Lab / Eastex Lab	7	Paper
Laboratory data reports/results	TRIES Lab	7	Paper &/or electronic
Laboratory equipment maintenance logs	TRIES Lab / Eastex Lab	7	Paper
Corrective Action Documentation	TRIES / TRIES Lab / Eastex Lab / H-GAC	7	Paper &/or 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 (2016), 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, and SJRA and analyzes TKN in samples collected by HHD. Eastex Lab submits 'data packets' to the H-GAC Data Manager on a monthly basis. Data are reformatted by H-GAC as needed and combined with additional field and lab data during SAS processing and reviewed with the final datasets. For FY 2022-2023, Eastex will submit data in electronic format only. Formal lab reports (hard copy) will be available upon request. Eastex Lab reports include the following information.

1) The title "Test Report" or other identifying statement – Formal Report only
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 – Formal Report only
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 (Data Review Checklist)
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) – Formal Report only
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) Identification of whether data are calculated on a dry weight or wet weight basis – Formal report only
12) Identification of the reporting units such as µg/l or mg/kg
13) Clear identification of all test data provided by outside sources, such as subcontracted laboratories, clients, etc.
14) Clear identification of numerical results with values below the Reporting Limit, and
15) Identification of accreditation status per analysis – Formal Report only

The information in test reports from other partners (HCPCS, 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 from all labs (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, 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 one of two 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
HCPCS	MS Excel
HHD	MS Access
DWO	MS Excel
SJRA	MS Excel
EIH	MS Excel
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, which can be found at https://www.tceq.texas.gov/waterquality/data-management/dmrg_index.html. A completed Data Summary (see Appendix G) 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), and shall be incorporated into the 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 HGAC 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[2]	28 days
Chloride	water	Plastic	Cool to <6°C but not frozen	100 mL[2]	28 days
E. coli IDEXX Colilert	water	Sterile Plastic w/ sodium thiosulfate	Cool to <6°C but not frozen	120 mL[4]	8 hours[1]
TKN	water	Plastic	Cool to <6°C but not frozen H_2SO_4 to pH <2	500 mL[3]	28 days
Ammonia-N	water	Plastic	Cool to <6°C but not frozen H_2SO_4 to pH <2	125 mL[3]	28 days
Nitrite + nitrate-N	water	Plastic	Cool to <6°C but not frozen, H_2SO_4 to pH <2	125 mL[3 and 5]	28 days
Nitrate-N	water	Plastic	Cool to <6°C but not frozen	100 mL[2 and 5]	48 hours
Nitrite-N	water	Plastic	Cool to <6°C but not frozen	100 mL[2 and 5]	48 hours
Phosphorus-P, total	water	Plastic	Cool to <6°C but not frozen Acidified at lab	125 mL[6]	28 days

1. *E.coli* samples 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. Three 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.
6. Total phosphorus sample taken out of TSS 1-liter and preserved at the lab with Nitric Acid (HNO_3) in separate bottle.

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_2SO_4 to pH <2	50 mL[2]	28 days
TKN	water	Plastic	Cool to <6°C but not frozen H_2SO_4 to pH <2	500 mL	28 days[1]
Nitrite + nitrate-N	water	Plastic	Cool to <6°C but not frozen, H_2SO_4 to pH <2	50 mL[2]	28 days
Phosphorus-P, total	water	Plastic	Cool to <6°C but not frozen H_2SO_4 to pH <2	50 mL[2]	28 days
Chlorophyll-*a*[1]	water	Brown plastic	Dark & iced before filtration; Dark & frozen after filtration	4 L	Filtered w/in 48 hours; after filtered, then frozen up to 24 days[1]

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	1000 mL[3]	7 days
Sulfate	water	Plastic	Cool to <6°C but not frozen	100 mL[3]	28 days
Chloride	water	Plastic	Cool to <6°C but not frozen	100 mL[3]	28 days
E. coli IDEXX Colilert-18	water	Sterile Plastic w/ sodium thiosulfate	Cool to <6°C but not frozen	120 mL/250 mL	8 hours[1]
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_2SO_4 to pH <2	500 mL	28 days[2]
Ammonia-N	water	Plastic	Cool to <6°C but not frozen H_2SO_4 to pH <2	100 mL[4]	28 days
Nitrate-N	water	Plastic	Cool to <6°C but not frozen	100 mL[3]	48 hours
Nitrite-N	Water	Plastic	Cool to <6°C but not frozen	100 mL[3]	48 hours
Phosphorus-P, total	water	Plastic	Cool to <6°C but not frozen H_2SO_4 to pH <2	100 mL[4]	28 days

1. E. coli samples analyzed by IDEXX Colilert method 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-gallon 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	1000 mL	7 days
Sulfate	water	Plastic	Cool to <6°C but not frozen	50 mL[3]	28 days
Chloride	water	Plastic	Cool to <6°C but not frozen	50 mL[3]	28 days
E. coli IDEXX Colilert	water	Sterile Plastic w/ sodium thiosulfate	Cool to <6°C but not frozen	120 mL[4]	8 hours[1]
TKN	water	Plastic	Cool to <6°C but not frozen H_2SO_4 to pH <2	500 mL	28 days[2]
Ammonia-N	water	Plastic	Cool to <6°C but not frozen H_2SO_4 to pH <2	500 mL	28 days
Nitrite-N	Water	Plastic	Cool to <6°C but not frozen	50 mL[3]	48 hours
Nitrate-N	water	Plastic	Cool to <6°C but not frozen	50 mL[3]	48 hours
Phosphorus-P, total	water	Brown, glass bottle	Cool to <6°C but not frozen H_2SO_4 to pH <2	125 mL	28 days
Chlorophyll-*a*	water	Brown plastic	Dark & iced before filtration; Dark & frozen after filtration	4 L	Filtered w/in 48 hours; after filtered, then frozen up to 24 days[2]
Alkalinity, Total	water	Plastic	Cool to <6°C but not frozen	50 mL[3]	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
Alkalinity, Total	water	Plastic	Cool to <6°C but not frozen	50 mL[3]	14 days
TSS	water	Plastic	Cool to <6°C but not frozen	1000 mL	7 days
Sulfate	water	Plastic	Cool to <6°C but not frozen	50 mL[3]	28 days
Chloride	water	Plastic	Cool to <6°C but not frozen	50 mL[3]	28 days
E. coli IDEXX Colilert	water	Sterile Plastic w/ sodium thiosulfate	Cool to <6°C but not frozen	120 mL[4]	8 hours[1]
TKN[2]	water	Plastic	Cool to <6°C but not frozen H_2SO_4 to pH <2	500 mL	28 days[2]
Ammonia-N	water	Plastic	Cool to <6°C but not frozen H_2SO_4 to pH <2	500 mL	28 days
Nitrite-N	water	Plastic	Cool to <6°C but not frozen	50 mL[3]	48 hours
Nitrate-N	water	Plastic	Cool to <6°C but not frozen	50 mL[3]	48 hours
Phosphorus-P, total	water	Brown, glass bottle	Cool to <6°C but not frozen H_2SO_4 to pH <2	125 mL	28 days

Chlorophyll-*a*[2]	water	Brown plastic	Dark & iced before filtration; Dark & frozen after filtration	4 L	Filtered w/in 48 hours; after filtered, then frozen up to 24 days[2]

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[3]	28 days
Chloride	water	Plastic	Cool to <6°C but not frozen	100 mL[3]	28 days
E. coli IDEXX Colilert	water	Sterile Plastic w/ sodium thiosulfate	Cool to <6°C but not frozen	120 mL[4]	8 hours[1]
Ammonia-N	water	Plastic	Cool to <6°C but not frozen Add H_2SO_4 to pH <2	125 mL[2]	28 days
TKN	water	Plastic	Cool to <6°C but not frozen Add H_2SO_4 to pH <2	500 mL	28 days
Nitrite-N	water	Plastic	Cool to <6°C but not frozen	100 mL[3 and 5]	48 hours
Nitrate-N	water	Plastic	Cool to <6°C but not frozen,	100 mL[3 and 5]	48 hours
Nitrite+Nitrate -N	water	Plastic	Cool to <6°C but not frozen Add H_2SO_4 to pH <2	125 mL[2 and 5]	28 days
Phosphorus-P, total	water	Plastic	Cool to <6°C but not frozen Acidified at lab[6]	125 mL[2 and 6]	28 days
Chlorophyll-*a*	water	Brown plastic	Dark & iced before filtration; Dark & frozen after filtration	4 L	Filtered w/in 48 hours; after filtered, then frozen up to 24 days[2]

1. E. coli samples 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 four parameters.
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) first but will analyze Nitrite+Nitrate (125 mL sample) by cadmium reduction method if IC equipment is down.
6. T. phosphorus sample taken out of TSS 1-liter and preserved at the lab with Nitric Acid (HNO3) in separate bottle.

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[3]	28 days
Chloride	water	Plastic	Cool to <6°C but not frozen	100 mL[3]	28 days
E. coli IDEXX Colilert	water	Sterile Plastic w/ sodium thiosulfate	Cool to <6°C but not frozen	120 mL[4]	8 hours[1]
Enterococci IDEXX Enterolert	water	Sterile Plastic w/ sodium thiosulfate	Cool to <6°C but not frozen	120 mL[4]	8 hours
TKN	water	Plastic	Cool to <6°C but not frozen H_2SO_4 to pH <2	500 mL[2]	28 days
Ammonia-N	water	Plastic	Cool to <6°C but not frozen H_2SO_4 to pH <2	125 mL[2]	28 days
Nitrite-N	water	Plastic	Cool to <6°C but not frozen	100 mL[2 and 5]	48 hours
Nitrate-N	water	Plastic	Cool to <6°C but not frozen	100 mL[2 and 5]	48 hours
Nitrite + nitrate-N	water	Plastic	Cool to <6°C but not frozen, H_2SO_4 to pH <2	125 mL[3 and 5]	28 days
Phosphorus-P, total	water	Plastic	Cool to <6°C but not frozen Acidified at lab[6]	125 mL[2]	28 days
Chlorophyll-*a*	water	Brown plastic	Dark & iced before filtration; Dark & frozen after filtration	4 L	Filtered w/in 48 hours; after filtered, then frozen up to 24 days

1. *E. coli* samples 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 bacteria analysis is 50 ml allowing duplicate analyses from 1 container.
5. 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.
6. T. Phosphorus sample taken out of TSS 1-liter and preserved at the lab with Nitric Acid (HNO_3) in separate bottle.

Table B2.1h Sample Storage, Preservation, and Handling Requirements for TRIES. Samples Analyzed by the TRIES Laboratory or 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[2]	28 days
Chloride	water	Plastic	Cool to <6°C but not frozen	100 mL[2]	28 days
E. coli IDEXX Colilert	water	Sterile Plastic w/ sodium thiosulfate	Cool to <6°C but not frozen	120[4] mL	8 hours[1]
Ammonia-N	water	Plastic	Cool to <6°C but not frozen H_2SO_4 to pH <2	125 mL[3]	28 days

Nitrate-N	water	Plastic	Cool to <6°C but not frozen	125 mL[3 and 6]	48 hours
Nitrite-N	water	Plastic	Cool to <6°C but not frozen	125 mL[3 and 6]	48 hours
Nitrite + nitrate-N	water	Plastic	Cool to <6°C but not frozen, H_2SO_4 to pH <2	125 mL[3 and 6]	28 days[5]
Phosphorus-P, total	water	Plastic	Cool to <6°C but not frozen HNO_3 to pH <2	125 mL[2 and 7]	28 days

1. *E.coli* samples analyzed by IDEXX Colilert method 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 three 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) if necessary.
6. TRIES & Eastex can both run IC speciation but Eastex will analyze Nitrite+Nitrate by cadmium reduction method if TRIES IC equipment is down
7. T. Phosphorus sample taken out of 1-liter cubitainer collected for sulfate and chlorides and preserved at the lab with Nitric Acid (HNO3) in separate bottle.

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.

- 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 Environmental Lab.
- Pre-cleaned, plastic, disposable sample containers for the TKN samples are also provided by H-GAC's contract lab, Eastex Environmental Lab.
- 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 white or opaque, plastic pitcher and water sample are collected from the required depth as specified in the SWQM Procedures Volume 1 manual.

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 HHD-BLS Lab where all QC checks and documentation are performed. The HHD-BLS 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).

- Sterile, sealed, 120 mL plastic, disposable bottles with sodium thiosulfate added, are used for bacteriological samples.
- Plastic, re-useable sample containers are used for most conventional parameters.
- Brown 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 a particular parameter, the containers are pre-acidified by the lab before being given to field personnel.
- 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 and are provided by H-GAC's contract lab, Eastex.
- 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, reusable 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.

TRIES container washing procedures (excluding bacteria bottles): The bottles are sent through a mechanical wash cycle. 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, and then a deionized water (DI) rinse cycle. Next, the bottles are allowed to air dry. Afterwards, the bottles are sealed prior to storage for their next use.

Processes to Prevent Contamination

SWQM Procedures outline the necessary steps to prevent contamination of samples, including: direct collection into sample containers, Several local partners collect samples from a bridge and must use the bucket method. All those partners practice the triple rinse procedure to eliminate or at least minimize the chance of carry-over from one site to the next.

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. The following will be recorded for all visits:

- Station ID
- Sampling Date
- Location
- Sampling Depth
- Sampling Time
- Sample Collector's name
- 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
- Make changes 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 the H-GAC Project Manager, in consultation with the 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

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) and available to H–GAC upon request. 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.

Monitoring Entity	Reference to Sample Handling
Houston-Galveston Area Council	H-GAC's Standard Operating Procedures (SOP) Manual for Conducting Surface Water Quality Monitoring references the most current *TCEQ Surface Water Quality Monitoring Procedures Volume 1 & 2* plus specific SOP's 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 – *Procedures for Sample Custody, Login and Tracking Using Sample Master LIMS*. Most current version.
City of Houston, Health Department	HHD-BLS Environmental Laboratory 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	SJRA's Sample Custody Standard Operating Procedure, October 2007. Eastex Environmental Laboratory QM, most current version, covers samples relinquished to the lab.

Monitoring Entity	Reference to Sample Handling
Environmental Institute of Houston	EIH's Standard Operating Procedures (SOP) Manual for Conducting Surface Water Quality Monitoring references the most current *TCEQ Surface Water Quality Monitoring Procedures Volume 1 & 2* plus additional/specific SOP's pertaining to EIH's monitoring activities only. Eastex Environmental Laboratory QM, most current version, covers samples relinquished to the lab.
Texas Research Institute for Environmental Studies	TRIES's Standard Operating Procedures (SOP) Manual for Conducting Surface Water Quality Monitoring references the most current *TCEQ Surface Water Quality Monitoring Procedures Volume 1* plus specific SOP's 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 the 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. The H-GAC Project Manager in consultation with the 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 the Lead Organization QAO and submitted to TCEQ CRP Project Manager along with project progress report.

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

B4 Analytical Methods

The analytical methods, associated matrices, and performing laboratories are listed in Appendix A. The authority for analysis methodologies under 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 shall be made available for review by the TCEQ.

Standards Traceability

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

Analytical Method Deficiencies and Corrective Actions

Deficiencies in field and laboratory measurement systems involve, but are not limited to such things as instrument malfunctions, failures in calibration, blank contamination, quality control samples outside QAPP-defined limits, etc. In many cases, the field technician or lab analyst will be able to correct the problem. If the problem is resolvable by the field technician or lab analyst, then they will document the problem on the field data sheet or laboratory record and complete the analysis. If the problem is not resolvable, then it is conveyed to the applicable Laboratory Supervisor, who will make the determination and notify the H-GAC QAO if the problem compromises sample results. If the analytical system failure may compromise the sample results, the resulting data will not be reported to the TCEQ. The nature and disposition of the problem is reported on the data report which is sent to the H-GAC Project Manager. The H-GAC Project Manager will include this information in a 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 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 should not be reported to the TCEQ. Additionally, any data collected or analyzed by means other than those stated in the QAPP, or data suspect for any reason should not be submitted for loading and storage in SWQMIS. However, when data is lost, its absence will be described in the data summary report submitted with the corresponding data set, and a CAP (as described in section C1) may be necessary.

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.

Laboratory Measurement Quality Control Requirements and Acceptability Criteria

Batch

A batch is defined as environmental samples that are prepared and/or analyzed together with the same process and personnel, using the same lot(s) of reagents. A preparation batch is composed of one to 20 environmental samples of the same NELAP-defined matrix, meeting the above-mentioned criteria and with a maximum time between the start of processing of the first and last sample in the batch to be 24 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 (e.g., sample duplicates, surrogates, internal standards, continuing calibration samples, interference check samples, positive control, negative control, and media blank), are run 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, the analyst will compare counts with another 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. The analyst(s) will record the results.

Limit of Quantitation (LOQ)

The laboratory will analyze a calibration standard (if applicable) at the LOQ published in Appendix A of this QAPP 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 of this QAPP, 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 of this QAPP, 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 and is performed 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 of this QAPP.

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 multipeak responses.

The LCS is carried through the complete preparation and analytical process and is performed 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.

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 achieved by preparing 2 separate 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 results as defined by 100 times the difference (range) of each duplicate set, divided by the average value (mean) of the set. For duplicate results, X_1 and X_2, the RPD is calculated from the following equation:

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

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.

For bacteriological parameters, precision is evaluated using the results from laboratory duplicates. Bacteriological duplicates are analyzed at 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.

The precision criterion in Appendix A 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, the 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 BLS 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 Charts are monitored 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 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 the batch shall be defined as environmental samples that are analyzed together with the same method and personnel, using the same lots of reagents, not to exceed the analysis of 20 environmental samples.

Quality Control or Acceptability Requirements Deficiencies and Corrective Actions

Sampling QC excursions are evaluated by the H-GAC Project Manager, in consultation with the H-GAC QAO and/or H-GAC 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 the H-GAC Project Manager, QAO and Data Manager will be relied upon in evaluating results. Notations of blank contamination are noted in the data summaries that accompany data deliverables.

Laboratory measurement quality control failures are evaluated by the laboratory staff. The disposition of such failures and the nature and disposition of the failure is reported to the Laboratory QAO. The Laboratory QAO

will discuss the failure with the H-GAC QAO and/or Data Manager. If applicable, the H-GAC QAO will include this information in a 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.

Additionally, in accordance with CRP requirements and the TNI Standard (Volume 1, Module 2, Section 4.5, Subcontracting of Environmental Tests) when a laboratory that is a signatory of this QAPP finds it necessary and/or advantageous to subcontract analyses, the laboratory that is the signatory on this QAPP must ensure that the subcontracting laboratory is NELAP-accredited (when required) and understands and follows the QA/QC requirements included in this QAPP. This includes that the subcontracting laboratory utilize the same reporting limits as the signatory laboratory and performs all required quality control analysis outlined in this QAPP. The signatory laboratory is also responsible for quality assurance of the data prior to delivering it to the H-GAC, including review of all applicable QC samples related to CRP data. As stated in section 4.5.5 of the 2016 TNI Standard, the laboratory performing the subcontracted work shall be indicated in the final report and the signatory laboratory shall make a copy of the subcontractor's report available to the client (H-GAC) when requested.

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 check error limits and the disposition resulting from errors are adhered to. Data collected from field instruments that do not meet the post-calibration check 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

There is a reference in each of the laboratory QMs or QMP for accepting all field supplies and consumables being approved using the same procedures as laboratory-related supplies and consumables. All the labs check multiple containers from each case or 'Lot' of bottles received to confirm all containers are properly cleaned before releasing them to the field staff for use in collecting samples. In short, each tested container is filled with deionized water (DI), shaken to disperse any residual contamination that might be present within the bottle, then, that same DI water is tested as blanks for each parameter to confirm no contamination is present. All the labs also track each of the cases/Lots to ensure only containers confirmed to be clean are used. Refer to the laboratory QMs or QMPs for inspection/acceptance process for all 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.

Reservoir stage data are collected every day from the 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. Information about measurement methodology can be found on the TWDB website. These data will be submitted to the TCEQ under parameter code 00052 Reservoir Stage and parameter code 00053 Reservoir Percent Full.

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.

B10 Data 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, most recent version, 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 or designee. If there are nonconformances such as failed calibration, the QAO or designee 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 using a 'field sheet form' by H-GAC staff and saved in a secured network drive in a 'raw data' folder as well. A second H-GAC employee reviews the input data for accuracy and completeness. No changes are made to that 'raw' data files once this recheck is finished and the files are saved. Next, the reviewed 'raw' data is saved into the 'working' data folder for additional processing. Both folders are backed by H-GAC Data Services on a regular basis. The new 'working' data is also converted into EXCEL format to await receiving lab data for merging. Sample analysis is performed by Eastex Environmental Laboratory and submitted to H-GAC in EXCEL format. The data is saved in a 'raw data' folder first, then merged with corresponding dates of field sampling runs and saved in the 'working data' folder. Datasonde data are also copied into the appropriate combined EXCEL file.

The new 'working' data EXCEL worksheet is loaded into statistical analysis software (SAS) where H-GAC's Data Manager rechecks the new data file for accuracy, completeness, formatting, outliers, corrections, verification, and validation. Once completed, data is saved in an ACCESS data base again where H-GAC's QAO or designee reviews the data manually for completeness, formatting, outliers, verification, and validation a second time.

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 Appendix H for H-GAC's Data Management Process for greater details.

- Harris County Pollution Control Services (HCPCS) submits EXCEL spreadsheets to H-GAC containing laboratory and field data. The data are exported from the department database and spreadsheets are reviewed by the QAO and/or CRP Data Manager (or designee) 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/CRP Data Manager and reviewed and approved by the Lab Manager (or designee), and CRP Field QAO or a representative of the field collection team.

- The City of Houston HHD field personnel and CRP Data Manager enter field and laboratory data into an ACCESS database from field sheets, COCs, and lab reports received from the Lab QAO. Print-outs of any data from field equipment memory are printed out to be saved with field forms by CRP Data Manager at the Park Avenue office where field staff are housed. The data manager or designee 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 HHD-BLS Lab QAO for additional review before being sent back to the HHD CRP Data Manager and submitted to H-GAC via Sharefile. The laboratory 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 samples, the chain of custody and field form to the sample receiver in the lab. The Sample Administrator enters some of the field data provided by sample collectors on COCs into the BTLIMS. Samples are analyzed by various chemists according to the required method and results are entered by the chemists performing each analysis, then reviewed by another chemist and the Data Manager for accuracy, validity & QA/QC requirement, and, finally, validated in BTLIMS by Lab QAO. The laboratory manager also checks the accuracy of these data entry into BTLIMS. These tables are exported from the BTLIMS. The checklist for lab data accuracy, completeness, reasonableness and outliers is created and reviewed by the lab QAO. The lab submits EXCEL spreadsheets to H-GAC containing laboratory data only. Documented non-conformances from QAPP, SOP, and DWO 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.

The CRP Field Supervisor and CRP Data Manager or designee inputs field data into an EXCEL worksheet. The data is reviewed for accuracy and completeness by a different person. A Data Review Checklist is generated for each data packet. The CRP Field supervisor completes a Data Review Checklist sections for that field 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 samples are submitted to the City of Houston DWO Lab for analysis (see previous paragraph for lab data handling) and the Woodlands samples are sent to Eastex Laboratory. 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 and The Woodlands samples. Eastex Lab sends electronic lab data results to SJRA and H-GAC at the same time for the H-GAC data manager to merge with field data.

- The EIH field staff enter field data collected by their program into an EXCEL spreadsheet and a second staff member reviews the entered data for accuracy and completeness. All supporting QA data is input to spreadsheets as well. The EIH CRP QAO and the EIH CRP Data Manager review 50-100% 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 and 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. Any supporting QA data is input to a separate spreadsheet. The TRIES field QAO, TRIES Lab QAO and the TRIES CRP Data 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 scanned hard copies of the field sheets and COCs to H-GAC. If necessary, analytes analyzed by Eastex Laboratory are submitted directly to H-GAC for processing.

- Eastex Environmental Lab (Eastex) analyses water quality samples for H-GAC, EIH, SJRA-Lake Woodlands, and sometimes TRIES. Eastex also analyses all TKN and chlorophyll samples for all local partners. Eastex is contacted to pick up samples and conducts the analysis. Then, final results and associated QA information is e-mailed to H-GAC where all TKN and chlorophyll data is merged with appropriate samples and dates.

Data Dictionary

Terminology and field descriptions are included in the DMRG, 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 – Sam Houston State University	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.

- H-GAC water samples are sent to Eastex Lab for analysis. (See Eastex lab details below.) 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 after SAS processing. A Data Summary Sheet is prepared by the Data Manager after SAS processing for review by H-GAC's QAO and for submission to TCEQ with the text files.

- 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 CRP Field QAO who applies the same review, correction of errors, and prevention of loss of data as the lab QAO and CRP Data Manager. A Data Review Checklist is completed for each set of data submitted to H-GAC.

- City of Houston HHD Details of the HHD-BLS Lab 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 or designee reviews the data for transcription accuracy and reasonableness. A Data Review Checklist is completed for each set of data submitted to H-GAC.

- San Jacinto River Authority Lake Conroe water samples are sent to DWO lab where all analyses are completed and results managed (See City of Houston DWO above). A copy of the field data sheet is sent to the lab. DWO Lab CRP Data Manager and Lab QAO perform all data management for Lake Conroe lab data. SJRA inputs field data to an EXCEL spreadsheet and submits spreadsheet to H-GAC Data Manager along with scanned copies of field sheets and COCs. Profile data from the Hydrolab Surveyor is downloaded to SJRA's data folders and saved in a raw data file and a working data file. The working data files are reviewed and reformatted as needed, then sent to H-GAC. A Data Review Checklist is completed by SJRA for field data while DWO provides the Data Review Checklist for the lab data.

  The Woodlands samples are sent to Eastex Lab for analysis. (See Eastex Lab details below.) The Woodlands lab data results are managed by Eastex and sent to H-GAC directly by Eastex along with a Data Review Checklist for the same data. Information from the field data sheets are input to EXCEL spreadsheets by the SJRA Data Manager who also checks the data for outliers and reasonableness. The CRP QAO or a second employee reviews the data for transcription accuracy and completeness. A Data Review Checklist is completed for each set of field data submitted to H-GAC along with scanned copies of field sheets and COCs. SJRA performs data management for only The Woodlands field data because Eastex manages all the lab data.

  When all data is received from SJRA, DWO Lab, and Eastex Lab, 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 and The Woodlands.

- 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.

- 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 or designee who also checks the data for outlier s 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.

- 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 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.

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 scanned 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 "raw data" 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 indefinitely by H-GAC and for at least seven (7) years by 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-BLS 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 field office.

- 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 from both Lake Conroe and The Woodlands sample sites in the Program Manager's Lake Conroe office. Electronic data (raw and working files) will be stored on a shared computer server at the same location in EXCEL or ACCESS format.

- 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.

- 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.

- 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 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 (most recent revision), and applicable H-GAC information resource management policies. See Appendix I for H-GAC's Community &Environmental 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 policy regarding the collection and management of positional data. 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.

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 CRP	TCEQ	Field sampling, handling and measurement; facility review; and data management as they relate to CRP	30 days to provide corrective actions response to the TCEQ
Monitoring Systems Audit of Program Subparticipants	Dates to be determined by H-GAC (at least once per biennium)	H-GAC	Field sampling, handling and measurement; facility review; and data management as they relate to CRP	30 days to respond in writing to the H-GAC. PM or QAO 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 provide corrective actions response to the TCEQ

Corrective Action Process for Deficiencies

Deficiencies are any deviation from the QAPP, SWQM Procedures, or other applicable guidance. 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 the 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 the H-GAC Project Manager, in consultation with the H-GAC QAO and Data Manager, 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 or QAO both verbally and in writing in quarterly progress reports and by completion of a CAP.

Corrective Action

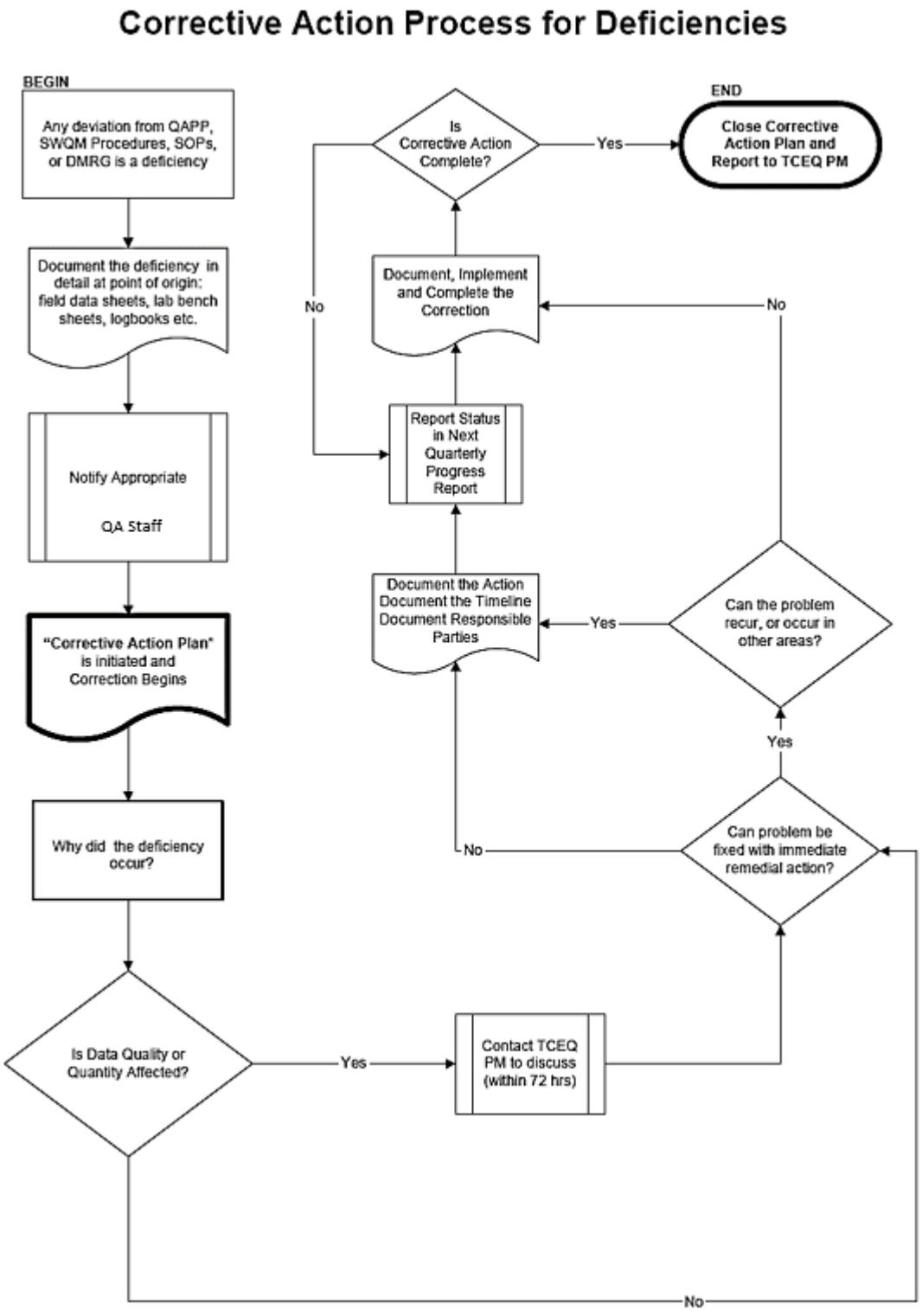
CAPs should:

- 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
- Assist in determining the need for corrective action
- Employ 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

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

Figure C1.1 Corrective Action Process for Deficiencies



The 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.

The H-GAC QAO or designee is responsible for ensuring that corrective actions have been implemented and tracks deficiencies and corrective actions. Records of audit findings and corrective actions are maintained by the H-GAC QAO. Audit reports and associated corrective action documentation will be submitted to the TCEQ with the quarterly progress reports.

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
Non-Conformance & Corrective Action Report	As Needed	With quarterly reports to TCEQ or sooner depending on severity	Subparticipant Field &Laboratory Staff; H-GAC Staff & QAO	H-GAC QA Staff; TCEQ PM
CRP Quarterly Progress Reports	Quarterly	December 15, 2021 March 15, 2022 June 15, 2022 September 15, 2022 December 15, 2022 March 15, 2023 June 15, 2023 August 31, 2023	H-GAC Project Manager or Designee	TCEQ CRP Project Management
Monitoring Systems Audit Report and Response	Once per biennium	Copies of Monitoring System Audit reports to be included with quarterly report to TCEQ	H-GAC QAO	TCEQ CRP Project Management
Data Review checklists	With data delivery	As needed	Local Partner & sub-contractors	H-GAC Data Manager
Data Summary	With data delivery	As Needed	H-GAC Data Manager	TCEQ CRP Project Management

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, HHD, EIH, & TRIES, who receive CRP funds to support data collection activities are also required to submit written documentation along with every invoice summarizing their monitoring activities. H-GAC schedules bi-weekly meetings to update the H-GAC's CRP PM and team members regarding status of deliverables and tasks.

During review and evaluation of submitted data, H-GAC's Data Manager and/or H-GAC's QAO will investigate suspected problems with the data. The QAO for each participating local agency is informed either informally (phone call) or by e-mail memoranda of any quality assurance problems encountered. With the local agency's help the issue will be investigated further and a resolution adopted. The resolution for each issue will be documented on the Data Summary Sheet that accompanies each dataset submitted to TCEQ. When H-GAC's Data Manager submits data to TCEQ, a summary of this information will be transmitted by H-GAC's Data Manager or QAO to H-GAC's Project Manager.

Information regarding the monitoring activities of funded subparticipants will then be reported to the TCEQ Project Manager by means of quarterly progress reports required under the Clean Rivers Program. The results of field and/or laboratory bi-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 the 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 the 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

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

D1 Data Review, Verification, and Validation

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 of this QAPP. 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 TCEQ Project Manager. Likewise, the Laboratory Managers of HCPCS, HHD, DWO, and Eastex laboratories are responsible for ensuring that laboratory data are reviewed, verified, and submitted in the required format to H-GAC CRP Data Manager. Finally, H-GAC CRP QAO and/or Data Manager are 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.

Data review, verification, and validation will be performed using self-assessments as well as peer and management review as appropriate to the project task. The data review tasks to be performed by field and laboratory staff are listed in the first two columns of Table D2.1, respectively. Potential errors are identified by examination of documentation and by manual examination of corollary or unreasonable data; this analysis may be 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 the 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, the 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 the H-GAC Data Manager with the data in the Data Summary (See Appendix G). All failed QC checks, missing samples, missing analytes, missing parameters, and suspect results should be discussed in the Data Summary.

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

H-GAC Data to be Verified	Field Tasks	Laboratory Tasks (Eastex Lab)	Lead Org. QAO or Data Manager Tasks
Sample documentation complete; samples labeled, sites identified	H-GAC Field Staff &/or QAO	Sample Custodian	
Field instrument pre- and post-calibration results within limits	H-GAC Field Staff &/or QAO		
Field QC samples collected for all analytes as prescribed in the TCEQ *SWQM Procedures Manual*	H-GAC QAO		
Field documentation (e.g., biological, stream habitat) complete	H-GAC Field Staff &/or QAO		
Standards and reagents traceable	H-GAC Field Staff	Lab QAO	
Chain of custody complete/acceptable	H-GAC Field Staff &/or QAO	Sample Custodian	H-GAC Data Mgr &/or QAO
NELAP Accreditation is current		Lab QAO	H-GAC Data Mgr
Sample preservation and handling acceptable	H-GAC Field Staff	Sample Custodian	H-GAC Data Mgr
Holding times not exceeded		Lab QAO	H-GAC Data Mgr
Collection, preparation, and analysis consistent with SOPs and QAPP	H-GAC Field Staff &/or QAO	Lab QAO	H-GAC QAO
Instrument calibration data complete	H-GAC Field Staff &/or QAO	Lab QAO	
Bacteriological records complete		Lab QAO	H-GAC Data Mgr
QC samples analyzed at required frequency		Lab QAO	H-GAC Data Mgr
QC results meet performance and program specifications		Lab QAO	H-GAC Data Mgr
Analytical sensitivity (Limits of Quantitation/Ambient Water Reporting Limits) consistent with QAPP		Lab QAO	H-GAC Data Mgr
Results, calculations, transcriptions checked	H-GAC Field Staff &/or 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
Codes for submitting & 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 Field Staff, Data Mgr &/or QAO	Technical Director	H-GAC Data Mgr
Absence of electronic errors confirmed	H-GAC Field Staff, Data Mgr &/or 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 Field Staff, Data Mgr &/or QAO		H-GAC Data Mgr
Field QC results attached to data review checklist	H-GAC Data Mgr		H-GAC Data Mgr
10% of data manually reviewed	H-GAC Data Mgr or H-GAC QAO	Technical Director	H-GAC QAO

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

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

Appendix A: Measurement Performance Specifications (Table A7.1-X)

Measurement performance specifications define the data quality needed to satisfy project objectives. To this end, measurement performance specifications are qualitative and quantitative statements that:

- clarify the intended use of the data
- define the type of data needed to support the end use
- identify the conditions under which the data should be collected

Appendix A of the QAPP addresses measurement performance specifications, including:

- analytical methodologies
- AWRLs
- limits of quantitation
- bias limits for LCSs
- precision limits for LCSDs
- completeness goals
- qualitative statements regarding representativeness and comparability

Tables in Appendix A have been modified to reflect actual parameters, methods, etc. employed by the H-GAC and its participants. Procedures for laboratory analysis must be in accordance with the most recently published edition of Standard Methods for the Examination of Water and Wastewater, 40 CFR 136, or otherwise approved independently. Only data collected that have a valid TCEQ parameter code assigned in Tables A7 are stored in SWQMIS. Any parameters listed in Tables A7 that do not have a valid TCEQ parameter code assigned will not be stored in SWQMIS.

Table A7.1 - Measurement Performance Specifications

TABLE A7.1a Measurement Performance Specifications for Houston-Galveston Area Council (H-GAC)

Field Parameters

Parameter	Units	Matrix	Method	Parameter Code	Lab
TEMPERATURE, WATER (DEGREES CENTIGRADE)	DEG C	water	SM 2550 B and TCEQ SOP V1	00010	Field
TRANSPARENCY, SECCHI DISC (METERS)	meters	water	TCEQ SOP V1	00078	Field
SPECIFIC CONDUCTANCE,FIELD (US/CM @ 25C)	us/cm	water	EPA 120.1 and TCEQ SOP, V1	00094	Field
OXYGEN, DISSOLVED (MG/L)	mg/L	water	SM 4500-O G and TCEQ SOP V1	00300	Field
PH (STANDARD UNITS)	s.u	water	EPA 150.1 and TCEQ SOP V1	00400	Field
DAYS SINCE PRECIPITATION EVENT (DAYS)	days	other	TCEQ SOP V1	72053	Field
DEPTH OF BOTTOM OF WATER BODY AT SAMPLE SITE	meters	water	TCEQ SOP V2	82903	Field
MAXIMUM POOL WIDTH AT TIME OF STUDY (METERS)**	meters	other	TCEQ SOP V2	89864	Field
MAXIMUM POOL DEPTH AT TIME OF STUDY(METERS)**	meters	other	TCEQ SOP V2	89865	Field
POOL LENGTH, METERS**	meters	other	TCEQ SOP V2	89869	Field
% POOL COVERAGE IN 500 METER REACH**	%	other	TCEQ SOP V2	89870	Field
WIND INTENSITY (1=CALM,2=SLIGHT,3=MOD.,4=STRONG)	NU	other	NA	89965	Field
PRESENT WEATHER (1=CLEAR,2=PTCLDY,3=CLDY,4=RAIN,5=OTHER)	NU	other	NA	89966	Field
WATER SURFACE(1=CALM,2=RIPPLE,3=WAVE,4=WHITECAP)	NU	water	NA	89968	Field
WATER ODOR (1=SEWAGE, 2=OILY/CHEMICAL, 3=ROTTEN EGGS, 4=MUSKY, 5=FISHY, 6=NONE, 7=OTHER (WRITE IN COMMENTS))	NU	water	NA	89971	Field
WATER COLOR 1=BRWN 2=RED 3=GRN 4=BLCK 5=CLR 6=OT	NU	water	NA	89969	Field
WATER CLARITY (1=EXCELLENT, 2=GOOD, 3=FAIR, 4=POOR)	NU	water	NA	20424	Field
TURBIDITY, OBSERVED (1=LOW, 2=MEDIUM, 3=HIGH)	NU	water	NA	88842	Field

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

** To be routinely reported when collecting data from perennial pools.

References:

United States Environmental Protection Agency (USEPA) Methods for Chemical Analysis of Water and Wastes, Manual #EPA-600/4-79-020

U.S. Code of Federal Regulations (CFR). Title 40: Protection of Environment, Part 136

American Public Health Association (APHA), American Water Works Association (AWWA), and Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 23rd Edition, 2017.

TCEQ SOP, V1 - TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods, 2012 (RG-415).

TCEQ SOP, V2 - TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, 2014 (RG-416).

TABLE A7.1b Measurement Performance Specifications for Houston-Galveston Area Council (H-GAC)					
Flow Parameters					
Parameter	**Units**	**Matrix**	**Method**	**Parameter Code**	**Lab**
FLOW STREAM, INSTANTANEOUS (CUBIC FEET PER SEC)	cfs	water	TCEQ SOP V1	00061	Field
FLOW SEVERITY:1=No Flow,2=Low,3=Normal,4=Flood,5=High,6=Dry	NU	water	TCEQ SOP V1	01351	Field
STREAM FLOW ESTIMATE (CFS)	cfs	water	TCEQ SOP V1	74069	Field
FLOW MTH 1=GAGE 2=ELEC 3=MECH 4=WEIR/FLU 5=DOPPLER	NU	other	TCEQ SOP V1	89835	Field

References:

United States Environmental Protection Agency (USEPA) Methods for Chemical Analysis of Water and Wastes, Manual #EPA-600/4-79-020

U.S. Code of Federal Regulations (CFR). Title 40: Protection of Environment, Part 136

American Public Health Association (APHA), American Water Works Association (AWWA), and Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 23rd Edition, 2017.

TCEQ SOP, V1 - TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods, 2012 (RG-415).

TCEQ SOP, V2 - TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, 2014 (RG-416).

TABLE A7.1c Measurement Performance Specifications for Houston-Galveston Area Council (H-GAC)										
Conventional Parameters in Water										
Parameter	Units	Matrix	Method	Parameter Code	TCEQ AWRL	LOQ	LOQ Check Sample %Rec	Precision (RPD)	Bias %Rec. of LCS	Lab
RESIDUE, TOTAL NONFILTRABLE (MG/L)	mg/L	water	SM 2540D	00530	5	1	NA	NA	NA	Eastex
NITROGEN, AMMONIA, TOTAL (MG/L AS N)	mg/L	water	SM 4500 NH3 G	00610	0.1	0.1	70-130	20	80-120	Eastex
NITRITE NITROGEN, TOTAL (MG/L AS N)	mg/L	water	EPA 300.0 Rev. 2.1 (1993)	00615	0.05	0.05	70-130	20	80-120	Eastex
NITRATE NITROGEN, TOTAL (MG/L AS N)	mg/L	water	EPA 300.0 Rev. 2.1 (1993)	00620	0.05	0.05	70-130	20	80-120	Eastex
NITROGEN, KJELDAHL, TOTAL (MG/L AS N)	mg/L	water	EPA 351.2	00625	0.2	0.2	70-130	20	80-120	Eastex
NITRITE PLUS NITRATE, TOTAL ONE LAB DETERMINED VALUE (MG/L AS N)	mg/L	water	SM 4500-NO3 F	00630	0.05	0.02	70-130	20	80-120	Eastex
PHOSPHORUS, TOTAL, WET METHOD (MG/L AS P)	mg/L	water	EPA 200.7	00665	0.06	0.06	70-130	20	80-120	Eastex
CHLORIDE (MG/L AS CL)	mg/L	water	EPA 300.0 Rev. 2.1 (1993)	00940	5	5	70-130	20	80-120	Eastex
SULFATE (MG/L AS SO4)	mg/L	water	EPA 300.0 Rev. 2.1 (1993)	00945	5	4	70-130	20	80-120	Eastex

References:

United States Environmental Protection Agency (USEPA) Methods for Chemical Analysis of Water and Wastes, Manual #EPA-600/4-79-020
U.S. Code of Federal Regulations (CFR). Title 40: Protection of Environment, Part 136
American Public Health Association (APHA), American Water Works Association (AWWA), and Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 23rd Edition, 2017.
TCEQ SOP, V1 - TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods, 2012 (RG-415).
TCEQ SOP, V2 - TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, 2014 (RG-416).

TABLE A7.1d Measurement Performance Specifications for Houston-Galveston Area Council (H-GAC)

Bacteriological Parameters in Water

Parameter	Units	Matrix	Method	Parameter Code	TCEQ AWRL	LOQ	LOQ Check Sample %Rec	Log Difference of Duplicates	Bias %Rec. of LCS	Lab
E. COLI, COLILERT, IDEXX METHOD, MPN/100ML	MPN/100 mL	water	IDEXX Colilert or Colilert 18**	31699	1	1	NA	0.50*	NA	Eastex
E.COLI, COLILERT, IDEXX, HOLDING TIME	hours	water	NA	31704	NA	NA	NA	NA	NA	Eastex

* This value is not expressed as a relative percent difference. It represents the maximum allowable difference between the logarithm of the result of a sample and the logarithm of the duplicate result. See Section B5.

** E.coli samples analyzed by these methods should always be processed as soon as possible and within 8 hours. When transport conditions necessitate delays in delivery longer than 6 hours, the holding time may be extended and samples must be processed as soon as possible and within 30 hours.

References:

United States Environmental Protection Agency (USEPA) Methods for Chemical Analysis of Water and Wastes, Manual #EPA-600/4-79-020

U.S. Code of Federal Regulations (CFR). Title 40: Protection of Environment, Part 136

American Public Health Association (APHA), American Water Works Association (AWWA), and Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 23rd Edition, 2017.

TCEQ SOP, V1 - TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods, 2012 (RG-415).

TCEQ SOP, V2 - TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, 2014 (RG-416).

TABLE A7.1e Measurement Performance Specifications for Houston-Galveston Area Council (H-GAC)					
24 HourParameters in Water					
Parameter	**Units**	**Matrix**	**Method**	**Parameter Code**	**Lab**
TEMPERATURE, WATER (DEGREES CENTIGRADE), 24HR AVG	DEG C	Water	TCEQ SOP V1	00209	field
WATER TEMPERATURE, DEGREES CENTIGRADE, 24HR MAX	DEG C	Water	TCEQ SOP V1	00210	field
TEMPERATURE, WATER (DEGREES CENTIGRADE) 24HR MIN	DEG C	Water	TCEQ SOP V1	00211	field
SPECIFIC CONDUCTANCE, US/CM, FIELD, 24HR AVG	uS/cm	Water	TCEQ SOP V1	00212	field
SPECIFIC CONDUCTANCE, US/CM, FIELD, 24HR MAX	uS/cm	Water	TCEQ SOP V1	00213	field
SPECIFIC CONDUCTANCE, US/CM, FIELD, 24HR MIN	uS/cm	Water	TCEQ SOP V1	00214	field
PH, S.U., 24HR MAXIMUM VALUE	std. units	Water	TCEQ SOP V1	00215	field
PH, S.U., 24HR, MINIMUM VALUE	std. units	Water	TCEQ SOP V1	00216	field
SALINITY, 24-HR, MAXIMUM, PPT	ppt	Water	TCEQ SOP V1	00217	field
SALINITY, 24-HR, AVERAGE, PPT	ppt	Water	TCEQ SOP V1	00218	field
SALINITY, 24-HR, MINIMUM, PPT	ppt	Water	TCEQ SOP V1	00219	field
SALINITY, # OF MEASUREMENTS IN 24-HRS	NU	Water	TCEQ SOP V1	00220	field
WATER TEMPERATURE, # OF MEASUREMENTS IN 24-HRS	NU	Water	TCEQ SOP V1	00221	field
SPECIFIC CONDUCTANCE, # OF MEASUREMENTS IN 24-HRS	NU	Water	TCEQ SOP V1	00222	field
pH, # OF MEASUREMENTS IN 24-HRS	NU	Water	TCEQ SOP V1	00223	field
DISSOLVED OXYGEN, 24-HOUR MIN. (MG/L) MIN. 4 MEA	mg/l	Water	TCEQ SOP V1	89855	field
DISSOLVED OXYGEN, 24-HOUR MAX. (MG/L) MIN. 4 MEA	mg/l	Water	TCEQ SOP V1	89856	field
DISSOLVED OXYGEN, 24-HOUR AVG. (MG/L) MIN. 4 MEA	mg/l	Water	TCEQ SOP V1	89857	field
DISSOLVED OXYGEN, # OF MEASUREMENTS IN 24-HRS	NU	Water	TCEQ SOP V1	89858	field

References:

United States Environmental Protection Agency (USEPA) Methods for Chemical Analysis of Water and Wastes, Manual #EPA-600/4-79-020

U.S. Code of Federal Regulations (CFR). Title 40: Protection of Environment, Part 136

American Public Health Association (APHA), American Water Works Association (AWWA), and Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 23rd Edition, 2017.

TCEQ SOP, V1 - TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods, 2012 (RG-415).

TCEQ SOP, V2 - TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, 2014 (RG-416).

TABLE A7.2a Measurement Performance Specifications for Harris County Pollution Control Services (HCPCS)					
Field Parameters					
Parameter	**Units**	**Matrix**	**Method**	**Parameter Code**	**Lab**
TEMPERATURE, WATER (DEGREES CENTIGRADE)	DEG C	water	SM 2550 B and TCEQ SOP V1	00010	Field
TRANSPARENCY, SECCHI DISC (METERS)	meters	water	TCEQ SOP V1	00078	Field
SPECIFIC CONDUCTANCE,FIELD (US/CM @ 25C)	us/cm	water	EPA 120.1 and TCEQ SOP, V1	00094	Field
OXYGEN, DISSOLVED (MG/L)	mg/L	water	SM 4500-O G and TCEQ SOP V1	00300	Field
PH (STANDARD UNITS)	s.u	water	EPA 150.1 and TCEQ SOP V1	00400	Field
SALINITY - PARTS PER THOUSAND	PPT	water	SM 2520 and TCEQ SOP V1	00480	Field
DAYS SINCE PRECIPITATION EVENT (DAYS)	days	other	TCEQ SOP V1	72053	Field
DEPTH OF BOTTOM OF WATER BODY AT SAMPLE SITE	meters	water	TCEQ SOP V2	82903	Field
WIND INTENSITY (1=CALM,2=SLIGHT,3=MOD.,4=STRONG)	NU	other	NA	89965	Field
PRESENT WEATHER (1=CLEAR,2=PTCLDY,3=CLDY,4=RAIN,5=OTHER)	NU	other	NA	89966	Field
WATER SURFACE(1=CALM,2=RIPPLE,3=WAVE,4=WHITECAP)	NU	water	NA	89968	Field
TIDE STAGE 1=LOW,2=FALLING,3=SLACK,4=RISING,5=HI	NU	water	NA	89972	Field
WATER ODOR (1=SEWAGE, 2=OILY/CHEMICAL, 3=ROTTEN EGGS, 4=MUSKY, 5=FISHY, 6=NONE, 7=OTHER (WRITE IN COMMENTS))	NU	water	NA	89971	Field
WATER COLOR 1=BRWN 2=RED 3=GRN 4=BLCK 5=CLR 6=OT	NU	water	NA	89969	Field
TURBIDITY, OBSERVED (1=LOW, 2=MEDIUM, 3=HIGH)	NU	water	NA	88842	Field

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

References:

United States Environmental Protection Agency (USEPA) Methods for Chemical Analysis of Water and Wastes, Manual #EPA-600/4-79-020
U.S. Code of Federal Regulations (CFR). Title 40: Protection of Environment, Part 136
American Public Health Association (APHA), American Water Works Association (AWWA), and Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 23rd Edition, 2017.
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TCEQ SOP, V2 - TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, 2014 (RG-416).

TABLE A7.2b Measurement Performance Specifications for Harris County Pollution Control Services (HCPCS)										
Conventional Parameters in Water										
Parameter	**Units**	**Matrix**	**Method**	**Parameter Code**	**TCEQ AWRL**	**LOQ**	**LOQ Check Sample %Rec**	**Precision (RPD)**	**Bias %Rec. of LCS**	**Lab**
RESIDUE, TOTAL NONFILTRABLE (MG/L)	mg/L	water	SM 2540D	00530	5	4	NA	NA	NA	HCPCS
NITROGEN, AMMONIA, TOTAL (MG/L AS N)	mg/L	water	SM4500 NH3-D	00610	0.1	0.1	70-130	20	85-115	HCPCS
NITROGEN, KJELDAHL, TOTAL (MG/L AS N)	mg/L	water	EPA 351.2	00625	0.2	0.2	70-130	20	80-120	Eastex
NITRITE PLUS NITRATE, TOTAL ONE LAB DETERMINED VALUE (MG/L AS N)	mg/L	water	SM 4500-NO3 E	00630	0.05	0.04	70-130	20	85-115	HCPCS
PHOSPHORUS, TOTAL, WET METHOD (MG/L AS P)	mg/L	water	SM 4500-P E	00665	0.06	0.02	70-130	20	85-115	HCPCS
CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH	ug/L	water	EPA 446.0	32211	3	3	NA	20	80-120	Eastex

References:

United States Environmental Protection Agency (USEPA) Methods for Chemical Analysis of Water and Wastes, Manual #EPA-600/4-79-020
U.S. Code of Federal Regulations (CFR). Title 40: Protection of Environment, Part 136
American Public Health Association (APHA), American Water Works Association (AWWA), and Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 23rd Edition, 2017.
TCEQ SOP, V1 - TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods, 2012 (RG-415).
TCEQ SOP, V2 - TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, 2014 (RG-416).

TABLE A7.2c Measurement Performance Specifications for Harris County Pollution Control Services (HCPCS)

Bacteriological Parameters in Water

Parameter	Units	Matrix	Method	Parameter Code	TCEQ AWRL	LOQ	LOQ Check Sample %Rec	Log Difference of Duplicates	Bias %Rec. of LCS	Lab
ENTEROCOCCI, ENTEROLERT, IDEXX, (MPN/100 ML)	MPN/100 mL	water	ASTM D-6503	31701	10***	10***	NA	0.50*	NA	HCPCS

***Enterococcus Samples should be diluted 1:10 for all waters.

References:

United States Environmental Protection Agency (USEPA) Methods for Chemical Analysis of Water and Wastes, Manual #EPA-600/4-79-020

U.S. Code of Federal Regulations (CFR). Title 40: Protection of Environment, Part 136

American Public Health Association (APHA), American Water Works Association (AWWA), and Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 23rd Edition, 2017.

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TCEQ SOP, V2 - TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, 2014 (RG-416).

TABLE A7.3a Measurement Performance Specifications for Houston Health Department (HHD)					
Field Parameters					
Parameter	**Units**	**Matrix**	**Method**	**Parameter Code**	**Lab**
TEMPERATURE, WATER (DEGREES CENTIGRADE)	DEG C	water	SM 2550 B and TCEQ SOP V1	00010	Field
TRANSPARENCY, SECCHI DISC (METERS)	meters	water	TCEQ SOP V1	00078	Field
SPECIFIC CONDUCTANCE,FIELD (US/CM @ 25C)	us/cm	water	EPA 120.1 and TCEQ SOP, V1	00094	Field
OXYGEN, DISSOLVED (MG/L)	mg/L	water	SM 4500-O G and TCEQ SOP V1	00300	Field
PH (STANDARD UNITS)	s.u	water	EPA 150.1 and TCEQ SOP V1	00400	Field
SALINITY - PARTS PER THOUSAND	PPT	water	SM 2520 and TCEQ SOP V1	00480	Field
DAYS SINCE PRECIPITATION EVENT (DAYS)	days	other	TCEQ SOP V1	72053	Field
DEPTH OF BOTTOM OF WATER BODY AT SAMPLE SITE	meters	water	TCEQ SOP V2	82903	Field
MAXIMUM POOL WIDTH AT TIME OF STUDY (METERS)**	meters	other	TCEQ SOP V2	89864	Field
MAXIMUM POOL DEPTH AT TIME OF STUDY(METERS)**	meters	other	TCEQ SOP V2	89865	Field
POOL LENGTH, METERS**	meters	other	TCEQ SOP V2	89869	Field
% POOL COVERAGE IN 500 METER REACH**	%	other	TCEQ SOP V2	89870	Field
WIND INTENSITY (1=CALM,2=SLIGHT,3=MOD.,4=STRONG)	NU	other	NA	89965	Field
PRESENT WEATHER (1=CLEAR,2=PTCLDY,3=CLDY,4=RAIN,5=OTHER)	NU	other	NA	89966	Field
WATER SURFACE(1=CALM,2=RIPPLE,3=WAVE,4=WHITECAP)	NU	water	NA	89968	Field
TIDE STAGE 1=LOW,2=FALLING,3=SLACK,4=RISING,5=HI	NU	water	NA	89972	Field
WATER ODOR (1=SEWAGE, 2=OILY/CHEMICAL, 3=ROTTEN EGGS, 4=MUSKY, 5=FISHY, 6=NONE, 7=OTHER (WRITE IN COMMENTS))	NU	water	NA	89971	Field
WATER COLOR 1=BRWN 2=RED 3=GRN 4=BLCK 5=CLR 6=OT	NU	water	NA	89969	Field

* Reporting to be consistent with SWQM guidance and based on measurement capability.
** To be routinely reported when collecting data from perennial pools.

References:
United States Environmental Protection Agency (USEPA) Methods for Chemical Analysis of Water and Wastes, Manual #EPA-600/4-79-020
U.S. Code of Federal Regulations (CFR). Title 40: Protection of Environment, Part 136
American Public Health Association (APHA), American Water Works Association (AWWA), and Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 23rd Edition, 2017.
TCEQ SOP, V1 - TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods, 2012 (RG-415).
TCEQ SOP, V2 - TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, 2014 (RG-416).

TABLE A7.3b Measurement Performance Specifications for Houston Health Department (HHD)					
Flow Parameters					
Parameter	**Units**	**Matrix**	**Method**	**Parameter Code**	**Lab**
FLOW STREAM, INSTANTANEOUS (CUBIC FEET PER SEC)	cfs	water	TCEQ SOP V1	00061	Field
FLOW SEVERITY:1=No Flow,2=Low,3=Normal,4=Flood,5=High,6=Dry	NU	water	TCEQ SOP V1	01351	Field
FLOW MTH 1=GAGE 2=ELEC 3=MECH 4=WEIR/FLU 5=DOPPLER	NU	other	TCEQ SOP V1	89835	Field

References:

United States Environmental Protection Agency (USEPA) Methods for Chemical Analysis of Water and Wastes, Manual #EPA-600/4-79-020
U.S. Code of Federal Regulations (CFR). Title 40: Protection of Environment, Part 136
American Public Health Association (APHA), American Water Works Association (AWWA), and Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 23rd Edition, 2017.
TCEQ SOP, V1 - TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods, 2012 (RG-415).
TCEQ SOP, V2 - TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, 2014 (RG-416).

TABLE A7.3c Measurement Performance Specifications for Houston Health Department (HHD)										
Conventional Parameters in Water										
Parameter	Units	Matrix	Method	Parameter Code	TCEQ AWRL	LOQ	LOQ Check Sample %Rec	Precision (RPD)	Bias %Rec. of LCS	Lab
RESIDUE, TOTAL NONFILTRABLE (MG/L)	mg/L	water	SM 2540D	00530	5	4	NA	NA	NA	HHD-BLS
NITROGEN, AMMONIA, TOTAL (MG/L AS N)	mg/L	water	SM 4500-NH3 H	00610	0.1	0.1	70-130	20	80-120	HHD-BLS
NITRITE NITROGEN, TOTAL (MG/L AS N)	mg/L	water	EPA 300.0 Rev. 2.1 (1993)	00615	0.05	0.05	70-130	20	80-120	HHD-BLS
NITRATE NITROGEN, TOTAL (MG/L AS N)	mg/L	water	EPA 300.0 Rev. 2.1 (1993)	00620	0.05	0.02	70-130	20	80-120	HHD-BLS
NITROGEN, KJELDAHL, TOTAL (MG/L AS N)	mg/L	water	EPA 351.2	00625	0.2	0.2	70-130	20	80-120	Eastex
PHOSPHORUS, TOTAL, WET METHOD (MG/L AS P)	mg/L	water	EPA 365.1	00665	0.06	0.02	70-130	20	80-120	HHD-BLS
CHLORIDE (MG/L AS CL)	mg/L	water	EPA 300.0 Rev. 2.1 (1993)	00940	5	5	70-130	20	80-120	HHD-BLS
SULFATE (MG/L AS SO4)	mg/L	water	EPA 300.0 Rev. 2.1 (1993)	00945	5	5	70-130	20	80-120	HHD-BLS

References:

United States Environmental Protection Agency (USEPA) Methods for Chemical Analysis of Water and Wastes, Manual #EPA-600/4-79-020

U.S. Code of Federal Regulations (CFR). Title 40: Protection of Environment, Part 136

American Public Health Association (APHA), American Water Works Association (AWWA), and Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 23rd Edition, 2017.

TCEQ SOP, V1 - TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods, 2012 (RG-415).

TCEQ SOP, V2 - TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, 2014 (RG-416).

TABLE A7.3d Measurement Performance Specifications for Houston Health Department (HHD)

Bacteriological Parameters in Water

Parameter	Units	Matrix	Method	Parameter Code	TCEQ AWRL	LOQ	LOQ Check Sample %Rec	Log Difference of Duplicates	Bias %Rec. of LCS	Lab
E. COLI, COLILERT, IDEXX METHOD, MPN/100ML	MPN/100 mL	water	IDEXX Colilert 18 **	31699	1	1	NA	0.50*	NA	HHD-BLS
ENTEROCOCCI, ENTEROLERT, IDEXX, (MPN/100 ML)	MPN/100 mL	water	Enterolert	31701	10***	10***	NA	0.50*	NA	HHD-BLS
E.COLI, COLILERT, IDEXX, HOLDING TIME	hours	water	NA	31704	NA	NA	NA	NA	NA	HHD-BLS

* This value is not expressed as a relative percent difference. It represents the maximum allowable difference between the logarithm of the result of a sample and the logarithm of the duplicate result. See Section B5.

** E.coli samples analyzed by these methods should always be processed as soon as possible and within 8 hours. When transport conditions necessitate delays in delivery longer than 6 hours, the holding time may be extended and samples must be processed as soon as possible and within 30 hours.

***Enterococcus Samples should be diluted 1:10 for all waters.

References:

United States Environmental Protection Agency (USEPA) Methods for Chemical Analysis of Water and Wastes, Manual #EPA-600/4-79-020

U.S. Code of Federal Regulations (CFR). Title 40: Protection of Environment, Part 136

American Public Health Association (APHA), American Water Works Association (AWWA), and Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 23rd Edition, 2017.

TCEQ SOP, V1 - TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods, 2012 (RG-415).

TCEQ SOP, V2 - TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, 2014 (RG-416).

TABLE A7.4a Measurement Performance Specifications for Houston Drinking Water Operations (DWO)					
Field Parameters					
Parameter	**Units**	**Matrix**	**Method**	**Parameter Code**	**Lab**
TEMPERATURE, WATER (DEGREES CENTIGRADE)	DEG C	water	SM 2550 B and TCEQ SOP V1	00010	Field
TRANSPARENCY, SECCHI DISC (METERS)	meters	water	TCEQ SOP V1	00078	Field
SPECIFIC CONDUCTANCE,FIELD (US/CM @ 25C)	us/cm	water	EPA 120.1 and TCEQ SOP, V1	00094	Field
OXYGEN, DISSOLVED (MG/L)	mg/L	water	SM 4500-O G and TCEQ SOP V1	00300	Field
PH (STANDARD UNITS)	s.u	water	EPA 150.1 and TCEQ SOP V1	00400	Field
DAYS SINCE PRECIPITATION EVENT (DAYS)	days	other	TCEQ SOP V1	72053	Field
DEPTH OF BOTTOM OF WATER BODY AT SAMPLE SITE	meters	water	TCEQ SOP V2	82903	Field
RESERVOIR STAGE (FEET ABOVE MEAN SEA LEVEL)* **	FT ABOVE MSL	water	TWDB	00052	Field
RESERVOIR PERCENT FULL* **	% RESERVOIR CAPACITY	water	TWDB	00053	Field
RESERVOIR ACCESS NOT POSSIBLE LEVEL TOO LOW ENTER 1 IF REPORTING	NS	other	TCEQ Drought Guidance	00051	Field
MAXIMUM POOL WIDTH AT TIME OF STUDY (METERS)**	meters	other	TCEQ SOP V2	89864	Field
MAXIMUM POOL DEPTH AT TIME OF STUDY(METERS)**	meters	other	TCEQ SOP V2	89865	Field
POOL LENGTH, METERS**	meters	other	TCEQ SOP V2	89869	Field
% POOL COVERAGE IN 500 METER REACH**	%	other	TCEQ SOP V2	89870	Field
WIND INTENSITY (1=CALM,2=SLIGHT,3=MOD.,4=STRONG)	NU	other	NA	89965	Field
PRESENT WEATHER (1=CLEAR,2=PTCLDY,3=CLDY,4=RAIN,5=OTHER)	NU	other	NA	89966	Field
WATER SURFACE(1=CALM,2=RIPPLE,3=WAVE,4=WHITECAP)	NU	water	NA	89968	Field
WATER ODOR (1=SEWAGE, 2=OILY/CHEMICAL, 3=ROTTEN EGGS, 4=MUSKY, 5=FISHY, 6=NONE, 7=OTHER (WRITE IN COMMENTS))	NU	water	NA	89971	Field
WATER COLOR 1=BRWN 2=RED 3=GRN 4=BLCK 5=CLR 6=OT	NU	water	NA	89969	Field

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

** To be routinely reported when collecting data from perennial pools.

*** As published by the Texas Water Development Board on their website https://www.waterdatafortexas.org/reservoirs/statewide

References:
United States Environmental Protection Agency (USEPA) Methods for Chemical Analysis of Water and Wastes, Manual #EPA-600/4-79-020
U.S. Code of Federal Regulations (CFR). Title 40: Protection of Environment, Part 136
American Public Health Association (APHA), American Water Works Association (AWWA), and Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 23rd Edition, 2017.
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TCEQ SOP, V2 - TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, 2014 (RG-416).

TABLE A7.4b Measurement Performance Specifications for Houston Drinking Water Operations (DWO)					
Flow Parameters					
Parameter	**Units**	**Matrix**	**Method**	**Parameter Code**	**Lab**
FLOW STREAM, INSTANTANEOUS (CUBIC FEET PER SEC)	cfs	water	TCEQ SOP V1	00061	Field
FLOW SEVERITY:1=No Flow,2=Low,3=Normal,4=Flood,5=High,6=Dry	NU	water	TCEQ SOP V1	01351	Field
FLOW MTH 1=GAGE 2=ELEC 3=MECH 4=WEIR/FLU 5=DOPPLER	NU	other	TCEQ SOP V1	89835	Field

References:

United States Environmental Protection Agency (USEPA) Methods for Chemical Analysis of Water and Wastes, Manual #EPA-600/4-79-020
U.S. Code of Federal Regulations (CFR). Title 40: Protection of Environment, Part 136
American Public Health Association (APHA), American Water Works Association (AWWA), and Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 23rd Edition, 2017.
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TCEQ SOP, V2 - TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, 2014 (RG-416).

TABLE A7.4c Measurement Performance Specifications for Houston Drinking Water Operations (DWO)										
Conventional Parameters in Water										
Parameter	Units	Matrix	Method	Parameter Code	TCEQ AWRL	LOQ	LOQ Check Sample %Rec	Precision (RPD)	Bias %Rec. of LCS	Lab
ALKALINITY, TOTAL (MG/L AS CACO3)	mg/L	water	SM 2320B	00410	20	20	NA	20	NA	DWO
RESIDUE, TOTAL NONFILTRABLE (MG/L)	mg/L	water	SM 2540D	00530	5	4	NA	NA	NA	DWO
NITROGEN, AMMONIA, TOTAL (MG/L AS N)	mg/L	water	EPA 350.3	00610	0.1	0.1	70-130	20	80-120	DWO
NITRITE NITROGEN, TOTAL (MG/L AS N)	mg/L	water	EPA 300.0 Rev. 2.1 (1993)	00615	0.05	0.04	70-130	20	80-120	DWO
NITRATE NITROGEN, TOTAL (MG/L AS N)	mg/L	water	EPA 300.0 Rev. 2.1 (1993)	00620	0.05	0.04	70-130	20	80-120	DWO
NITROGEN, KJELDAHL, TOTAL (MG/L AS N)	mg/L	water	EPA 351.2	00625	0.2	0.2	70-130	20	80-120	Eastex
PHOSPHORUS, TOTAL, WET METHOD (MG/L AS P)	mg/L	water	EPA 365.3	00665	0.06	0.02	70-130	20	80-120	DWO
CHLORIDE (MG/L AS CL)	mg/L	water	EPA 300.0 Rev. 2.1 (1993)	00940	5	5	70-130	20	80-120	DWO
SULFATE (MG/L AS SO4)	mg/L	water	EPA 300.0 Rev. 2.1 (1993)	00945	5	5	70-130	20	80-120	DWO
CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH	ug/L	water	EPA 446.0	32211	3	3	NA	20	80-120	Eastex

References:

United States Environmental Protection Agency (USEPA) Methods for Chemical Analysis of Water and Wastes, Manual #EPA-600/4-79-020
U.S. Code of Federal Regulations (CFR). Title 40: Protection of Environment, Part 136
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TABLE A7.4d Measurement Performance Specifications for Houston Drinking Water Operations (DWO)

Bacteriological Parameters in Water

Parameter	Units	Matrix	Method	Parameter Code	TCEQ AWRL	LOQ	LOQ Check Sample %Rec	Log Difference of Duplicates	Bias %Rec. of LCS	Lab
E. COLI, COLILERT, IDEXX METHOD, MPN/100ML	MPN/100 mL	water	SM 9223-B**	31699	1	1	NA	0.50*	NA	DWO
E.COLI, COLILERT, IDEXX, HOLDING TIME	hours	water	NA	31704	NA	NA	NA	NA	NA	DWO

* This value is not expressed as a relative percent difference. It represents the maximum allowable difference between the logarithm of the result of a sample and the logarithm of the duplicate result. See Section B5.

** E.coli samples analyzed by these methods should always be processed as soon as possible and within 8 hours. When transport conditions necessitate delays in delivery longer than 6 hours, the holding time may be extended and samples must be processed as soon as possible and within 30 hours.

References:

United States Environmental Protection Agency (USEPA) Methods for Chemical Analysis of Water and Wastes, Manual #EPA-600/4-79-020

U.S. Code of Federal Regulations (CFR). Title 40: Protection of Environment, Part 136

American Public Health Association (APHA), American Water Works Association (AWWA), and Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 23rd Edition, 2017.

TCEQ SOP, V1 - TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods, 2012 (RG-415).

TCEQ SOP, V2 - TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, 2014 (RG-416).

TABLE A7.5a Measurement Performance Specifications for San Jacinto River Authority - Lake Conroe (SJRA-LC)					
Field Parameters					
Parameter	**Units**	**Matrix**	**Method**	**Parameter Code**	**Lab**
TEMPERATURE, WATER (DEGREES CENTIGRADE)	DEG C	water	SM 2550 B and TCEQ SOP V1	00010	Field
TRANSPARENCY, SECCHI DISC (METERS)	meters	water	TCEQ SOP V1	00078	Field
SPECIFIC CONDUCTANCE,FIELD (US/CM @ 25C)	us/cm	water	EPA 120.1 and TCEQ SOP, V1	00094	Field
OXYGEN, DISSOLVED (MG/L)	mg/L	water	SM 4500-O G and TCEQ SOP V1	00300	Field
PH (STANDARD UNITS)	s.u	water	EPA 150.1 and TCEQ SOP V1	00400	Field
DAYS SINCE PRECIPITATION EVENT (DAYS)	days	other	TCEQ SOP V1	72053	Field
DEPTH OF BOTTOM OF WATER BODY AT SAMPLE SITE	meters	water	TCEQ SOP V2	82903	Field
RESERVOIR STAGE (FEET ABOVE MEAN SEA LEVEL)* **	FT ABOVE MSL	water	TWDB	00052	Field
RESERVOIR PERCENT FULL* **	% RESERVOIR CAPACITY	water	TWDB	00053	Field
RESERVOIR ACCESS NOT POSSIBLE LEVEL TOO LOW ENTER 1 IF REPORTING	NS	other	TCEQ Drought Guidance	00051	Field
WIND INTENSITY (1=CALM,2=SLIGHT,3=MOD.,4=STRONG)	NU	other	NA	89965	Field
PRESENT WEATHER (1=CLEAR,2=PTCLDY,3=CLDY,4=RAIN,5=OTHER)	NU	other	NA	89966	Field
WATER SURFACE(1=CALM,2=RIPPLE,3=WAVE,4=WHITECAP)	NU	water	NA	89968	Field
WATER ODOR (1=SEWAGE, 2=OILY/CHEMICAL, 3=ROTTEN EGGS, 4=MUSKY, 5=FISHY, 6=NONE, 7=OTHER (WRITE IN COMMENTS))	NU	water	NA	89971	Field
WATER COLOR 1=BRWN 2=RED 3=GRN 4=BLCK 5=CLR 6=OT	NU	water	NA	89969	Field

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

*** As published by the Texas Water Development Board on their website https://www.waterdatafortexas.org/reservoirs/statewide

References:

United States Environmental Protection Agency (USEPA) Methods for Chemical Analysis of Water and Wastes, Manual #EPA-600/4-79-020

U.S. Code of Federal Regulations (CFR). Title 40: Protection of Environment, Part 136

American Public Health Association (APHA), American Water Works Association (AWWA), and Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 23rd Edition, 2017.

TCEQ SOP, V1 - TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods, 2012 (RG-415).

TCEQ SOP, V2 - TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, 2014 (RG-416).

TABLE A7.5b Measurement Performance Specifications for San Jacinto River Authority - Lake Conroe (SJRA-LC)										
Conventional Parameters in Water										
Parameter	Units	Matrix	Method	Parameter Code	TCEQ AWRL	LOQ	LOQ Check Sample %Rec	Precision (RPD)	Bias %Rec. of LCS	Lab
ALKALINITY, TOTAL (MG/L AS CACO3)	mg/L	water	SM 2320B	00410	20	20	NA	20	NA	DWO
RESIDUE, TOTAL NONFILTRABLE (MG/L)	mg/L	water	SM 2540D	00530	5	4	NA	NA	NA	DWO
NITROGEN, AMMONIA, TOTAL (MG/L AS N)	mg/L	water	EPA 350.3	00610	0.1	0.1	70-130	20	80-120	DWO
NITRITE NITROGEN, TOTAL (MG/L AS N)	mg/L	water	EPA 300.0 Rev. 2.1 (1993)	00615	0.05	0.04	70-130	20	80-120	DWO
NITRATE NITROGEN, TOTAL (MG/L AS N)	mg/L	water	EPA 300.0 Rev. 2.1 (1993)	00620	0.05	0.04	70-130	20	80-120	DWO
NITROGEN, KJELDAHL, TOTAL (MG/L AS N)	mg/L	water	EPA 351.2	00625	0.2	0.2	70-130	20	80-120	Eastex
PHOSPHORUS, TOTAL, WET METHOD (MG/L AS P)	mg/L	water	EPA 365.3	00665	0.06	0.02	70-130	20	80-120	DWO
CHLORIDE (MG/L AS CL)	mg/L	water	EPA 300.0 Rev. 2.1 (1993)	00940	5	5	70-130	20	80-120	DWO
SULFATE (MG/L AS SO4)	mg/L	water	EPA 300.0 Rev. 2.1 (1993)	00945	5	5	70-130	20	80-120	DWO
CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH	ug/L	water	EPA 446.0	32211	3	3	NA	20	80-120	Eastex

References:

United States Environmental Protection Agency (USEPA) Methods for Chemical Analysis of Water and Wastes, Manual #EPA-600/4-79-020
U.S. Code of Federal Regulations (CFR). Title 40: Protection of Environment, Part 136
American Public Health Association (APHA), American Water Works Association (AWWA), and Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 23rd Edition, 2017.
TCEQ SOP, V1 - TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods, 2012 (RG-415).
TCEQ SOP, V2 - TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, 2014 (RG-416).

TABLE A7.5c Measurement Performance Specifications for San Jacinto River Authority - Lake Conroe (SJRA-LC)										
Bacteriological Parameters in Water										
Parameter	Units	Matrix	Method	Parameter Code	TCEQ AWRL	LOQ	LOQ Check Sample %Rec	Log Difference of Duplicates	Bias %Rec. of LCS	Lab
E. COLI, COLILERT, IDEXX METHOD, MPN/100ML	MPN/100 mL	water	SM 9223-B**	31699	1	1	NA	0.50*	NA	DWO
E.COLI, COLILERT, IDEXX, HOLDING TIME	hours	water	NA	31704	NA	NA	NA	NA	NA	DWO

* This value is not expressed as a relative percent difference. It represents the maximum allowable difference between the logarithm of the result of a sample and the logarithm of the duplicate result. See Section B5.

** E.coli samples analyzed by these methods should always be processed as soon as possible and within 8 hours. When transport conditions necessitate delays in delivery longer than 6 hours, the holding time may be extended and samples must be processed as soon as possible and within 30 hours.

References:

United States Environmental Protection Agency (USEPA) Methods for Chemical Analysis of Water and Wastes, Manual #EPA-600/4-79-020

U.S. Code of Federal Regulations (CFR). Title 40: Protection of Environment, Part 136

American Public Health Association (APHA), American Water Works Association (AWWA), and Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 23rd Edition, 2017.

TCEQ SOP, V1 - TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods, 2012 (RG-415).

TCEQ SOP, V2 - TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, 2014 (RG-416).

TABLE A7.6a Measurement Performance Specifications for San Jacinto River Authority - Woodlands (SJRA-W)

Field Parameters

Parameter	Units	Matrix	Method	Parameter Code	Lab
TEMPERATURE, WATER (DEGREES CENTIGRADE)	DEG C	water	SM 2550 B and TCEQ SOP V1	00010	Field
TRANSPARENCY, SECCHI DISC (METERS)	meters	water	TCEQ SOP V1	00078	Field
SPECIFIC CONDUCTANCE,FIELD (US/CM @ 25C)	us/cm	water	EPA 120.1 and TCEQ SOP, V1	00094	Field
OXYGEN, DISSOLVED (MG/L)	mg/L	water	SM 4500-O G and TCEQ SOP V1	00300	Field
PH (STANDARD UNITS)	s.u	water	EPA 150.1 and TCEQ SOP V1	00400	Field
DAYS SINCE PRECIPITATION EVENT (DAYS)	days	other	TCEQ SOP V1	72053	Field
DEPTH OF BOTTOM OF WATER BODY AT SAMPLE SITE	meters	water	TCEQ SOP V2	82903	Field
RESERVOIR STAGE (FEET ABOVE MEAN SEA LEVEL)* **	FT ABOVE MSL	water	TWDB	00052	Field
RESERVOIR PERCENT FULL* **	% RESERVOIR CAPACITY	water	TWDB	00053	Field
RESERVOIR ACCESS NOT POSSIBLE LEVEL TOO LOW ENTER 1 IF REPORTING	NS	other	TCEQ Drought Guidance	00051	Field
WIND INTENSITY (1=CALM,2=SLIGHT,3=MOD.,4=STRONG)	NU	other	NA	89965	Field
PRESENT WEATHER (1=CLEAR,2=PTCLDY,3=CLDY,4=RAIN,5=OTHER)	NU	other	NA	89966	Field
WATER SURFACE(1=CALM,2=RIPPLE,3=WAVE,4=WHITECAP)	NU	water	NA	89968	Field
WATER ODOR (1=SEWAGE, 2=OILY/CHEMICAL, 3=ROTTEN EGGS, 4=MUSKY, 5=FISHY, 6=NONE, 7=OTHER (WRITE IN COMMENTS))	NU	water	NA	89971	Field
WATER COLOR 1=BRWN 2=RED 3=GRN 4=BLCK 5=CLR 6=OT	NU	water	NA	89969	Field

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

*** As published by the Texas Water Development Board on their website https://www.waterdatafortexas.org/reservoirs/statewide

References:

United States Environmental Protection Agency (USEPA) Methods for Chemical Analysis of Water and Wastes, Manual #EPA-600/4-79-020

U.S. Code of Federal Regulations (CFR). Title 40: Protection of Environment, Part 136

American Public Health Association (APHA), American Water Works Association (AWWA), and Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 23rd Edition, 2017.

TCEQ SOP, V1 - TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods, 2012 (RG-415).

TCEQ SOP, V2 - TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, 2014 (RG-416).

TABLE A7.6b Measurement Performance Specifications for San Jacinto River Authority - Woodlands (SJRA-W)					
Flow Parameters					
Parameter	**Units**	**Matrix**	**Method**	**Parameter Code**	**Lab**
FLOW STREAM, INSTANTANEOUS (CUBIC FEET PER SEC)	cfs	water	TCEQ SOP V1	00061	Field
FLOW SEVERITY:1=No Flow,2=Low,3=Normal,4=Flood,5=High,6=Dry	NU	water	TCEQ SOP V1	01351	Field
FLOW MTH 1=GAGE 2=ELEC 3=MECH 4=WEIR/FLU 5=DOPPLER	NU	other	TCEQ SOP V1	89835	Field

References:

United States Environmental Protection Agency (USEPA) Methods for Chemical Analysis of Water and Wastes, Manual #EPA-600/4-79-020
U.S. Code of Federal Regulations (CFR). Title 40: Protection of Environment, Part 136
American Public Health Association (APHA), American Water Works Association (AWWA), and Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 23rd Edition, 2017.
TCEQ SOP, V1 - TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods, 2012 (RG-415).
TCEQ SOP, V2 - TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, 2014 (RG-416).

TABLE A7.6c Measurement Performance Specifications for San Jacinto River Authority - Woodlands (SJRA-W)										
Conventional Parameters in Water										
Parameter	Units	Matrix	Method	Parameter Code	TCEQ AWRL	LOQ	LOQ Check Sample %Rec	Precision (RPD)	Bias %Rec. of LCS	Lab
RESIDUE, TOTAL NONFILTRABLE (MG/L)	mg/L	water	SM 2540D	00530	5	1	NA	NA	NA	Eastex
NITROGEN, AMMONIA, TOTAL (MG/L AS N)	mg/L	water	SM 4500 NH3 G	00610	0.1	0.1	70-130	20	80-120	Eastex
NITRITE NITROGEN, TOTAL (MG/L AS N)	mg/L	water	EPA 300.0 Rev. 2.1 (1993)	00615	0.05	0.05	70-130	20	80-120	Eastex
NITRATE NITROGEN, TOTAL (MG/L AS N)	mg/L	water	EPA 300.0 Rev. 2.1 (1993)	00620	0.05	0.05	70-130	20	80-120	Eastex
NITROGEN, KJELDAHL, TOTAL (MG/L AS N)	mg/L	water	EPA 351.2	00625	0.2	0.2	70-130	20	80-120	Eastex
NITRITE PLUS NITRATE, TOTAL ONE LAB DETERMINED VALUE (MG/L AS N)	mg/L	water	SM 4500 NO3 F	00630	0.05	0.02	70-130	20	80-120	Eastex
PHOSPHORUS, TOTAL, WET METHOD (MG/L AS P)	mg/L	water	EPA 200.7	00665	0.06	0.06	70-130	20	80-120	Eastex
CHLORIDE (MG/L AS CL)	mg/L	water	EPA 300.0 Rev. 2.1 (1993)	00940	5	5	70-130	20	80-120	Eastex
SULFATE (MG/L AS SO4)	mg/L	water	EPA 300.0 Rev. 2.1 (1993)	00945	5	4	70-130	20	80-120	Eastex
CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH	ug/L	water	EPA 446.0	32211	3	3	NA	20	80-120	Eastex

References:

United States Environmental Protection Agency (USEPA) Methods for Chemical Analysis of Water and Wastes, Manual #EPA-600/4-79-020
U.S. Code of Federal Regulations (CFR). Title 40: Protection of Environment, Part 136
American Public Health Association (APHA), American Water Works Association (AWWA), and Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 23rd Edition, 2017.
TCEQ SOP, V1 - TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods, 2012 (RG-415).
TCEQ SOP, V2 - TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, 2014 (RG-416).

TABLE A7.6d Measurement Performance Specifications for San Jacinto River Authority - Woodlands (SJRA-W)										
Bacteriological Parameters in Water										
Parameter	Units	Matrix	Method	Parameter Code	TCEQ AWRL	LOQ	LOQ Check Sample %Rec	Log Difference of Duplicates	Bias %Rec. of LCS	Lab
E. COLI, COLILERT, IDEXX METHOD, MPN/100ML	MPN/100 mL	water	IDEXX Colilert or Colilert 18**	31699	1	1	NA	0.50*	NA	Eastex
E.COLI, COLILERT, IDEXX, HOLDING TIME	hours	water	NA	31704	NA	NA	NA	NA	NA	Eastex

* This value is not expressed as a relative percent difference. It represents the maximum allowable difference between the logarithm of the result of a sample and the logarithm of the duplicate result. See Section B5.

** E.coli samples analyzed by these methods should always be processed as soon as possible and within 8 hours. When transport conditions necessitate delays in delivery longer than 6 hours, the holding time may be extended and samples must be processed as soon as possible and within 30 hours.

References:

United States Environmental Protection Agency (USEPA) Methods for Chemical Analysis of Water and Wastes, Manual #EPA-600/4-79-020

U.S. Code of Federal Regulations (CFR). Title 40: Protection of Environment, Part 136

American Public Health Association (APHA), American Water Works Association (AWWA), and Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 23rd Edition, 2017.

TCEQ SOP, V1 - TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods, 2012 (RG-415).

TCEQ SOP, V2 - TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, 2014 (RG-416).

TABLE A7.7a Measurement Performance Specifications for Environmental Institute of Houston (EIH)

Field Parameters

Parameter	Units	Matrix	Method	Parameter Code	Lab
TEMPERATURE, WATER (DEGREES CENTIGRADE)	DEG C	water	SM 2550 B and TCEQ SOP V1	00010	Field
TRANSPARENCY, SECCHI DISC (METERS)	meters	water	TCEQ SOP V1	00078	Field
SPECIFIC CONDUCTANCE,FIELD (US/CM @ 25C)	us/cm	water	EPA 120.1 and TCEQ SOP, V1	00094	Field
OXYGEN, DISSOLVED (MG/L)	mg/L	water	SM 4500-O G and TCEQ SOP V1	00300	Field
PH (STANDARD UNITS)	s.u	water	EPA 150.1 and TCEQ SOP V1	00400	Field
SALINITY - PARTS PER THOUSAND	PPT	water	SM 2520 and TCEQ SOP V1	00480	Field
DAYS SINCE PRECIPITATION EVENT (DAYS)	days	other	TCEQ SOP V1	72053	Field
DEPTH OF BOTTOM OF WATER BODY AT SAMPLE SITE	meters	water	TCEQ SOP V2	82903	Field
MAXIMUM POOL WIDTH AT TIME OF STUDY (METERS)**	meters	other	TCEQ SOP V2	89864	Field
MAXIMUM POOL DEPTH AT TIME OF STUDY(METERS)**	meters	other	TCEQ SOP V2	89865	Field
POOL LENGTH, METERS**	meters	other	TCEQ SOP V2	89869	Field
% POOL COVERAGE IN 500 METER REACH**	%	other	TCEQ SOP V2	89870	Field
WIND INTENSITY (1=CALM,2=SLIGHT,3=MOD.,4=STRONG)	NU	other	NA	89965	Field
PRESENT WEATHER (1=CLEAR,2=PTCLDY,3=CLDY,4=RAIN,5=OTHER)	NU	other	NA	89966	Field
WATER SURFACE(1=CALM,2=RIPPLE,3=WAVE,4=WHITECAP)	NU	water	NA	89968	Field
TIDE STAGE 1=LOW,2=FALLING,3=SLACK,4=RISING,5=HI	NU	water	NA	89972	Field
WATER ODOR (1=SEWAGE, 2=OILY/CHEMICAL, 3=ROTTEN EGGS, 4=MUSKY, 5=FISHY, 6=NONE, 7=OTHER (WRITE IN COMMENTS))	NU	water	NA	89971	Field
WATER COLOR 1=BRWN 2=RED 3=GRN 4=BLCK 5=CLR 6=OT	NU	water	NA	89969	Field

* Reporting to be consistent with SWQM guidance and based on measurement capability.
** To be routinely reported when collecting data from perennial pools.

References:
United States Environmental Protection Agency (USEPA) Methods for Chemical Analysis of Water and Wastes, Manual #EPA-600/4-79-020
U.S. Code of Federal Regulations (CFR). Title 40: Protection of Environment, Part 136
American Public Health Association (APHA), American Water Works Association (AWWA), and Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 23rd Edition, 2017.
TCEQ SOP, V1 - TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods, 2012 (RG-415).
TCEQ SOP, V2 - TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, 2014 (RG-416).

TABLE A7.7b Measurement Performance Specifications for Environmental Institute of Houston (EIH)					
Flow Parameters					
Parameter	**Units**	**Matrix**	**Method**	**Parameter Code**	**Lab**
FLOW STREAM, INSTANTANEOUS (CUBIC FEET PER SEC)	cfs	water	TCEQ SOP V1	00061	Field
FLOW SEVERITY:1=No Flow,2=Low,3=Normal,4=Flood,5=High,6=Dry	NU	water	TCEQ SOP V1	01351	Field
STREAM FLOW ESTIMATE (CFS)	cfs	water	TCEQ SOP V1	74069	Field
FLOW MTH 1=GAGE 2=ELEC 3=MECH 4=WEIR/FLU 5=DOPPLER	NU	other	TCEQ SOP V1	89835	Field

References:

United States Environmental Protection Agency (USEPA) Methods for Chemical Analysis of Water and Wastes, Manual #EPA-600/4-79-020
U.S. Code of Federal Regulations (CFR). Title 40: Protection of Environment, Part 136
American Public Health Association (APHA), American Water Works Association (AWWA), and Water Environment Federation (WEF), Standard
Methods for the Examination of Water and Wastewater, 23rd Edition, 2017.
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TCEQ SOP, V2 - TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, 2014 (RG-416).

TABLE A7.7c Measurement Performance Specifications for Environmental Institute of Houston (EIH)										
Conventional Parameters in Water										
Parameter	Units	Matrix	Method	Parameter Code	TCEQ AWRL	LOQ	LOQ Check Sample %Rec	Precision (RPD)	Bias %Rec. of LCS	Lab
RESIDUE, TOTAL NONFILTRABLE (MG/L)	mg/L	water	SM 2540D	00530	5	1	NA	NA	NA	Eastex
NITROGEN, AMMONIA, TOTAL (MG/L AS N)	mg/L	water	SM 4500 NH3 G	00610	0.1	0.1	70-130	20	80-120	Eastex
NITRITE NITROGEN, TOTAL (MG/L AS N)	mg/L	water	EPA 300.0 Rev. 2.1 (1993)	00615	0.05	0.05	70-130	20	80-120	Eastex
NITRATE NITROGEN, TOTAL (MG/L AS N)	mg/L	water	EPA 300.0 Rev. 2.1 (1993)	00620	0.05	0.05	70-130	20	80-120	Eastex
NITROGEN, KJELDAHL, TOTAL (MG/L AS N)	mg/L	water	EPA 351.2	00625	0.2	0.2	70-130	20	80-120	Eastex
NITRITE PLUS NITRATE, TOTAL ONE LAB DETERMINED VALUE (MG/L AS N)	mg/L	water	SM 4500-NO3 F	00630	0.05	0.02	70-130	20	80-120	Eastex
PHOSPHORUS, TOTAL, WET METHOD (MG/L AS P)	mg/L	water	200.7	00665	0.06	0.06	70-130	20	80-120	Eastex
CHLORIDE (MG/L AS CL)	mg/L	water	EPA 300.0 Rev. 2.1 (1993)	00940	5	5	70-130	20	80-120	Eastex
SULFATE (MG/L AS SO4)	mg/L	water	EPA 300.0 Rev. 2.1 (1993)	00945	5	4	70-130	20	80-120	Eastex
CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH	ug/L	water	EPA 446.0	32211	3	3	NA	20	80-120	Eastex

References:

United States Environmental Protection Agency (USEPA) Methods for Chemical Analysis of Water and Wastes, Manual #EPA-600/4-79-020
U.S. Code of Federal Regulations (CFR). Title 40: Protection of Environment, Part 136
American Public Health Association (APHA), American Water Works Association (AWWA), and Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 23rd Edition, 2017.
TCEQ SOP, V1 - TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods, 2012 (RG-415).
TCEQ SOP, V2 - TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, 2014 (RG-416).

TABLE A7.7d Measurement Performance Specifications for Environmental Institute of Houston (EIH)										
Bacteriological Parameters in Water										
Parameter	**Units**	**Matrix**	**Method**	**Parameter Code**	**TCEQ AWRL**	**LOQ**	**LOQ Check Sample %Rec**	**Log Difference of Duplicates**	**Bias %Rec. of LCS**	**Lab**
E. COLI, COLILERT, IDEXX METHOD, MPN/100ML	MPN/100 mL	water	IDEXX Colilert or Colilert 18**	31699	1	1	NA	0.50*	NA	Eastex
ENTEROCOCCI, ENTEROLERT, IDEXX, (MPN/100 ML)	MPN/100 mL	water	IDEXX Enterolert	31701	10***	10***	NA	0.50*	NA	Eastex
E.COLI, COLILERT, IDEXX, HOLDING TIME	hours	water	NA	31704	NA	NA	NA	NA	NA	Eastex

* This value is not expressed as a relative percent difference. It represents the maximum allowable difference between the logarithm of the result of a sample and the logarithm of the duplicate result. See Section B5.
** E.coli samples analyzed by these methods should always be processed as soon as possible and within 8 hours. When transport conditions necessitate delays in delivery longer than 6 hours, the holding time may be extended and samples must be processed as soon as possible and within 30 hours.
***Enterococcus Samples should be diluted 1:10 for all waters.

References:
United States Environmental Protection Agency (USEPA) Methods for Chemical Analysis of Water and Wastes, Manual #EPA-600/4-79-020
U.S. Code of Federal Regulations (CFR). Title 40: Protection of Environment, Part 136
American Public Health Association (APHA), American Water Works Association (AWWA), and Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 23rd Edition, 2017.
TCEQ SOP, V1 - TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods, 2012 (RG-415).
TCEQ SOP, V2 - TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, 2014 (RG-416).

TABLE A7.7e Measurement Performance Specifications for Environmental Institute of Houston (EIH)					
24 HourParameters in Water					
Parameter	Units	Matrix	Method	Parameter Code	Lab
TEMPERATURE, WATER (DEGREES CENTIGRADE), 24HR AVG	DEG C	Water	TCEQ SOP V1	00209	field
WATER TEMPERATURE, DEGREES CENTIGRADE, 24HR MAX	DEG C	Water	TCEQ SOP V1	00210	field
TEMPERATURE, WATER (DEGREES CENTIGRADE) 24HR MIN	DEG C	Water	TCEQ SOP V1	00211	field
SPECIFIC CONDUCTANCE, US/CM, FIELD, 24HR AVG	uS/cm	Water	TCEQ SOP V1	00212	field
SPECIFIC CONDUCTANCE, US/CM, FIELD, 24HR MAX	uS/cm	Water	TCEQ SOP V1	00213	field
SPECIFIC CONDUCTANCE, US/CM, FIELD, 24HR MIN	uS/cm	Water	TCEQ SOP V1	00214	field
PH, S.U., 24HR MAXIMUM VALUE	std. units	Water	TCEQ SOP V1	00215	field
PH, S.U., 24HR, MINIMUM VALUE	std. units	Water	TCEQ SOP V1	00216	field
SALINITY, 24-HR, MAXIMUM, PPT	ppt	Water	TCEQ SOP V1	00217	field
SALINITY, 24-HR, AVERAGE, PPT	ppt	Water	TCEQ SOP V1	00218	field
SALINITY, 24-HR, MINIMUM, PPT	ppt	Water	TCEQ SOP V1	00219	field
SALINITY, # OF MEASUREMENTS IN 24-HRS	NU	Water	TCEQ SOP V1	00220	field
WATER TEMPERATURE, # OF MEASUREMENTS IN 24-HRS	NU	Water	TCEQ SOP V1	00221	field
SPECIFIC CONDUCTANCE, # OF MEASUREMENTS IN 24-HRS	NU	Water	TCEQ SOP V1	00222	field
pH, # OF MEASUREMENTS IN 24-HRS	NU	Water	TCEQ SOP V1	00223	field
DISSOLVED OXYGEN, 24-HOUR MIN. (MG/L) MIN. 4 MEA	mg/l	Water	TCEQ SOP V1	89855	field
DISSOLVED OXYGEN, 24-HOUR MAX. (MG/L) MIN. 4 MEA	mg/l	Water	TCEQ SOP V1	89856	field
DISSOLVED OXYGEN, 24-HOUR AVG. (MG/L) MIN. 4 MEA	mg/l	Water	TCEQ SOP V1	89857	field
DISSOLVED OXYGEN, # OF MEASUREMENTS IN 24-HRS	NU	Water	TCEQ SOP V1	89858	field

References:

United States Environmental Protection Agency (USEPA) Methods for Chemical Analysis of Water and Wastes, Manual #EPA-600/4-79-020
U.S. Code of Federal Regulations (CFR). Title 40: Protection of Environment, Part 136
American Public Health Association (APHA), American Water Works Association (AWWA), and Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 23rd Edition, 2017.
TCEQ SOP, V1 - TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods, 2012 (RG-415).
TCEQ SOP, V2 - TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, 2014 (RG-416).

TABLE A7.8a Measurement Performance Specifications for Texas Research Institute for Environmenta Studies (TRIES)					
Field Parameters					
Parameter	**Units**	**Matrix**	**Method**	**Parameter Code**	**Lab**
TEMPERATURE, WATER (DEGREES CENTIGRADE)	DEG C	water	SM 2550 B and TCEQ SOP V1	00010	Field
TRANSPARENCY, SECCHI DISC (METERS)	meters	water	TCEQ SOP V1	00078	Field
SPECIFIC CONDUCTANCE,FIELD (US/CM @ 25C)	us/cm	water	EPA 120.1 and TCEQ SOP, V1	00094	Field
OXYGEN, DISSOLVED (MG/L)	mg/L	water	SM 4500-O G and TCEQ SOP V1	00300	Field
PH (STANDARD UNITS)	s.u	water	EPA 150.1 and TCEQ SOP V1	00400	Field
DAYS SINCE PRECIPITATION EVENT (DAYS)	days	other	TCEQ SOP V1	72053	Field
DEPTH OF BOTTOM OF WATER BODY AT SAMPLE SITE	meters	water	TCEQ SOP V2	82903	Field
MAXIMUM POOL WIDTH AT TIME OF STUDY (METERS)**	meters	other	TCEQ SOP V2	89864	Field
MAXIMUM POOL DEPTH AT TIME OF STUDY(METERS)**	meters	other	TCEQ SOP V2	89865	Field
POOL LENGTH, METERS**	meters	other	TCEQ SOP V2	89869	Field
% POOL COVERAGE IN 500 METER REACH**	%	other	TCEQ SOP V2	89870	Field
WIND INTENSITY (1=CALM,2=SLIGHT,3=MOD.,4=STRONG)	NU	other	NA	89965	Field
PRESENT WEATHER (1=CLEAR,2=PTCLDY,3=CLDY,4=RAIN,5=OTHER)	NU	other	NA	89966	Field
WATER SURFACE(1=CALM,2=RIPPLE,3=WAVE,4=WHITECAP)	NU	water	NA	89968	Field
WATER ODOR (1=SEWAGE, 2=OILY/CHEMICAL, 3=ROTTEN EGGS, 4=MUSKY, 5=FISHY, 6=NONE, 7=OTHER (WRITE IN COMMENTS))	NU	water	NA	89971	Field
WATER COLOR 1=BRWN 2=RED 3=GRN 4=BLCK 5=CLR 6=OT	NU	water	NA	89969	Field

* Reporting to be consistent with SWQM guidance and based on measurement capability.
** To be routinely reported when collecting data from perennial pools.

References:
United States Environmental Protection Agency (USEPA) Methods for Chemical Analysis of Water and Wastes, Manual #EPA-600/4-79-020
U.S. Code of Federal Regulations (CFR). Title 40: Protection of Environment, Part 136
American Public Health Association (APHA), American Water Works Association (AWWA), and Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 23rd Edition, 2017.
TCEQ SOP, V1 - TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods, 2012 (RG-415).
TCEQ SOP, V2 - TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, 2014 (RG-416).

TABLE A7.8b Measurement Performance Specifications for Texas Research Institute for Environmental Studies (TRIES)

Flow Parameters					
Parameter	**Units**	**Matrix**	**Method**	**Parameter Code**	**Lab**
FLOW STREAM, INSTANTANEOUS (CUBIC FEET PER SEC)	cfs	water	TCEQ SOP V1	00061	Field
FLOW SEVERITY:1=No Flow,2=Low,3=Normal,4=Flood,5=High,6=Dry	NU	water	TCEQ SOP V1	01351	Field
FLOW MTH 1=GAGE 2=ELEC 3=MECH 4=WEIR/FLU 5=DOPPLER	NU	other	TCEQ SOP V1	89835	Field

References:

United States Environmental Protection Agency (USEPA) Methods for Chemical Analysis of Water and Wastes, Manual #EPA-600/4-79-020

U.S. Code of Federal Regulations (CFR). Title 40: Protection of Environment, Part 136

American Public Health Association (APHA), American Water Works Association (AWWA), and Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 23rd Edition, 2017.

TCEQ SOP, V1 - TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods, 2012 (RG-415).

TCEQ SOP, V2 - TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, 2014 (RG-416).

TABLE A7.8c Measurement Performance Specifications for Texas Research Institute for Environmenta Studies (TRIES)										
Conventional Parameters in Water										
Parameter	Units	Matrix	Method	Parameter Code	TCEQ AWRL	LOQ	LOQ Check Sample %Rec	Precision (RPD)	Bias %Rec. of LCS	Lab
RESIDUE, TOTAL NONFILTRABLE (MG/L)	mg/L	water	SM 2540D	00530	5	2.5	NA	NA	NA	TRIES
RESIDUE, TOTAL NONFILTRABLE (MG/L)	mg/L	water	SM 2540D	00530	5	1	NA	NA	NA	Eastex
NITROGEN, AMMONIA, TOTAL (MG/L AS N)	mg/L	water	SM 4500-NH3 D	00610	0.1	0.1	70-130	20	80-120	TRIES
NITROGEN, AMMONIA, TOTAL (MG/L AS N)	mg/L	water	SM 4500-NH3 G	00610	0.1	0.1	70-130	20	80-120	Eastex
NITRITE NITROGEN, TOTAL (MG/L AS N)	mg/L	water	EPA 300.0 Rev. 2.1 (1993)	00615	0.05	0.05	70-130	20	85-115	TRIES
NITRITE NITROGEN, TOTAL (MG/L AS N)	mg/L	water	EPA 300.0 Rev. 2.1 (1993)	00615	0.05	0.05	70-130	20	80-120	Eastex
NITRATE NITROGEN, TOTAL (MG/L AS N)	mg/L	water	EPA 300.0 Rev. 2.1 (1993)	00620	0.05	0.05	70-130	20	85-115	TRIES
NITRATE NITROGEN, TOTAL (MG/L AS N)	mg/L	water	EPA 300.0 Rev. 2.1 (1993)	00620	0.05	0.05	70-130	20	80-120	Eastex
NITRITE PLUS NITRATE, TOTAL ONE LAB DETERMINED VALUE (MG/L AS N)	mg/L	water	SM 4500-NO3 F	00630	0.05	0.02	70-130	20	80-120	Eastex
PHOSPHORUS, TOTAL, WET METHOD (MG/L AS P)	mg/L	water	EPA 200.7	00665	0.06	0.04	70-130	20	85-115	TRIES
PHOSPHORUS, TOTAL, WET METHOD (MG/L AS P)	mg/L	water	EPA 200.7	00665	0.06	0.06	70-130	20	80-120	Eastex
CHLORIDE (MG/L AS CL)	mg/L	water	EPA 300.0 Rev. 2.1 (1993)	00940	5	4	70-130	20	85-115	TRIES
CHLORIDE (MG/L AS CL)	mg/L	water	EPA 300.0 Rev. 2.1 (1993)	00940	5	5	70-130	20	80-120	Eastex
SULFATE (MG/L AS SO4)	mg/L	water	EPA 300.0 Rev. 2.1 (1993)	00945	5	3	70-130	20	85-115	TRIES
SULFATE (MG/L AS SO4)	mg/L	water	EPA 300.0 Rev. 2.1 (1993)	00945	5	4	70-130	20	80-120	Eastex

References:

United States Environmental Protection Agency (USEPA) Methods for Chemical Analysis of Water and Wastes, Manual #EPA-600/4-79-020
U.S. Code of Federal Regulations (CFR). Title 40: Protection of Environment, Part 136
American Public Health Association (APHA), American Water Works Association (AWWA), and Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 23rd Edition, 2017.
TCEQ SOP, V1 - TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods, 2012 (RG-415).
TCEQ SOP, V2 - TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, 2014 (RG-416).

TABLE A7.8d Measurement Performance Specifications for Texas Research Institute for Environmenta Studies (TRIES)

Bacteriological Parameters in Water

Parameter	Units	Matrix	Method	Parameter Code	TCEQ AWRL	LOQ	LOQ Check Sample %Rec	Log Difference of Duplicates	Bias %Rec. of LCS	Lab
E. COLI, COLILERT, IDEXX METHOD, MPN/100ML	MPN/100 mL	water	IDEXX Colilert or Colilert-18**	31699	1	1	NA	0.50*	NA	TRIES
E.COLI, COLILERT, IDEXX, HOLDING TIME	hours	water	NA	31704	NA	NA	NA	NA	NA	TRIES
E. COLI, COLILERT, IDEXX METHOD, MPN/100ML	MPN/100 mL	water	IDEXX Colilert**	31699	1	1	NA	0.50*	NA	Eastex
E.COLI, COLILERT, IDEXX, HOLDING TIME	hours	water	NA	31704	NA	NA	NA	NA	NA	Eastex

* This value is not expressed as a relative percent difference. It represents the maximum allowable difference between the logarithm of the result of a sample and the logarithm of the duplicate result. See Section B5.

** E.coli samples analyzed by these methods should always be processed as soon as possible and within 8 hours. When transport conditions necessitate delays in delivery longer than 6 hours, the holding time may be extended and samples must be processed as soon as possible and within 30 hours.

References:

United States Environmental Protection Agency (USEPA) Methods for Chemical Analysis of Water and Wastes, Manual #EPA-600/4-79-020

U.S. Code of Federal Regulations (CFR). Title 40: Protection of Environment, Part 136

American Public Health Association (APHA), American Water Works Association (AWWA), and Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 23rd Edition, 2017.

TCEQ SOP, V1 - TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods, 2012 (RG-415).

TCEQ SOP, V2 - TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, 2014 (RG-416).

Appendix B Sampling Process Design and Monitoring Schedule (plan)

TASK 3: WATER QUALITY MONITORING

Objectives: Water quality monitoring will focus on the characterization of a variety of locations and conditions. This will include a combination of the following:

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

Task Description:

The Performing Party will coordinate and develop water quality monitoring strategies through the RMW and present strategies to the CRP Steering Committee for review and concurrence.

To avoid duplication of monitoring efforts, the Performing Party will continue to coordinate monitoring efforts with other area data providers. The Performing Party also will continue to arrange regional training opportunities and workshops which support cooperative monitoring efforts (e.g., field methods, biological data collection, and habitat assessment).

The Performing Party will complete the following subtasks:

Monitoring Description - In FY2022, the Performing Party will collect quarterly sample at a minimum of twenty (20) water quality monitoring sites throughout the Performing Party's service area. Sampling efforts will include basic field parameters, flow, conventional chemical parameters, and bacteria. Most sites are located in the upper portions of watersheds or watersheds that fall outside the jurisdiction of local partner agencies.

In addition to the Performing Party's ambient monitoring program, six (6) local agencies are involved in this multi-basin monitoring effort. The Performing Party subcontracts with several entities to conduct monitoring and coordinates with others as in-kind contributors to conduct monitoring. The six participating agencies typically monitor a combined total of over 300 monitoring sites in the region. Each agency's monitoring activities will be coordinated through the RMW. The coordination reduces monitoring duplication and allows all local agencies to see the data collection efforts of and data availability from other local agencies. 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. Frequencies vary from quarterly for some parameters to monthly in highly impacted urban areas. Baseline monitoring will include the collection of field parameters at all sites and the collection of bacteria, flow, and conventional chemical parameters at sites where indicated. Additional details concerning the monitoring activities conducted by partner agencies are outlined in the Performing Party's Multi-Basin QAPP.

In FY2023, the Performing Party and area partners are expected to monitor at a similar level of effort as in FY2022. The actual number of sites, location, frequency, and parameters collected for FY2023 will be based on priorities identified at the CRP Steering Committee and Coordinated Monitoring meetings and included in the amended Appendix B schedule of the Performing Party's Multi-Basin QAPP.

All monitoring will be completed in accordance with the H-GAC Multi-Basin QAPP, the TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods (RG-415) and the TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data (RG-416). The Performing Party will include summaries of monitoring activities in the corresponding quarterly Progress Report.

24-Hour Dissolved Oxygen Monitoring - There are priority sub-segments with dissolved oxygen impairments or concerns in the Performing Party's monitoring area. More data collection is needed to determine or verify the impairments. The Performing Party and/or sub- participants will conduct 24-hour dissolved oxygen monitoring at a minimum of two stations, four times per year, throughout the two-year Contract period. The sites will be determined once budget is approved and site locations are coordinated and prioritized with TCEQ. The Performing Party will also include summaries of monitoring events in the corresponding quarterly Progress Report.

Permit Support Monitoring - During FY2022 and/or FY2023, the Performing Party may conduct monitoring activities to support TCEQ's Water Quality Division by collecting field parameters and discharge measurements at selected waterbodies identified by TCEQ. The sites will be determined once budget is approved and site locations are coordinated and prioritized with TCEQ. The Performing Party will include summaries of any activities in the corresponding quarterly Progress Report.

RMW - The RMW will meet during three of four quarters to discuss monitoring needs, problems, successes and changes. The third quarter meeting is conducted as the Coordinated Monitoring Meeting (see below). The RMW is composed of Performing Party staff and representatives from local participating agencies, currently including Harris County Pollution Control, Environmental Institute of Houston, City of Houston-Health Department, City of Houston-Drinking Water Operations, Texas Research Institute for Environmental Studies, and the San Jacinto River Authority as well as H-GAC's Contract lab and TCEQ Region 12. Meeting notices will be sent to TCEQ, United States Geological Survey (USGS), Texas Parks and Wildlife, Texas Department of Health, GBEP, local universities, and other interested parties to invite input on monitoring discussions and strategies. Each agency/organization will be asked to send representatives from their field investigation staff and laboratory staff. The RMW will

discuss CRP monitoring tasks and deliverables, basin monitoring priorities, training, and upcoming projects. This workgroup is designed to function as the mechanism through which data management needs and priorities are discussed. The Performing Party will include meeting summaries in the corresponding quarterly Progress Report.

RMW meeting results will be presented to the CRP Steering Committee for review and concurrence with various basin interests. This review process will be used to assess the current monitoring plan and adjust regional monitoring strategies as needed.

Coordinated Monitoring Meeting - The Performing Party will hold an annual coordinated monitoring meeting as described in the FY2022-2023 CRP Guidance, in lieu of the spring RMW meeting. Qualified monitoring organizations will be invited to attend the working meeting in which monitoring needs and purposes will be discussed segment by segment and station by station. Information from participants and stakeholders will be used to select stations and parameters that will enhance overall water quality monitoring coverage, eliminate duplication of effort, and address basin priorities. A summary of the changes to the monitoring schedule will be provided to the participants within two weeks of the meeting. Changes to the monitoring schedule will be entered into the statewide Coordinated Monitoring Schedule (http://cms.lcra.org) and communicated to meeting attendees. Changes to monitoring schedules that occur during the year will be entered into the Coordinated Monitoring Schedule and communicated to meeting attendees. All requirements related to meetings will be followed and required meetings will be conducted in-person or via TCEQ approved virtual format.

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

Special Studies - Special studies are developed, as needed, based on local stakeholder input and the results of TCEQ or the Performing Party assessments. Status reports of each special study conducted will describe activities completed during the quarter. The status reports will be submitted along with the progress report. To help keep the public and basin stakeholders informed, the Performing Party's website will be updated in a timely manner to include key elements of special studies' reports or summaries (e.g., status reports, executive summary, maps, data analysis, final reports). Special studies will be coordinated with and approved by the TCEQ Project Manager prior to implementation.

<u>Special studies for the FY2022-2023 Contract biennium may include:</u>

Site Characterizations - Review of local monitoring data indicates there are many sites throughout the region where elevated levels of bacteria or low levels of dissolved oxygen are chronic conditions. Local entities have expressed interest in determining why these chronic conditions exist. Beginning with some of the most problematic sites, the Performing Party and other CRP partners may conduct "site specific" characterizations at future locations if determined necessary by data analysis. Habitat information, field verification of land cover, and identification of potential sources of

pollution will be determined. Additional monitoring data will be collected from these small sub-watersheds as needed to supply data to support TCEQ's assessment process. Data collected during these intensive surveys may be submitted at TCEQ's request. The Performing Party will also include summaries of any activities in the corresponding quarterly Progress Report.

A short report of approximately one to five pages in length along with photographs will be submitted following completion of each characterization assessment. The reports will be submitted to TCEQ to assist with determining the appropriate water quality strategies to be pursued. An appendix to the Multi-Basin QAPP will be developed to provide the details of these characterizations.

Deliverables and Dues Dates:

September 1, 2021 through August 31, 2022

A. Conduct water quality monitoring, summarize activities, and submit with Progress Report - December 15, 2021; March 15 and June 15, 2022;
B. RMW Meeting Notice – Two weeks in advance of RMW meetings;
C. Coordinated Monitoring Meeting - between March 15 and April 30, 2022;
D. Coordinated Monitoring Meeting Summary of Changes - within 2 weeks of the meeting;
E. Email notification that Coordinated Monitoring Schedule updates are complete – May 31, 2022;
F. Special Study Status Reports (if applicable) – December 15, 2021; March 15 and June 15, 2022; and
G. Site Characterization Reports (if applicable) – coordinate due date(s) with TCEQ Project Manager.

September 1, 2022 through August 31, 2023

A. Conduct water quality monitoring, summarize activities, and submit with Progress Report - September 15 and December 15, 2022; March 15 and June 15 and August 31, 2023;
B. RMW Meeting Notice – Two weeks in advance of RMW meetings;
C. Coordinated Monitoring Meeting - between March 15 and April 30, 2023;
D. Coordinated Monitoring Meeting Summary of Changes – within 2 weeks of the meeting;
E. Email notification that Coordinated Monitoring Schedule updates are complete - May 31, 2023;
F. Special Study Status Reports (if applicable) – September 15 and December 15, 2022; March 15, June 15, and August 31, 2023; and
G. Site Characterization Reports (if applicable) – coordinate due date(s) with TCEQ Project Manager.

Sample Design Rationale FY 2022

The sample design is based on the legislative intent of CRP. Under the legislation, the Basin Planning Agencies have been tasked with providing data to characterize water quality conditions in support of the Texas Water Quality Integrated Report, and to identify significant long-term water quality trends. Based on Steering Committee input, achievable water quality objectives and priorities and the identification of water quality issues are used to develop work plans which are in accord with available resources. As part of the Steering Committee process, the Houston-Galveston Area Council (H-GAC) coordinates closely with the TCEQ and other participants to ensure a comprehensive water monitoring strategy within the watershed.

Houston-Galveston Area Council (H-GAC): H-GAC conducts 20 routine quarterly monitoring events with flow measurements collected at all sites, whenever possible. All current routine sites, parameters, and monitoring efforts will continue into FY22. H-GAC also conducts 24-hour DO monitoring.

- **DROP** quarterly 24-hr DO monitoring from site 21965 – Spring Branch at Shaky Hollow.
- **ADD** quarterly 24-hr DO monitoring with flow measurements at site 16675 (1013C_01) – Unnamed Trib of Buffalo Bayou at Glenwood Cemetery. H-GAC will not collect field parameters or samples during these events.
- **ADD** quarterly 24-hr DO monitoring with flow measurements at site 11405 (1113A_01) – Armand Bayou above tidal at Fairmont Parkway – conducted. H-GAC will not collect field parameters or samples during these events.
- **DROPPED** three West Fork San Jacinto River flow monitoring stations – 11181, 11243, and 16626 from coordinated monitoring schedule in FY2021. However, sites were accidentally kept in Table B1.1 for that year.

Houston Health Department (HHD): Currently collect samples from 133 sites 6 times per year or approximately every other month. They intend to continue with all sites except they are having issues with a few sites.

- Site 16665 on Halls Bayou (1006J_01) has construction occurring upstream and adjacent to the waterway. Looking at photos taken during the last sampling run indicates it may be a Harris County Flood Control District (HCFCD) project. HHD will inquire with HCFCD regarding ditch #P118-14-00. There is still flow there but has been reduced significantly from past visits to the site. ***This investigation was completed and the site will continue into FY22.*** There will be six sampling events per year.
- Site 16663 on Spring Gully has been fenced off by Centerpoint Energy. HHD reached out to Centerpoint with the hope of getting continuing access. Centerpoint gave HHD a contact person for getting access each time they plan to sample that site. HHD will keep H-GAC informed about ongoing access. Frequency will remain at six events per year.
- Site 11369 on Greens Bayou has bridge construction blocking access. Also, there is a WWTF (WQ 0010495148 or TX0101460) on the northwest corner of the bridge. The address is 10545 Tidwell Rd, Houston, Casillas & Sims plotted the outfall position to determine if sampling was being conducted within a mixing zone or not. ***Investigation was completed and the distance is not an issue***. Sampling will continue at six events per year.
- ADD site 17487 on Willow Spring at Bandridge Road in Southeast Houston (1113D). Collect field parameters and lab samples six times per year.

San Jacinto River Authority (SJRA): Collects 19 sites in all – 10 sites on Lake Conroe and 9 sites in The Woodlands area. SJRA plans no changes to their monitoring sites, frequency, or parameter list. Sites where SJRA collects TKN and Chlorophyll *a* were confirmed.

Houston Drinking Water Operations (DWO): Collects samples from Lake Houston and the Lake Houston watershed. Some sites are monthly, some are every other month. DWO plans no changes to their monitoring sites, parameters, or frequencies. Sites where DWO collects TKN and Chlorophyll *a* were confirmed.

Harris County Pollution Control Services (HCPCS): Collects samples for San Jacinto River below the Lake Houston dam, to the Houston Ship Channel, side bays along the ship channel and Clear Lake area. HCPCS plans to keep all sites, parameters, and frequencies. Sites where DWO collects TKN and Chlorophyll *a* were confirmed.

Texas Research Institute for Environmental Studies (TRIES): Is contracted to collect 10 sites on the East Fork San Jacinto River, Winters Bayou, and a couple of other tributaries. Sites are monitored quarterly and there is no plan to change the sites, frequency, or parameters. There are no TKN nor Chlorophyll *a* samples collected at any of the 10 sites.

University of Houston-Clear Lake, Environmental Institute of Houston (EIH): is contracted to collect samples in Basin 8 (Cotton Bayou), Basin 9 (Cedar Bayou), Basin 11 (Galveston and Brazoria Counties), Basin 13 (Austin, Brazoria, Colorado, Wharton, and Matagorda Counties), and Basin 24 (Bays and Estuaries). Sites are routinely monitored on a quarterly basis except for Cotton Bayou which is sampled monthly. EIH also collects 24-hour DO and monthly flow monitoring at select locations.

- EIH will CONTINUE with quarterly 24-hour DO monitoring along with flow measurements (freshwater sites only) at:
    - Site 11490 (1110) – Oyster Creek immediately downstream of SH 35 west of Angleton
    - Site 11493 (1110) – Oyster Creek at FM 1462 west of Rosharon.
    - Site 21079 (0901A) – Cary Bayou immediately upstream of Raccooon Drive bridge in Baytown.
    - Site 22232 (0801E) – Cotton Bayou 10 meters upstream of I-10 westbound frontage road in Mont Belvieu

- EIH will ADD quarterly 24-hour DO monitoring along with routine field parameters, flow measurements, and lab parameters at:
    - Site 21734 (1105E) – Brushy Bayou at FM 213 (in Brazoria County).

- EIH will CONTINUE with monthly flow and field parameters during the 8 months that do not include quarterly routine sampling with lab samples at:
    - Site 18636 (1102G) – Unnamed trib of Marys Creek 8 meters downstream of Thalerfield Dr in Pearland.

- EIH will DROP monthly flow monitoring at:
    - Site 11491 (1110) – Oyster Creek at Sims Rd/ Brazoria CR 30 west of Angleton
    - Site 11493 (1110) – Oyster Creek at FM 1462 west of Rosharon.

- EIH DROPPED two quarterly monitoring sites in FY2021 when two other sites were picked up in their place. These two sites were accidentally kept in Table B1.1 for that year.
    - Site 11117 (0901) – Cedar Bayou tidal at IH 10 eastbound bridge south of Mont Belvieu east side of Bayou
    - Site 15951 (1304) – Caney Creek above tidal immediately upstream of FM457 in City of Cedar Lane

- EIH will CONTINUE with monthly routine monitoring with all field and lab parameters including flow, at:

- Site 22232 (0801E) – Cotton Bayou 10 meters upstream of I-10 westbound frontage road in Mont Belvieu.

Site Selection Criteria

This data collection effort involves monitoring routine water quality using procedures that are consistent with the TCEQ SWQM program. Some general guidelines are followed when selecting sampling sites, as outlined below, and discussed thoroughly in SWQM Procedures, Volumes I and II. Overall consideration is given to accessibility and safety. All monitoring activities have been developed in coordination with the CRP Steering Committee and with the TCEQ. The site selection criteria specified are those the TCEQ would like considered to produce data which is complementary to that collected by the state and which may be used in assessments, etc.

1. Locate stream sites so that samples can be safely collected from the centroid of flow. Centroid is defined as the midpoint of that portion of stream width which contains 50 percent of the total flow. If multiple potential sites on a stream segment are appropriate for monitoring, choose one that would best represent the water body, and not a site that displays unusual conditions or contaminant source(s). Avoid backwater areas or eddies when selecting a stream site.

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

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

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

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

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

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

Monitoring Sites for FY 2022

Monitoring Tables for FY 2022 are presented on the following page. These monitoring tables are modified annually.

Site Description	Station ID	Waterbody ID	Basin	Region	SE	CE	MT	Field	Conv	Bacteria	Flow	24 hr DO	Comments
ARMAND BAYOU AT FAIRMONT PARKWAY ALONG MEDIAN AT MIDPOINT BETWEEN BRIDGES	11405	1113A	11	12	HG	HG	BS				4	4	
UNNAMED TRIB OF BUFFALO BAYOU AT GLENWOOD CEMETARY RD 160 M W OF INTERSECT OF LUBBOCK ST AND SAWYER ST IN CENTRAL HOUSTON	16675	1013C	10	12	HG	HG	BS				4	4	
OYSTER CREEK IMMED. DOWNSTREAM OF SH 35 WEST OF ANGLETON	11490	1110	11	12	HG	UI	BS				4	4	
OYSTER CREEK AT FM 1462 WEST OF ROSHARON	11493	1110	11	12	HG	UI	BS				4	4	
CARY BAYOU IMMEDIATELY UPSTREAM OF RACCOON DRIVE BRIDGE IN BAYTOWN	21079	0901A	9	12	HG	UI	BS					4	Added in FY21 per assessor
COTTON BAYOU 10 METERS UPSTREAM OF WESTBOUND I-10 FRONTAGE ROAD IN MONT BELVIEU	22232	0801E	8	12	HG	UI	BS				4	4	Added in FY21 for City of Mont Belvieu
BRUSHY BAYOU AT FM213	21734	1105E	11	12	HG	UI	BS				4	4	Added in FY22 per assessor
SAN JACINTO RIVER TIDAL IMMEDIATELY DOWNSTREAM OF IH 10 BRIDGE EAST OF CHANNELVIEW	11193	1001	10	12	HG	HC	RT	12	12	12			
SAN JACINTO RIVER TIDAL 23 METERS SOUTH AND 735 METERS EAST OF INTERSECTION OF WALLISVILLE ROAD AND 7TH STREET	11198	1001	10	12	HG	HC	RT	12	12	12			
SAN JACINTO RIVER TIDAL IMMEDIATELY DOWNSTREAM OF US 90 BRIDGE EAST OF SHELDON	11200	1001	10	12	HG	HC	RT	12	12	12			
SAN JACINTO RIVER TIDAL AT MAGNOLIA GARDENS 1.78 KM UPSTREAM OF US BUS 90U/ BEAUMONT HIGHWAY IN HOUSTON	11201	1001	10	12	HG	HC	RT	12	12	12			

Site Description	Station ID	Waterbody ID	Basin	Region	SE	CE	MT	Field	Conv	Bacteria	Flow	24 hr DO	Comments
HOUSTON SHIP CHANNEL AT BAYTOWN TUNNEL/CM 103 1.84 KM NORTH AND 1.17 KM EAST OF INTERSECTION OF SH 225 AND SH 146	11254	1005	10	12	HG	HC	RT	12	12	12			
HOUSTON SHIP CHANNEL AT SAN JACINTO PK WEST OF THE BATTLESHIP TX 317 M N AND 303 M W OF INTERSECTION OF BATTLEGROUND RD AND MARKER DR	11264	1006	10	12	HG	HC	RT	12	12	12			
HOUSTON SHIP CHANNEL AT CONFLUENCE WITH GREENS BAYOU/CM 152	11271	1006	10	12	HG	HC	RT	12	12	12			
HOUSTON SHIP CHANNEL/BUFFALO BAYOU HSC AT WASHBURN TUNNEL	11283	1007	10	12	HG	HC	RT	12	12	12			
HSC/BUFFALO BAYOU IN TURNING BASIN 2.82 K UPSTREAM OF CONFLUENCE WITH BRAYS BAYOU 433 M S AND 182 M W OF INTERSECT OF SIGNET AND DORSETT	11292	1007	10	12	HG	HC	RT	12	12	12			
CLEAR LAKE AT SH 146 DRAWBRIDGE	13332	2425	24	12	HG	HC	RT	6	6	6			
TABBS BAY MIDWAY BETWEEN GOOSE CREEK AND UPPER HOG ISLAND	13338	2426	24	12	HG	HC	RT	6	6	6			
BLACK DUCK BAY AT MID BAY 0.6 KM NE OF SH 146 BRIDGE AND 0.6 KM SE OF END OF OKLAHOMA ST IN BAYTOWN	13340	2428	24	12	HG	HC	RT	6	6	6			
BURNETT BAY AT MID BAY 1.3 KM SSW OF CONFLUENCE WITH SPRING GULLY AND 1.6 KM SE OF LYNCHBURG ROAD	13344	2430	24	12	HG	HC	RT	6	6	6			
ARMAND BAYOU TIDAL 25 M WEST OF CLEAR LAKE PARK FISHING PIER IN MUD LAKE/PASADENA LAKE IN HARRIS COUNTY	15455	1113	11	12	HG	HC	RT	6	6	6			
CLEAR CREEK TIDAL AT THE CONFLUENCE WITH CLEAR LAKE 30 M NORTH AND 266 M WEST OF DAVIS ROAD AT VEGA COURT IN LEAGUE CITY IN HARRIS COUNTY	16573	1101	11	12	HG	HC	RT	6	6	6			
HOUSTON SHIP CHANNEL AT CARGILL TERMINAL NORTH OF TIDAL ROAD	16617	1006	10	12	HG	HC	RT	12	12	12			

Site Description	Station ID	Waterbody ID	Basin	Region	SE	CE	MT	Field	Conv	Bacteria	Flow	24 hr DO	Comments
HOUSTON SHIP CHANNEL W OF EXXON DOCKS AND N OF ALEXANDER ISLAND 316 M S AND 1.55 KM W OF INTERSECTION OF BAYWAY DR AND BAYTOWN AVE	16618	1005	10	12	HG	HC	RT	12	12	12	-		
HOUSTON SHIP CHANNEL AT LYNCHBURG FERRY INN SOUTH OF LYNCHBURG RD 658 M N AND 802 M E OF INTERSECTION OF BATTLEGROUND RD AND TIDAL RD	16619	1005	10	12	HG	HC	RT	12	12	12			
HOUSTON SHIP CHANNEL/BUFFALO BAYOU AT MAYO SHELL RD 1.42 KM S AND 41 M W OF INTERSECTION OF MAYO SHELL RD AND CLINTON DR IN HOUSTON	16620	1007	10	12	HG	HC	RT	12	12	12			
SAN JACINTO RIVER TIDAL AT CONFLUENCE WITH HSC 226 M S AND 1.07 KM W OF INTERSECTION OF S LYNCHBURG RD AND POQUENO RD IN HOUSTON	16621	1005	10	12	HG	HC	RT	12	12	12			
SAN JACINTO RIVER TIDAL AT BANANA BEND ROAD AT END OF PAVEMENT IN HOUSTON	16622	1001	10	12	HG	HC	RT	12	12	12			
SAN JACINTO RIVER TIDAL MID STREAM AT TERMINUS OF SHADY LANE IN CHANNELVIEW 9 M S AND 648 M W OF INTERSECTION OF SHADY LN AND PARK DR	17919	1001	10	12	HG	HC	RT	12	12	12			
CRYSTAL BAY IN BAYTOWN 383 METERS WEST AND 137 METERS SOUTH OF THE INTERSECTION OF BAYSHORE DRIVE AND CROW ROAD	17921	2430A	24	12	HG	HC	RT	6	6	6			
SCOTT BAY 1.2 KM SW OF INTERSECTION OF BAYWAY DRIVE AND PARK STREET IN BAYTOWN	17922	2429	24	12	HG	HC	RT	6	6	6			
UPPER SAN JACINTO BAY UNDERNEATH ELECTRICAL TRANSMISSION LINES 2.1 KM E/NE OF INTERSECTION OF MILLER CUTOFF RD AND OLD CLARK RD	17923	2427	24	12	HG	HC	RT	6	6	6			

Site Description	Station ID	Waterbody ID	Basin	Region	SE	CE	MT	Field	Conv	Bacteria	Flow	24 hr DO	Comments
LOWER SAN JACINTO BAY MID CHANNEL SOUTH OF SH 146 1 KM NE OF INTERSECTION OF SH 225 AND STRANG ROAD IN LAPORTE	17924	2427	24	12	HG	HC	RT	6	6	6			
BARBOUR'S CUT NEAR NORTH BANK 0.5 KM NNW OF THE INTERSECTION OF BARBOURS CUT BLVD AND MAPLE ST	17925	2436	24	12	HG	HC	RT	6	6	6			
GOOSE CREEK NEAR SH 146 340 M SOUTH OF THE INTERSECTION OF SH 146 AND WEST MAIN IN BAYTOWN	17927	2426C	24	12	HG	HC	RT	6	6	6			
HARRIS COUNTY FLOOD CONTROL DITCH A TRIBUTARY TO TAYLOR BAYOU 385 M UPSTREAM OF CONFLUENCE WEST OF SH 146 AT PORT ROAD IN HARRIS COUNTY	20012	2425E	24	12	HG	HC	RT	6	6	6			
TAYLOR BAYOU MID CHANNEL 400 M DOWNSTREAM OF PORT ROAD BRIDGE IN HARRIS COUNTY	20013	2425A	24	12	HG	HC	RT	6	6	6			
CLEAR LAKE UNNAMED INLET 115 M SOUTHWEST OF THE INTERSECTION OF NASA ROAD 1 AND OCEANVIEW DRIVE IN SEABROOK IN HARRIS COUNTY	20014	2425	24	12	HG	HC	RT	6	6	6			
TAYLOR LAKE MID LAKE AT BLUE WINDOWS 230 M SOUTH OF LAKEWAY DRIVE AT RAY SHELL COURT/HARBOR COVE CIRCLE IN HARRIS COUNTY	20015	2425A	24	12	HG	HC	RT	6	6	6			
CARPENTERS BAYOU AT MOUTH OF BARGE CANAL 32 METERS WEST AND 666 METERS SOUTH FROM THE INTERSECTION OF DE ZAVALLA ROAD AND HARDING ROAD/HARDING STREET IN HARRIS COUNTY	20797	1006	10	12	HG	HC	RT	12	12	12			
BUFFALO BAYOU IMMEDIATELY DOWNSTREAM OF GREEN BUSH ROAD 3.1 MILES SOUTHEAST OF KATY	11145	1014B	10	12	HG	HG	RT	4	4	4	4		
CANEY CREEK IMMEDIATELY UPSTREAM OF FM 2090 WEST OF SPLENDORA	11335	1010	10	12	HG	HG	RT	4	4	4	4		

Site Description	Station ID	Waterbody ID	Basin	Region	SE	CE	MT	Field	Conv	Bacteria	Flow	24 hr DO	Comments
LAKE CREEK AT EGYPT COMMUNITY ROAD 8.3 MILES SOUTHWEST OF CONROE	11367	1015	10	12	HG	HG	RT	4	4	4	4		
EAST FORK SAN JACINTO RIVER IMMEDIATELY DOWNSTREAM OF SH 150 WEST OF COLDSPRING	17431	1003	10	10	HG	HG	RT	4	4	4	4		
MOUND CREEK 167 METERS DOWNSTREAM OF MULLIGAN ROAD 1.35 KM UPSTREAM OF CONFLUENCE WITH LAKE CREEK	17937	1015A	10	12	HG	HG	RT	4	4	4	4		
LAKE CREEK AT SH 105 1.0 KM NORTHEAST OF FM 1486 NEAR DOBBIN AND 8.0 KM WEST OF MONTGOMERY TEXAS	18192	1015	10	12	HG	HG	RT	4	4	4	4		
SPRING CREEK AT ROBERTS CEMETERY ROAD WEST-NORTHWEST OF TOMBALL	18868	1008	10	12	HG	HG	RT	4	4	4	4		
CANEY CREEK AT FIRETOWER ROAD WEST TO THE CITY OF WOODBRANCH	20452	1010	10	12	HG	HG	RT	4	4	4	4		
CANEY CREEK AT COUNTY LINE ROAD IN MONTGOMERY COUNTY EAST TO THE CITY OF WILLIS	20453	1010	10	12	HG	HG	RT	4	4	4	4		
PEACH CREEK AT COUNTY LINE ROAD-FM 3081 NORTHEAST OF CONROE IN MONTGOMERY COUNTY	20454	1011	10	12	HG	HG	RT	4	4	4	4		
LITTLE CYPRESS CREEK AT MUESCHKE ROAD 4.4 KILOMETERS NORTH OF SH 290 NORTHWEST OF CYPRESS	20456	1009E	10	12	HG	HG	RT	4	4	4	4		
CYPRESS CREEK AT KATY HOCKLEY ROAD 7 KILOMETERS SOUTH OF SH 290 WEST OF CYPRESS	20457	1009	10	12	HG	HG	RT	4	4	4	4		
WALNUT CREEK AT DECKER PRAIRIE ROSEHL ROAD NORTHWEST OF TOMBALL	20462	1008I	10	12	HG	HG	RT	4	4	4	4		
BRUSHY CREEK AT GLENMONT ESTATES BOULEVARD 265 METERS NORTH AND 35 METERS WEST TO THE INTERSECTION OF ARNDT LANE AND ANN CIRCLE WEST OF TOMBALL	20463	1008J	10	12	HG	HG	RT	4	4	4	4		

Site Description	Station ID	Waterbody ID	Basin	Region	SE	CE	MT	Field	Conv	Bacteria	Flow	24 hr DO	Comments
HORSEPEN CREEK AT FM 529 1.9 KILOMETERS EAST OF SH 6 NORTHWEST OF HOUSTON	20465	1014C	10	12	HG	HG	RT	4	4	4	4		
TARKINGTON BAYOU AT SH 105/SH 321 SOUTHEAST OF CLEVELAND	20466	1002A	10	12	HG	HG	RT	4	4	4	4		
WHITE OAK CREEK AT MEMORIAL DRIVE IN CONROE	20731	1004J	10	12	HG	HG	RT	4	4	4	4		
WINTERS BAYOU AT TONY TAP ROAD NEAR CLEVELAND	21417	1003A	10	10	HG	HG	RT	4	4	4	4		
MILL CREEK AT FM 149 NORTH OF TOMBALL	21957	1008A	10	12	HG	HG	RT	4	4	4	4		
SPRING BRANCH IMMEDIATELY DOWNSTREAM OF SHAKEY HOLLOW WEST OF WOODBRANCH VILLAGE IN MONTGOMERY COUNTY	21965	1010C	10	12	HG	HG	RT	4	4	4	4		
GARNERS BAYOU AT NORTH SAM HOUSTON PARKWAY/SH LOOP 8 NE OF HOUSTON	11125	1016A	10	12	HG	HH	RT	6	6	6	6		Flow from gage 8074250
HALLS BAYOU AT JENSEN DRIVE IN HOUSTON	11126	1006D	10	12	HG	HH	RT	6	6	6	6		Flow from gage 8076500.
HALLS BAYOU 87 METERS UPSTREAM OF TIDWELL ROAD IN SETTEGAST	11127	1006D	10	12	HG	HH	RT	6	6	6			
HUNTING BAYOU IMMEDIATELY DOWNSTREAM OF IH 10 EAST OF HOUSTON	11128	1007R	10	12	HG	HH	RT	6	6	6			
HUNTING BAYOU AT NORTH LOOP EAST/IH 610 IN HOUSTON	11129	1007R	10	12	HG	HH	RT	6	6	6	6		Flow from gage 8075770.
SIMS BAYOU AT TELEPHONE ROAD/SH 35 IN HOUSTON	11132	1007D	10	12	HG	HH	RT	6	6	6	6		Flow from gage 8075500.
SIMS BAYOU AT CULLEN BLVD/FM 865 SOUTH OF HOUSTON	11133	1007D	10	12	HG	HH	RT	6	6	6			

Site Description	Station ID	Waterbody ID	Basin	Region	SE	CE	MT	Field	Conv	Bacteria	Flow	24 hr DO	Comments
SIMS BAYOU AT HIRAM CLARKE RD IN HOUSTON	11135	1007D	10	12	HG	HH	RT	6	6	6	6		Flow from gage 8075400.
BRAYS BAYOU IMMEDIATELY DOWNSTREAM OF ALMEDA ROAD SOUTHWEST OF HOUSTON	11138	1007B	10	12	HG	HH	RT	6	6	6			
BRAYS BAYOU AT SOUTH MAIN ST IN HOUSTON	11139	1007B	10	12	HG	HH	RT	6	6	6	6		Flow from gage 8075000.
BRAYS BAYOU AT SOUTH GESSNER DRIVE IN HOUSTON	11140	1007B	10	12	HG	HH	RT	6	6	6	6		Flow from gage 8074810
LITTLE WHITE OAK BAYOU AT TRIMBLE STREET/NORTH EDGE OF HOLLYWOOD CEMETERY IN HOUSTON	11148	1013A	10	12	HG	HH	RT	6	6	6	6		Flow from gage 8074540.
VOGEL CREEK IMMEDIATELY DOWNSTREAM OF WEST LITTLE YORK ROAD	11155	1017C	10	12	HG	HH	RT	6	6	6			
ROLLING FORK CREEK IMMEDIATELY DOWNSTREAM OF LAKE LANE	11157	1017F	10	12	HG	HH	RT	6		6			
SOUTH MAYDE CREEK IMMEDIATELY DOWNSTREAM OF MEMORIAL DRIVE	11163	1014H	10	12	HG	HH	RT	6	6	6			
BRAYS/KEEGANS BAYOU IMMEDIATELY DOWNSTREAM OF ROARK ROAD NEAR US 59 AT BELTWAY 8 IN SOUTHWEST HOUSTON	11169	1007C	10	12	HG	HH	RT	6	6	6	6		Flow from gage 8074800
LITTLE VINCE BAYOU IMMEDIATELY DOWNSTREAM OF NORTH MAIN STREET IN PASADENA TX	11172	1007	10	12	HG	HH	RT	6	6	6			
WILLOW CREEK IMMEDIATELY UPSTREAM OF GOSLING ROAD	11185	1008H	10	12	HG	HH	RT	6	6	6			
RUMMEL CREEK IMMEDIATELY DOWNSTREAM OF MEMORIAL DRIVE IN WEST HOUSTON	11188	1014N	10	12	HG	HH	RT	6	6	6			

Site Description	Station ID	Waterbody ID	Basin	Region	SE	CE	MT	Field	Conv	Bacteria	Flow	24 hr DO	Comments
GREENS BAYOU IMMEDIATELY DOWNSTREAM OF GREEN RIVER ROAD/LEY ROAD IN HOUSTON	11279	1006	10	12	HG	HH	RT	6	6	6	6		Flow from gage 8076700
HUNTING BAYOU TIDAL AT FEDERAL ROAD BRIDGE IN HOUSTON	11298	1007	10	12	HG	HH	RT	6	6	6			
SIMS BAYOU TIDAL IMMEDIATELY DOWNSTREAM OF LAWNDALE AVENUE IN HOUSTON	11302	1007	10	12	HG	HH	RT	6	6	6			
BRAYS BAYOU TIDAL AT 75TH STREET IN HOUSTON	11306	1007	10	12	HG	HH	RT	6	6	6			
BRAYS BAYOU TIDAL AT SCOTT STREET IN HOUSTON	11309	1007	10	12	HG	HH	RT	6	6	6			
SPRING CREEK IMMEDIATELY DOWNSTREAM OF RILEY FUZZEL ROAD	11312	1008	10	12	HG	HH	RT	6	6	6	6		Flow from gage 8068520
SPRING CREEK 1.13 KM UPSTREAM OF SH 249 NEAR DRAGONFLY RD IN SPRING CREEK PARK	11315	1008	10	12	HG	HH	RT	6	6	6			
SPRING CREEK IMMEDIATELY UPSTREAM OF DECKER PRAIRIE ROSEHILL ROAD	11323	1008	10	12	HG	HH	RT	6	6	6			
CYPRESS CREEK AT STEUBNER-AIRLINE ROAD IN HOUSTON	11330	1009	10	12	HG	HH	RT	6	6	6	6		Flow from gage 8068900
CYPRESS CREEK AT SH 249	11331	1009	10	12	HG	HH	RT	6	6	6			
CYPRESS CREEK IMMEDIATELY DOWNSTREAM OF GRANT ROAD NEAR CYPRESS	11332	1009	10	12	HG	HH	RT	6	6	6	6		Flow from gage 8068800
CYPRESS CREEK IMMEDIATELY DOWNSTREAM OF HOUSE HAHL ROAD NEAR CYPRESS	11333	1009	10	12	HG	HH	RT	6	6	6	6		Flow from gage 8068740
BUFFALO BAYOU TIDAL AT MCKEE ST IN HOUSTON	11345	1013	10	12	HG	HH	RT	6	6	6			
BUFFALO BAYOU TIDAL IMMEDIATELY DOWNSTREAM OF MAIN STREET IN HOUSTON	11347	1013	10	12	HG	HH	RT	6	6	6	6		Flow from gage 8074600

Site Description	Station ID	Waterbody ID	Basin	Region	SE	CE	MT	Field	Conv	Bacteria	Flow	24 hr DO	Comments
BUFFALO BAYOU TIDAL AT SHEPHERD DRIVE IN HOUSTON	11351	1013	10	12	HG	HH	RT	6	6	6	6		Flow from gage 8074000
BUFFALO BAYOU AT VOSS ROAD	11356	1014	10	12	HG	HH	RT	6	6	6			
BUFFALO BAYOU IMMEDIATELY DOWNSTREAM OF WEST BELTWAY 8 IN HOUSTON	11360	1014	10	12	HG	HH	RT	6	6	6	6		Flow from gage 8073600
BUFFALO BAYOU AT WILCREST DRIVE IN HOUSTON	11361	1014	10	12	HG	HH	RT	6	6	6			
BUFFALO BAYOU IMMEDIATELY DOWNSTREAM OF DAIRY ASHFORD ROAD WEST OF HOUSTON	11362	1014	10	12	HG	HH	RT	6	6	6	6		Flow from gage 8073500
BUFFALO BAYOU AT ELDRIDGE ROAD IN HOUSTON	11363	1014	10	12	HG	HH	RT	6	6	6			
BUFFALO BAYOU AT SH 6	11364	1014	10	12	HG	HH	RT	6	6	6	6		Flow from gage 8072500
GREENS BAYOU AT TIDWELL ROAD IN HARRIS CO	11369	1016	10	12	HG	HH	RT	6	6	6			Reduced frequency in FY2020
GREENS BAYOU IMMEDIATELY DOWNSTREAM OF MT HOUSTON PARKWAY	11370	1016	10	12	HG	HH	RT	6	6	6			
GREENS BAYOU AT US 59 NORTH OF HOUSTON	11371	1016	10	12	HG	HH	RT	6	6	6			
GREENS BAYOU AT WEST GREENS PARKWAY	11376	1016	10	12	HG	HH	RT	6	6	6			
WHITEOAK BAYOU AT NORTH SHEPHERD STREET IN HOUSTON	11389	1017	10	12	HG	HH	RT	6	6	6			
WHITEOAK BAYOU AT NORTH HOUSTON ROSSLYN ROAD	11394	1017	10	12	HG	HH	RT	6	6	6			
WHITEOAK BAYOU IMMEDIATELY DOWNSTREAM OF TAHOE DRIVE	11396	1017	10	12	HG	HH	RT	6	6	6			
ARMAND BAYOU AT GENOA-RED BLUFF RD NE OF ELLINGTON AFB	11404	1113A	11	12	HG	HH	RT	6	6	6			

Site Description	Station ID	Waterbody ID	Basin	Region	SE	CE	MT	Field	Conv	Bacteria	Flow	24 hr DO	Comments
ARMAND BAYOU AT FAIRMONT PARKWAY ALONG MEDIAN AT MIDPOINT BETWEEN BRIDGES	11405	1113A	11	12	HG	HH	RT	6	6	6			
ARMAND BAYOU TIDAL AT BAY AREA BLVD NORTH OF NASA AT MIDDLE OF MEDIAN BETWEEN 2 BRIDGES EASTERN SHORE	11503	1113	11	12	HG	HH	RT	6	6	6			
GREENS BAYOU 184 METERS DOWNSTREAM OF KNOBCREST DRIVE	13778	1016	10	12	HG	HH	RT	6	6	6	6		Flow from gage 8075900
LITTLE CYPRESS CREEK IMMEDIATELY DOWNSTREAM OF KLUGE ROAD IN HOUSTON	14159	1009E	10	12	HG	HH	RT	6	6	6			
WHITEOAK BAYOU IMMEDIATELY DOWNSTREAM OF WEST 43RD STREET IN NORTHWEST HOUSTON	15829	1017	10	12	HG	HH	RT	6	6	6			
WHITEOAK BAYOU AT WEST TIDWELL ROAD IN NORTHWEST HOUSTON	15831	1017	10	12	HG	HH	RT	6	6	6			
BUFFALO BAYOU TIDAL IMMEDIATELY UPSTREAM OF JENSEN DRIVE IN HOUSTON	15841	1007	10	12	HG	HH	RT	6	6	6			
BUFFALO BAYOU TIDAL AT SABINE STREET NORTH OF ALLEN PARKWAY IN HOUSTON	15843	1013	10	12	HG	HH	RT	6	6	6			
BUFFALO BAYOU AT CHIMNEY ROCK ROAD IN HOUSTON	15845	1014	10	12	HG	HH	RT	6	6	6			
BUFFALO BAYOU IMMEDIATELY DOWNSTREAM OF BRIAR FOREST DRIVE IN WEST HOUSTON	15846	1014	10	12	HG	HH	RT	6	6	6			
TURKEY CREEK IMMEDIATELY DOWNSTREAM OF MEMORIAL DRIVE IN WEST HOUSTON	15847	1014K	10	12	HG	HH	RT	6	6	6			
BRAYS BAYOU IMMEDIATELY DOWNSTREAM OF SH 6 IN WEST HOUSTON	15848	1007B	10	12	HG	HH	RT	6	6	6			
BRAYS BAYOU AT DAIRY ASHFORD STREET IN WEST HOUSTON	15850	1007B	10	12	HG	HH	RT	6	6	6			
BRAYS BAYOU AT WILCREST DRIVE IN WEST HOUSTON	15851	1007B	10	12	HG	HH	RT	6	6	6			

Site Description	Station ID	Waterbody ID	Basin	Region	SE	CE	MT	Field	Conv	Bacteria	Flow	24 hr DO	Comments
BRAYS BAYOU IMMEDIATELY DOWNSTREAM OF BEECHNUT STREET IN WEST HOUSTON	15852	1007B	10	12	HG	HH	RT	6	6	6			
BRAYS BAYOU IMMEDIATELY DOWNSTREAM OF HILLCROFT STREET IN WEST HOUSTON	15853	1007B	10	12	HG	HH	RT	6	6	6			
BRAYS BAYOU IMMEDIATELY DOWNSTREAM OF SOUTH RICE AVENUE IN WEST HOUSTON	15854	1007B	10	12	HG	HH	RT	6	6	6			
BRAYS BAYOU IMMEDIATELY DOWNSTREAM OF STELLA LINK ROAD IN HOUSTON	15855	1007B	10	12	HG	HH	RT	6	6	6			
HALLS BAYOU AT HOMESTEAD ROAD IN NORTHEAST HOUSTON	15862	1006D	10	12	HG	HH	RT	6	6	6			
HALLS BAYOU AT HIRSCH RD IN NORTHEAST HOUSTON	15863	1006D	10	12	HG	HH	RT	6	6	6			
HALLS BAYOU AT MESA DR IN NORTHEAST HOUSTON	15864	1006D	10	12	HG	HH	RT	6	6	6			
HUNTING BAYOU AT JENSEN DRIVE IN NORTHEAST HOUSTON	15867	1007R	10	12	HG	HH	RT	6	6	6			
HUNTING BAYOU AT CAVALCADE ST IN NORTHEAST HOUSTON	15869	1007R	10	12	HG	HH	RT	6	6	6			
HUNTING BAYOU AT LOCKWOOD DRIVE IN NORTHEAST HOUSTON	15873	1007R	10	12	HG	HH	RT	6	6	6			
SIMS BAYOU IMMEDIATELY DOWNSTREAM OF ALMEDA ROAD IN SOUTH HOUSTON	15876	1007D	10	12	HG	HH	RT	6	6	6			
SIMS BAYOU AT MARTIN LUTHER KING JUNIOR BOULEVARD IN SOUTH HOUSTON	15877	1007D	10	12	HG	HH	RT	6	6	6	6		Flow from gage 8075470
SIMS BAYOU AT SWALLOW STREET IN SOUTHEAST HOUSTON	15878	1007D	10	12	HG	HH	RT	6	6	6			
BRAYS BAYOU AT SOUTH WAYSIDE DRIVE 802 METERS UPSTREAM OF IH 45 IN SOUTHEAST HOUSTON	16479	1007	10	12	HG	HH	RT	6	6	6			

Site Description	Station ID	Waterbody ID	Basin	Region	SE	CE	MT	Field	Conv	Bacteria	Flow	24 hr DO	Comments
GARNERS BAYOU IMMEDIATELY UPSTREAM OF OLD HUMBLE ROAD AT CONFLUENCE WITH RIENHARDT BAYOU IN NORTHEAST HOUSTON	16589	1016A	10	12	HG	HH	RT	6	6	6			
UNNAMED TRIBUTARY OF GREENS BAYOU AT MESA DR/E. HOUSTON-DYERSDALE ROAD IN NORTHEAST HOUSTON	16590	1016B	10	12	HG	HH	RT	6	6	6			
SPRING BRANCH CREEK IMMEDIATELY UPSTREAM OF WIRT ROAD 331 METERS DOWNSTREAM OF IH 10 IN WEST HOUSTON	16592	1014O	10	12	HG	HH	RT	6	6	6			
COLE CREEK IMMEDIATELY UPSTREAM OF BOLIVIA BLVD 792 METERS UPSTREAM OF CONFLUENCE WITH WHITEOAK BAYOU IN NW HOUSTON	16593	1017B	10	12	HG	HH	RT	6	6	6			
BRICKHOUSE GULLY AT US 290 IN NORTHWEST HOUSTON 2.03 KM UPSTREAM OF CONFLUENCE WITH WHITEOAK BAYOU	16594	1017A	10	12	HG	HH	RT	6		6	6		Flow from gage 8074250
UNNAMED TRIBUTARY OF WHITE OAK BAYOU AT W 14TH IN WEST HOUSTON 516 METERS UPSTREAM OF CONFLUENCE WITH WHITE OAK BAYOU	16596	1017E	10	12	HG	HH	RT	6	6	6			
NEWMAN BRANCH / NEIMANS BAYOU AT MEMORIAL DRIVE IN WEST HOUSTON	16597	1014M	10	12	HG	HH	RT	6	6	6			
LITTLE WHITE OAK BAYOU AT WHITE OAK DRIVE IN NORTH HOUSTON	16648	1013A	10	12	HG	HH	RT	6	6	6			
COUNTRY CLUB BAYOU/TRIBUTARY OF BRAYS BAYOU IMMEDIATELY UPSTREAM OF SOUTH WAYSIDE DRIVE/US90A IN CENTRAL HOUSTON	16650	1007K	10	12	HG	HH	RT	6	6	6			
COUNTRY CLUB BAYOU/TRIBUTARY OF BRAYS BAYOU AT HUGHES STREET IN CENTRAL HOUSTON	16651	1007K	10	12	HG	HH	RT	6	6	6			
WILLOW WATERHOLE AT MCDERMED DRIVE IN SOUTHWEST HOUSTON	16652	1007E	10	12	HG	HH	RT	6		6			

Site Description	Station ID	Waterbody ID	Basin	Region	SE	CE	MT	Field	Conv	Bacteria	Flow	24 hr DO	Comments
KUHLMAN GULLY/TRIBUTARY OF BRAYS BAYOU AT BROCK STREET 311 METERS UPSTREAM OF WHEELER STREET IN SOUTHEAST CENTRAL HOUSTON	16653	1007G	10	12	HG	HH	RT	6	6	6			
UNNAMED TRIBUTARY OF BRAYS BAYOU AT DUMFRIES DRIVE IN SOUTH WEST HOUSTON	16654	1007L	10	12	HG	HH	RT	6	6	6			
UNNAMED TRIBUTARY OF SIMS BAYOU AT DULCIMER STREET IN SOUTH HOUSTON	16655	1007N	10	12	HG	HH	RT	6	6	6			
SIMS BAYOU SOUTH BRANCH AT TIFFANY DRIVE IN SOUTH HOUSTON	16656	1007A	10	12	HG	HH	RT	6		6			
UNNAMED TRIBUTARY OF HUNTING BAYOU IMMEDIATELY UPSTREAM OF JOHN RALSTON ROAD IN EAST HOUSTON	16657	1007M	10	12	HG	HH	RT	6		6			
PLUM CREEK/TRIBUTARY OF SIMS BAYOU AT OLD GALVESTON ROAD IN SOUTH EAST HOUSTON	16658	1007I	10	12	HG	HH	RT	6	6	6			
PINE GULLY/TRIBUTARY OF SIMS BAYOU AT OLD GALVESTON ROAD IN SOUTH EAST HOUSTON	16659	1007H	10	12	HG	HH	RT	6	6	6			
BERRY BAYOU/TRIBUTARY OF SIMS BAYOU IMMEDIATELY UPSTREAM OF AHRENS DRIVE IN SOUTH EAST HOUSTON	16660	1007	10	12	HG	HH	RT	6	6	6			
BERRY BAYOU IMMEDIATELY UPSTREAM OF SOUTH RICHEY STREET IN SOUTH EAST HOUSTON	16661	1007F	10	12	HG	HH	RT	6	6	6			
BIG GULCH AT WALLISVILLE ROAD IN EAST HOUSTON	16662	1006F	10	12	HG	HH	RT	6		6			
SPRING GULLY AT WEST TERMINUS OF BARNESWORTH DRIVE IN NORTHEAST HOUSTON	16663	1006H	10	12	HG	HH	RT	6	6	6			
GOODYEAR CREEK TIDAL IMMEDIATELY UPSTREAM OF IH 10 IN EAST HOUSTON	16664	1006	10	12	HG	HH	RT	6	6	6			
UNNAMED TRIBUTARY OF HALLS BAYOU IMMEDIATELY DOWNSTREAM OF LANGLEY ROAD IN NORTH HOUSTON	16665	1006J	10	12	HG	HH	RT	6	6	6			

Site Description	Station ID	Waterbody ID	Basin	Region	SE	CE	MT	Field	Conv	Bacteria	Flow	24 hr DO	Comments
UNNAMED TRIBUTARY OF HALLS BAYOU AT TALTON STREET IN NORTH EAST HOUSTON	16666	1006I	10	12	HG	HH	RT	6		6			
UNNAMED TRIBUTARY OF HALLS BAYOU AT WOODLYN ROAD IN NORTH EAST HOUSTON	16667	1006I	10	12	HG	HH	RT	6		6			
UNNAMED TRIB OF BUFFALO BAYOU NEAR GLENWOOD CEMETARY ST 120 METERS SOUTH AND 110 METERS WEST OF INTERSECTION OF LUBBOCK ST AND WEST SAWYER ST IN CENTRAL HOUSTON	16675	1013C	10	12	HG	HH	RT	6	6	6			
UNNAMED TRIBUTARY OF GREENS BAYOU AT SMITH RD IN NORTHEAST HOUSTON	16676	1016D	10	12	HG	HH	RT	6	6	6			
SPRING GULLY AT SPRING CREEK OAKS DRIVE IN TOMBALL	17481	1009D	10	12	HG	HH	RT	6	6	6			
LANGHAM CREEK AT SH 6 IN NORTHWEST HOUSTON	17482	1014E	10	12	HG	HH	RT	6	6	6	6		Flow from gage 8072760
BEAR CREEK AT OLD GREENHOUSE ROAD WEST OF HOUSTON	17484	1014A	10	12	HG	HH	RT	6	6	6			
UNNAMED TRIBUTARY OF HORSEPEN BAYOU TIDAL AT PENN HILLS	17485	1113C	11	12	HG	HH	RT	6	6	6			
BIG ISLAND SLOUGH AT HILLRIDGE ROAD IN SOUTHEAST HOUSTON	17486	1113E	11	12	HG	HH	RT	6	6	6			
WILLOW SPRING AT BANDRIDGE ROAD IN SOUTHEAST HOUSTON	17487	1113D	11	12	HG	HH	RT	6	6	6			
SPRING CREEK IMMEDIATELY DOWNSTREAM OF KUYKENDAHL ROAD NORTHEAST OF HOUSTON	17489	1008	10	12	HG	HH	RT	6	6	6			
HALLS BAYOU AT AIRLINE ROAD IN NORTH HOUSTON	17490	1006D	10	12	HG	HH	RT	6	6	6			
HALLS BAYOU AT DEER TRAIL DRIVE IN NORTH HOUSTON	17491	1006D	10	12	HG	HH	RT	6	6	6	6		Flow from gage 8076200
BUFFALO BAYOU AT SOUTH MASON ROAD WEST OF HOUSTON	17492	1014B	10	12	HG	HH	RT	6	6	6			

Site Description	Station ID	Waterbody ID	Basin	Region	SE	CE	MT	Field	Conv	Bacteria	Flow	24 hr DO	Comments
MASON CREEK 151 METERS DOWNSTREAM OF PARK PINE DRIVE WEST OF HOUSTON	17494	1014L	10	12	HG	HH	RT	6	6	6			
GREENS BAYOU IMMEDIATELY UPSTREAM OF MILLS ROAD WEST OF HOUSTON	17495	1016	10	12	HG	HH	RT	6	6	6			
FAULKEY GULLY OF CYPRESS CREEK 105 METERS DOWNSTREAM OF LAKEWOOD FOREST DRIVE NORTHWEST OF HOUSTON	17496	1009C	10	12	HG	HH	RT	6	6	6			
SIMS BAYOU UPSTREAM TIDAL AT SOUTH POST OAK ROAD IN SOUTHWEST HOUSTON	17976	1007D	10	12	HG	HH	RT	6	6	6			
UNNAMED TRIBUTARY OF BUFFALO BAYOU IMMEDIATELY DOWNSTREAM OF EMILE ST ON NORTH BANK 120 M SOUTH OF CLINTON DRIVE IN CENTRAL HOUSTON	17977	1007O	10	12	HG	HH	RT	6	6	6			
UNNAMED TRIBUTARY OF HUNTING BAYOU AT MINDEN STREET APPROXIMATELY 0.3 KM EAST OF LOCKWOOD AND S OF N 610 LOOP EAST	18689	1007V	10	12	HG	HH	RT	6		6			
BINTLIFF DITCH TRIBUTARY OF BRAYS BAYOU UNDER CENTER OF BISSONNET ST BRIDGE 317 M NE OF BISSONNET AT FONDREN RD IN SW HOUSTON	18690	1007T	10	12	HG	HH	RT	6		6			
MIMOSA DITCH TRIBUTARY OF BRAYS BAYOU AT NEWCASTLE DR IN SOUTHWEST HOUSTON	18691	1007U	10	12	HG	HH	RT	6		6			
POOR FARM DITCH TRIBUTARY OF BRAYS BAYOU AT EASTBOUND NORTH BRAESWOOD BLVD APPROX 200 M E OF BUFFALO SPEEDWAY IN SW HOUSTON	18692	1007S	10	12	HG	HH	RT	6		6			
KEEGAN'S BAYOU AT SYNOTT ROAD 1.1 KM SOUTH OF THE INTERSECTION OF SYNOTT ROAD AND BISSONET STREET IN SOUTHWEST HOUSTON	20211	1007C	10	12	HG	HH	RT	6	6	6			

Site Description	Station ID	Waterbody ID	Basin	Region	SE	CE	MT	Field	Conv	Bacteria	Flow	24 hr DO	Comments
BUFFALO BAYOU NORTH SHORE IMMEDIATELY UNDERNEATH THE SOUTHBOUND FEEDER ROAD BRIDGE OF IH 610 WEST IN HOUSTON	20212	1014	10	12	HG	HH	RT	6	6	6			
WILLOW CREEK AT TUWA ROAD APPROXIMATELY 859 METERS DOWNSTREAM OF FM 2920 ROAD IN NORTHERN HARRIS COUNTY	20730	1008H	10	12	HG	HH	RT	6	6	6			
SIMS BAYOU AT GALVESTON ROAD IN HOUSTON	20736	1007	10	12	HG	HH	RT	6	6	6			
GREENS BAYOU AT WALLISVILLE ROAD APPROX 150 METERS NORTHEAST OF THE INTERSECTION OF DATTNER ROAD AND WALLISVILLE ROAD IN HOUSTON	21008	1006	10	12	HG	HH	RT	6	6	6			
HARRIS COUNTY FLOOD CONTROL DISTRICT CHANNEL D138 / CHIMNEY DITCH IMMEDIATELY UPSTREAM OF CAVERSHAM DRIVE BETWEEN THE NORTHBOUND AND SOUTHBOUND SECTIONS OF CHIMNEY ROCK ROAD IN HOUSTON	21180	1007W	10	12	HG	HH	RT	6	6	6			
SOUTH MAYDE CREEK AT SOUTH PARK VIEW DRIVE WEST OF HOUSTON	21813	1014H	10	12	HG	HH	RT	6	6	6			
UNNAMED TRIBUTARY OF GREENS BAYOU AT ALDINE WESTFIELD RD	22090	1016C	10	12	HG	HH	RT	6	6	6			
UNNAMED TRIBUTARY OF WHITE OAK BAYOU 18 METERS SOUTH AND 18 METERS WEST OF HELBERG RD DEAD END	22094	1017D	10	12	HG	HH	RT	6	6	6			
TURKEY CREEK AT CLAY ROAD IN NORTHWEST HOUSTON	22169	1014K	10	12	HG	HH	RT	6	6	6			
CRYSTAL CREEK AT FM 1314	11181	1004D	10	12	HG	HW	RT	6	6	6			
LUCE BAYOU/SAN JACINTO RIVER EAST FORK AT HUFFMAN-NEW CANEY ROAD	11187	1002B	10	12	HG	HW	RT	6	6	6			

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LAKE HOUSTON NORTH SIDE OF MISSOURI PACIFIC RAILROAD BRIDGE 137 METERS SOUTH AND 1.36 KM WEST OF INTERSECTION OF PINO LN AND SUNOCO RD	11208	1002	10	12	HG	HW	RT	12	12	12			
LAKE HOUSTON AT FM 1960 WEST END PASS BRIDGE 269 M N AND 731 M E OF INTERSECTION OF ATASCOCITA SHORES AND FM 1960/CITY HO SITE 9	11211	1002	10	12	HG	HW	RT	12	12	12			
LAKE HOUSTON AT FM 1960 EAST END PASS BRIDGE 235 M S AND 950 M WEST OF INTERSECTION OF FM 1960 AND FAIRLAKE LANE/CITY HO SITE 13	11212	1002	10	12	HG	HW	RT	12	12	12			
EAST FORK SAN JACINTO RIVER AT FM 1485	11235	1003	10	12	HG	HW	RT	6	6	6	6		Flow from gage 8070200
EAST FORK SAN JACINTO RIVER IMMEDIATELY UPSTREAM OF TX-105 BUSINESS ROUTE / W SOUTHLINE STREET WEST OF CLEVELAND	11238	1003	10	12	HG	HW	RT	6	6	6	6		Flow from gage 8070000
WEST FORK SAN JACINTO RIVER IMMEDIATELY UPSTREAM OF SH 242	11243	1004	10	12	HG	HW	RT	6	6	6			
WEST FORK SAN JACINTO RIVER IMMEDIATELY DOWNSTREAM OF SH 105 NW OF CONROE CAMS772	11251	1004	10	12	HG	HW	RT	6	6	6	6		Flow from gage 8067650
SPRING CREEK BRIDGE AT IH 45 20 MILES NORTH OF HOUSTON	11313	1008	10	12	HG	HW	RT	6	6	6	6		Flow from gage 8068500
CYPRESS CREEK BRIDGE ON IH 45 15 MI NORTH OF HOUSTON	11328	1009	10	12	HG	HW	RT	6	6	6	6		Flow from gage 8069000
CANEY CREEK IMMEDIATELY DOWNSTREAM OF FM 1485	11334	1010	10	12	HG	HW	RT	6	6	6			
PEACH CREEK BRIDGE AT FM 2090 IN SPLENDORA	11337	1011	10	12	HG	HW	RT	6	6	6	6		Flow from Gage 08071000

Site Description	Station ID	Waterbody ID	Basin	Region	SE	CE	MT	Field	Conv	Bacteria	Flow	24 hr DO	Comments
LAKE HOUSTON 90 M S AND 349 M W OF INTERSECTION OF MAGNOLIA PT DR AND DIAMOND WAY CANEY CREEK ARM IN HOUSTON	16623	1002	10	12	HG	HW	RT	12	12	12			
PEACH CREEK IMMEDIATELY UPSTREAM OF OLD HWY 105	16625	1011	10	12	HG	HW	RT	6	6	6			
STEWARTS CREEK 175 METERS DOWNSTREAM OF SH LOOP 336 SOUTHEAST OF CONROE	16626	1004E	10	12	HG	HW	RT	6	6	6			
LK HOUSTON W OF LK SHADOWS SUBDIVISION MID LAKE NW OF HOUSTON 2.09 KM N AND 1.38 KM E OF INTERSECT OF LK HOUSTON PKWY AND DITE CAYLIN	16668	1002	10	12	HG	HW	RT	12	12	12			
LAKE HOUSTON IN THE WEST FORK SAN JACINTO RIVER CHANNEL 270 M EAST AND 60 M NORTH OF MISTY COVE AT ATASCOCITA PLACE DR	18667	1002	10	12	HG	HW	RT	12	12	12			
LAKE HOUSTON/LUCE BAYOU 123 M NORTH AND 188 M WEST OF LAKEWATER DR AT WATERWOOD DR IN WATER WONDERLAND SUBDIVISION IN HARRIS COUNTY	18670	1002	10	12	HG	HW	RT	12	12	12			
LAKE HOUSTON WEST FORK SAN JACINTO RIVER ARM UNDER POWER LINES 567 METERS EAST AND 538 METERS NORTH FROM THE INTERSECTION OF BELLEAU WOOD DRIVE AND SOUTHSHORE DRIVE IN HOUSTON	20782	1002	10	12	HG	HW	RT	12	12	12			
CANEY CREEK AT MILLMAC ROAD NORTHEAST OF CUT AND SHOOT	21465	1010	10	12	HG	HW	RT	6	6	6			
LUCE BAYOU 224 METERS NORTHWEST OF END OF CRY BABY LANE IN HUFFMAN	22224	1002	10	12	HG	HW	RT	6	6	6			Added in FY21
LAKE CONROE AT DAM MID CHANNEL 85 M OUT FROM MIDDLE TAINTER GATE 922 M N AND 426 M E OF INTERSECTION OF DAM SITE RD AND SH 105	11342	1012	10	12	HG	SJ	RT	12	12	12			

Site Description	Station ID	Waterbody ID	Basin	Region	SE	CE	MT	Field	Conv	Bacteria	Flow	24 hr DO	Comments
LAKE CONROE AT FM 1375 IN THE MAIN CHANNEL 4TH PILING FROM THE EAST 541 M SOUTH AND 1.40 KM W OF INTERSECTION OF KAGLE RD AND FM 1375 USGS SITE GC	11344	1012	10	12	HG	SJ	RT	12	12	12			
PANTHER BRANCH 295 METERS DOWNSTREAM OF SAWDUST ROAD IN THE WOODLANDS	16422	1008C	10	12	HG	SJ	RT	12	4	4			
LAKE WOODLANDS AT WESTERN REACH 110 METERS NORTH AND 100 METERS EAST OF INTERSECTION OF MEADOW COVE DR AND PLEASURE COVE DR IN THE WOODLANDS	16481	1008F	10	12	HG	SJ	RT	12	4	4			
LAKE WOODLANDS AT SOUTH END 23 METERS NORTH AND 50 METERS EAST OF THE WEST EDGE OF DAM IN THE WOODLANDS	16482	1008F	10	12	HG	SJ	RT	12	4	4			
LAKE WOODLANDS AT MID POINT 130 METERS NORTH AND 30 METERS EAST OF THE NORTHERN INTERSECTION OF E SHORE DR AND CAPE HARBOR PL IN THE WOODLANDS	16483	1008F	10	12	HG	SJ	RT	12	4	4			
LAKE WOODLANDS AT NORTH END 111 METERS DOWNSTREAM OF RESEARCH FOREST DRIVE IN THE WOODLANDS	16484	1008F	10	12	HG	SJ	RT	12	4	4			
LOWER PANTHER BRANCH AT FOOTBRIDGE 265 M UPSTREAM OF SAWDUST RD APPROX 200 M UPSTREAM OF PERMIT WQ0011401-001 LOCATED AT 2436 SAWDUST ROAD	16627	1008C	10	12	HG	SJ	RT	12	4	4			
UPPER PANTHER BRANCH APPROX 80 M UPSTREAM OF PERMIT WQ0012597-001 LOCATED AT 5402 RESEARCH FOREST DR	16629	1008B	10	12	HG	SJ	RT	12	4	4			

Site Description	Station ID	Waterbody ID	Basin	Region	SE	CE	MT	Field	Conv	Bacteria	Flow	24 hr DO	Comments
UPPER PANTHER BRANCH APPROX 170 METERS DOWNSTREAM OF PERMIT WQ0012597-001 LOCATED AT 5402 RESEARCH FOREST DR	16630	1008B	10	12	HG	SJ	RT	12	4	4			
BEAR BRANCH 20 METERS DOWNSTREAM OF RESEARCH FOREST DRIVE	16631	1008E	10	12	HG	SJ	RT	12	4	4	12		Flow from gage 8068390
LAKE CONROE AT APRIL POINT MID CHANNEL 559 M N AND 586 M E OF INTERSECTION OF APRIL POINT PLACE AND APRIL HILL	16638	1012	10	12	HG	SJ	RT	12	12	12			
LAKE CONROE AT SOUTH END OF LAKE ON EAST SIDE 201 METERS SOUTH AND 732 METERS WEST OF INTERSECTION OF S VALLEY DRIVE AND CREST DRIVE	16639	1012	10	12	HG	SJ	RT	12	12	12			
LAKE CONROE S OF BENTWATER ISLAND WEST COVE S OF FM 1097 BRIDGE 769 M N AND 89 M E OF INTERSECTION OF WATERFRONT AND SPRINGTIME DR	16640	1012	10	12	HG	SJ	RT	12	12	12			
LAKE CONROE AT AQUARIUS POINT MID CHANNEL N OF FM 830 BOAT RAMP 437 M N AND 924 M W OF INTERSECT OF FM 830 AND LAKEVIEW MANOR DR	16641	1012	10	12	HG	SJ	RT	12	12	12			
LAKE CONROE AT LAKE MID POINT MID CHANNEL AT FM 1097 BRIDGE 57 M S AND 520 M W OF INTERSECTION OF FM 1097 AND BLUEBERRY HILL	16642	1012	10	12	HG	SJ	RT	12	12	12			
LAKE CONROE AT HUNTERS POINT CANEY CREEK ARM E OF SCOTTS RIDGE BOAT RAMP 640 M N AND 558 M E OF INTERSECT OF TEEL RD AND HUNTERS TRL	16643	1012	10	12	HG	SJ	RT	12	12	12			
LAKE CONROE AT PARADISE POINT MID CHANNEL 396 METERS S AND 309 M WEST INTERSECTION OF PARADISE VIEW DRIVE AND PARADISE POINT DRIVE	16644	1012	10	12	HG	SJ	RT	12	12	12			

Site Description	Station ID	Waterbody ID	Basin	Region	SE	CE	MT	Field	Conv	Bacteria	Flow	24 hr DO	Comments
LAKE CONROE AT MOUTH OF SANDY BRANCH COVE 2.63 KM EAST OF INTERSECTION OF HARDY SMITH ROAD AND F S 218 A	16645	1012	10	12	HG	SJ	RT	12	12	12			
EAST FORK SAN JACINTO RIVER AT FM 2090 IN LIBERTY COUNTY	11236	1003	10	12	HG	TF	RT	4	4	4	4		
EAST FORK SAN JACINTO RIVER IMMEDIATELY DOWNSTREAM OF FM 945 5.6 MILES NORTH OF CLEVELAND	11237	1003	10	10	HG	TF	RT	4	4	4	4		
EAST FORK SAN JACINTO RIVER IMMEDIATELY DOWNSTREAM OF US 59 AT RED GULLY	14242	1003	10	12	HG	TF	RT	4	4	4	4		
WINTERS BAYOU AT FM 2929 / FOUR NOTCH ROAD 4.8 KILOMETERS SOUTH OF PHELPS IN WALKER COUNTY	21933	1003A	10	12	HG	TF	RT	4	4	4	4		
BOSWELL CREEK AT FOUR NOTCH ROAD / BOSWELL ROAD 13 KILOMETERS NORTHEAST OF NEW WAVERLY IN WALKER COUNTY	21934	1003C	10	12	HG	TF	RT	4	4	4	4		
WINTERS BAYOU AT FM 2693 IN SAN JACINTO COUNTY	21935	1003A	10	10	HG	TF	RT	4	4	4	4		
WINTERS BAYOU AT SH 150 IN SAN JACINTO COUNTY	21936	1003A	10	10	HG	TF	RT	4	4	4	4		
WINTERS BAYOU AT DABNEY BOTTOM RD IN SAN JACINTO COUNTY	21937	1003A	10	10	HG	TF	RT	4	4	4	4		
NEBLETTS CREEK AT FM 1725 IN SAN JACINTO COUNTY	21938	1003B	10	10	HG	TF	RT	4	4	4	4		
EAST FORK SAN JACINTO RIVER AT NORTH BUTCH ARTHUR ROAD IN SAN JACINTO COUNTY	21939	1003	10	10	HG	TF	RT	4	4	4	4		
CEDAR BAYOU TIDAL MID CHANNEL 45 M DOWNSTREAM OF SH 146 NORTHEAST OF BAYTOWN	11115	0901	9	12	HG	UI	RT	4	4	4			
CEDAR BAYOU ABOVE TIDAL 30 M DOWNSTREAM OF FM 1942 AT EAST BANK	11118	0902	9	12	HG	UI	RT	4	4	4	4		

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CEDAR BAYOU ABOVE TIDAL 45 M DOWNSTREAM OF FM 1960 NORTHEAST OF HUFFMAN	11123	0902	9	12	HG	UI	RT	4	4	4	4		
MOSES BAYOU AT NORTHBOUND SH 146 BRIDGE AT MID-BRIDGE NORTH OF LA MARQUE	11400	2431A	24	12	HG	UI	RT	4	4	4			
HIGHLAND BAYOU AT FAIRWOOD ROAD IN LA MARQUE IN GALVESTON COUNTY	11415	2424A	24	12	HG	UI	RT	4	4	4			
MUSTANG BAYOU AT FM 2917 SOUTH OF ALVIN	11423	2432A	24	12	HG	UI	RT	4	4	4	4		
CEDAR CREEK AT FM 517 W OF DICKINSON	11434	1103E	11	12	HG	UI	RT	4	4	4	4		
GUM BAYOU AT FM 517 E OF DICKINSON	11436	1103D	11	12	HG	UI	RT	4	4	4			
DICKINSON BAYOU TIDAL AT SH 146 BRIDGE EAST OF DICKINSON	11455	1103	11	12	HG	UI	RT	4	4	4			
DICKINSON BAYOU TIDAL AT IH 45	11462	1103	11	12	HG	UI	RT	4	4	4			
CHOCOLATE BAYOU TIDAL FM 2004 BRIDGE SOUTH OF ALVIN	11478	1107	11	12	HG	UI	RT	4	4	4			
OYSTER CREEK TIDAL AT THAT-WAY DRIVE 0.5 MILES BELOW FM 2004	11486	1109	11	12	HG	UI	RT	4	4	4			
OYSTER CREEK IMMED. DOWNSTREAM OF SH 35 WEST OF ANGLETON	11490	1110	11	12	HG	UI	RT	4	4	4	4		
OYSTER CREEK AT SIMS RD / BRAZORIA CR 30 WEST OF ANGLETON	11491	1110	11	12	HG	UI	RT	4	4	4	4		
OYSTER CREEK AT FM 1462 WEST OF ROSHARON	11493	1110	11	12	HG	UI	RT	4	4	4	4		
HARDEMAN SLOUGH IMMEDIATELY DOWNSTREAM OF ALLENHURST RD NE OF FM 2540 NEAR ALLENHURST COMMUNITY	12135	1305A	13	12	HG	UI	RT	4	4	4	4		
CANEY CREEK IMMEDIATELY UPSTREAM OF CONCRETE BRIDGE 210 M DOWNSTREAM OF LINVILLE BAYOU CONFLUENCE AND ADJACENT TO FM 521	12151	1304	13	12	HG	UI	RT	4	4	4			
CANEY CREEK AT SERGEANT JOE PARKS JR MEMORIAL HIGHWAY / FM 457 IN MATAGORDA COUNTY	12153	1305	13	12	HG	UI	RT	4	4	4	4		

Site Description	Station ID	Waterbody ID	Basin	Region	SE	CE	MT	Field	Conv	Bacteria	Flow	24 hr DO	Comments
WEST BAY OFFAT BAYOU MID BAYOU OPPOSITE LAKE MADELINE CANAL	13322	2424D	24	12	HG	UI	RT	4	4	4			
WEST BAY AT RANGE MARKER D BETWEEN SOUTH DEER ISLAND AND TEICHMAN POINT	14622	2424	24	12	HG	UI	RT	4	4	4			
OFFATTS BAYOU OFF CM 18	14645	2424D	24	12	HG	UI	RT	4	4	4			
HIGHLAND BAYOU TIDAL AT FM 519 335 METERS NORTH OF SH 6 IN CITY OF HITCHCOCK IN GALVESTON COUNTY	15941	2424A	24	12	HG	UI	RT	4	4	4			
SAN BERNARD RIVER IMMEDIATELY DOWNSTREAM OF FM 3013 ON THE COLORADO-AUSTIN COUNTY LINE APPROXIMATELY 15KM SW OF SEALY	16370	1302	13	12	HG	UI	RT	4	4	4	4		
GEISLER BAYOU AT FM517 BRIDGE 0.19MI UPSTREAM OF DICKINSON BAYOU IN DICKINSON	16470	1103C	11	12	HG	UI	RT	4	4	4			
BENSONS BAYOU AT FM 517 / PINE DR IN DICKINSON	16471	1103A	11	12	HG	UI	RT	4	4	4			
MARYS CREEK AT MARYS CROSSING IN NORTH FRIENDSWOOD	16473	1102B	11	12	HG	UI	RT	4	4	4	4		
ROBINSONS BAYOU AT FM270 IN LEAGUE CITY	16475	1101D	11	12	HG	UI	RT	4	4	4			
HIGHLAND BAYOU 80 M NORTHEAST OF SH 6 BRIDGE CENTERPOINT IN BAYOU VISTA WEST OF IH 45 IN GALVESTON COUNTY	16488	2424A	24	12	HG	UI	RT	4	4	4			
MARCHAND BAYOU TIDAL AT FM519 IN HITCHCOCK	16490	2424C	24	12	HG	UI	RT	4	4	4			
HIGHLAND BAYOU AT FM 2004 IN HITCHCOCK IN GALVESTON COUNTY	16491	2424A	24	12	HG	UI	RT	4	4	4			
CHIGGER CREEK AT FM528 BRIDGE IN FRIENDSWOOD	16493	1101B	11	12	HG	UI	RT	4	4	4	4		
HIGHLAND BAYOU AT END OF BAYOU LANE FREDDIESVILLE	16562	2424A	24	12	HG	UI	RT	4	4	4			

Site Description	Station ID	Waterbody ID	Basin	Region	SE	CE	MT	Field	Conv	Bacteria	Flow	24 hr DO	Comments
LAKE MADELINE AT CORNER OF BELUCHE DRIVE AND DOMINIQUE DRIVE IN GALVESTON	16564	2424B	24	12	HG	UI	RT	4	4	4			
CLEAR CREEK TIDAL AT BROOKDALE DR APPROX 0.1MI DOWNSTREAM OF GRISSOM RD IN COUNTRYSIDE PARK IN CANOE LAUNCHING AREA IN LEAGUE CITY	16576	1101	11	12	HG	UI	RT	4	4	4			
MAGNOLIA CREEK AT W BAY AREA BLVD LEAGUE CITY APPROX 250 M UPSTREAM OF WWTP PERMIT WQ0010568-003	16611	1101A	11	12	HG	UI	RT	4	4	4	4		
COWART CREEK 9 METERS UPSTREAM FROM CASTLEWOOD DRIVE BRIDGE IN FRIENDSWOOD	16677	1102A	11	12	HG	UI	RT	4	4	4	4		
HICKORY SLOUGH AT ROBINSON DRIVE IN PEARLAND	17068	1102C	11	12	HG	UI	RT	4	4	4	4		
CHOCOLATE BAY 1.2 KM EAST OF WHARTON BAYOU AND 8.1 KM DOWNSTREAM OF FM 2004	17085	2432	24	12	HG	UI	RT	4					Collect field parameters only; will collect lab if another site is dry that quarter.
CHOCOLATE BAY 200 M NORTHWEST OF HORSE GROVE POINT AND 5.1 KM DOWNSTREAM OF FM 2004	17086	2432	24	12	HG	UI	RT	4	4	4			
MOSES BAYOU AT SH 3 IN TEXAS CITY	17910	2431A	24	12	HG	UI	RT	4	4	4	4		
NEW BAYOU AT FM 2004 S/SW OF HITCHCOCK	17911	2432E	24	12	HG	UI	RT	4	4	4			
PERSIMMON BAYOU AT FM 2004 S/SW OF HITCHCOCK	17913	2432D	24	12	HG	UI	RT	4	4	4			
COW BAYOU AT NASA ROAD 1 IN WEBSTER 100 M EAST OF FM 270/EL CAMINO REAL	17928	1101C	11	12	HG	UI	RT	4	4	4			
AUSTIN BAYOU AT FM 2004 APPROXIMATELY 4 MILES SOUTHEAST OF ANGLETON TEXAS IN BRAZORIA COUNTY	18048	1105B	11	12	HG	UI	RT	4	4	4			

Site Description	Station ID	Waterbody ID	Basin	Region	SE	CE	MT	Field	Conv	Bacteria	Flow	24 hr DO	Comments
BASTROP BAYOU OFF BAYOU WOOD DR DUE EAST OF BRAZORIA CR 201 AT BASTROP BAYOU DR APPROX 1.1 KM UPSTREAM OF SH 288B IN RICHWOOD VILLAGE	18502	1105	11	12	HG	UI	RT	4	4	4			
BASTROP BAYOU TIDAL APPROXIMATELY 15 M OFF NORTH BANK AND 1.55 KM UPSTREAM OF FM 2004 IN RICHWOOD VILLAGE	18503	1105	11	12	HG	UI	RT	4	4	4			
BASTROP BAYOU TIDAL MID CHANNEL AT NORTH END OF BASTROP BEACH ROAD 350 M DOWNSTREAM OF FM 523 SE OF ANGLETON	18504	1105	11	12	HG	UI	RT	4	4	4			
BASTROP BAYOU TIDAL 38 M NORTH OF N END OF COMPASS DR/BRAZORIA CR 504 APPROXIMATELY 4.4 KM DOWNSTREAM OF FM 523 SE OF ANGLETON	18505	1105	11	12	HG	UI	RT	4	4	4			
AUSTIN BAYOU IMMEDIATELY UPSTREAM OF DANBURY-ANGLETON ROAD/BRAZORIA CR 210 EAST OF DANBURY	18506	1105C	11	12	HG	UI	RT	4	4	4	4		
FLORES BAYOU IMMEDIATELY UPSTREAM OF DANBURY-ANGLETON ROAD/BRAZORIA CR 210 EAST OF ANGLETON	18508	1105A	11	12	HG	UI	RT	4	4	4	4		
MUSTANG BAYOU IMMEDIATELY UPSTREAM OF EAST SOUTH STREET 85 METERS WEST OF SOUTHBOUND SH 35 IN ALVIN USGS ID 8077890	18554	2432A	24	12	HG	UI	RT	4	4	4	4		
UNNAMED TRIBUTARY OF CLEAR CREEK TIDAL IN FOREST PARK CEMETERY IMMEDIATELY UPSTREAM OF S FEEDER RD OF I 45/GULF FWY S OF NASA RD 1 IN WEBSTER	18591	1101F	11	12	HG	UI	RT	4	4	4	4		
UNNAMED TRIBUTARY OF MOSES LAKE AT STATE LOOP 197/25TH AVE NORTH 432 M EAST OF NORTHBOUND SH 146 IN TEXAS CITY	18592	2431C	24	12	HG	UI	RT	4	4	4			

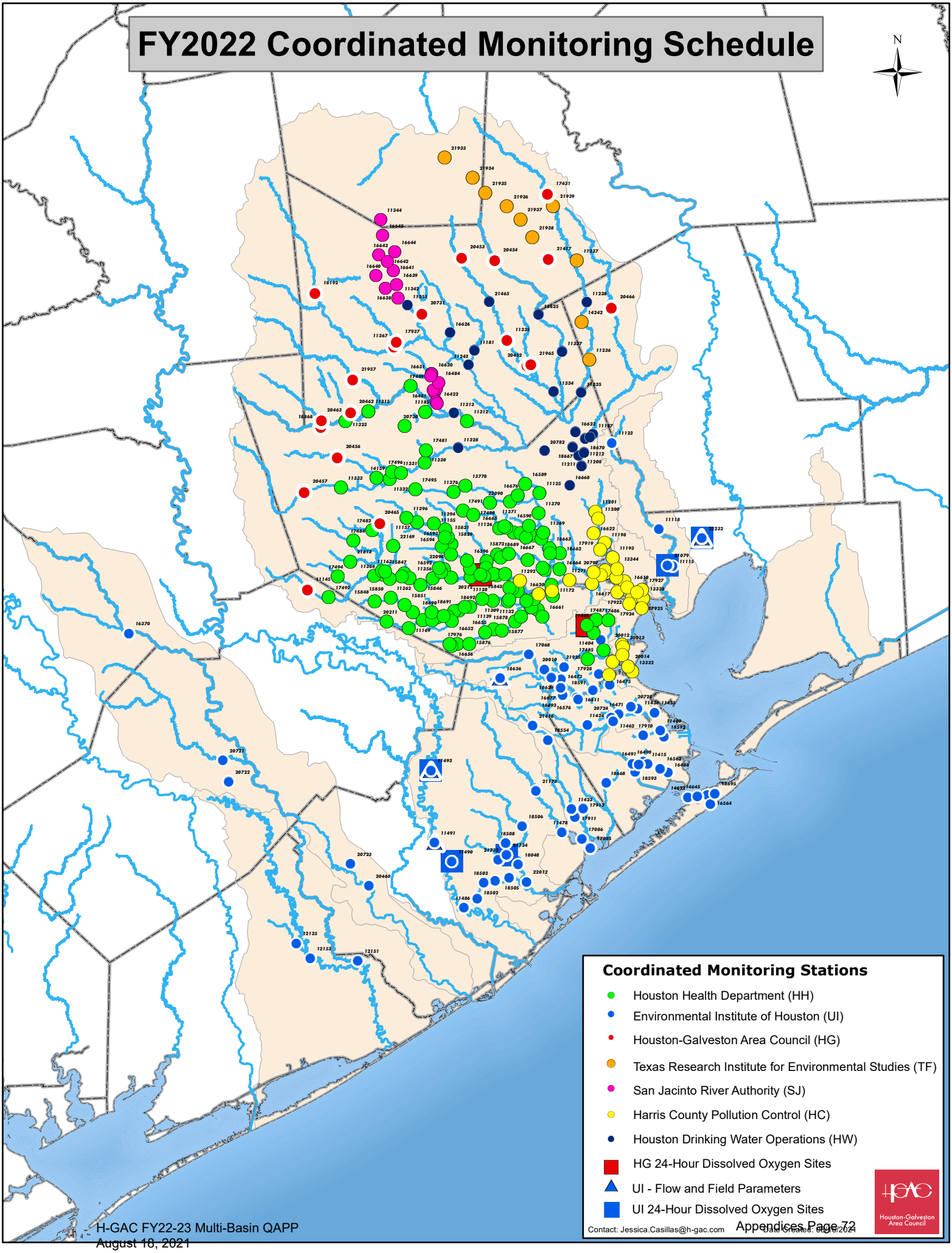
Site Description	Station ID	Waterbody ID	Basin	Region	SE	CE	MT	Field	Conv	Bacteria	Flow	24 hr DO	Comments
HIGHLAND BAYOU DIVERSION CANAL MID CHANNEL AT SECOND STREET BRIDGE 467 M UPSTREAM OF PRICE ROAD WWTP RELEASE IN HITCHCOCK	18593	2424G	24	12	HG	UI	RT	4	4	4			
UNNAMED TRIB OF MARYS CREEK 8 M DOWNSTREAM OF THALERFIELD DR E OF OLD CHOCOLATE BAYOU RD/BRAZORIA CR 89 APPROX 300 M UPST SILVER LAKE WWTP	18636	1102G	11	12	HG	UI	RT	12	4	4	12		Added in FY21 at request of assessor
MARYS CREEK BYPASS AT EAST BROADWAY ST/FM 518 WEST OF SUNSET MEADOWS DR IN PEARLAND	18639	1102F	11	12	HG	UI	RT	4	4	4	4		
WILLOW BAYOU AT BAKER ST 404 M UPSTREAM OF FM 2004 SOUTH OF SANTA FE IN GALVESTON COUNTY	18668	2432B	24	12	HG	UI	RT	4	4	4	4		
ENGLISH BAYOU MID BAYOU 250 M EAST AND 83 M SOUTH OF 61ST ST BRIDGE CENTERPOINT IN GALVESTON	18695	2424E	24	12	HG	UI	RT	4	4	4			
CLEAR CREEK ABOVE TIDAL AT YOST ROAD TERMINUS IN PEARLAND IN BRAZORIA COUNTY	20010	1102	11	12	HG	UI	RT	4	4	4	4		
SAN BERNARD RIVER TIDAL AT SH 35 SOUTHWEST OF WEST COLUMBIA	20460	1301	13	12	HG	UI	RT	4	4	4			
WEST BERNARD CREEK AT WHARTON CR 225 IN EAST OF HUNGERFORD	20721	1302B	13	12	HG	UI	RT	4	4	4	4		
PEACH CREEK AT WHARTON CR 117/CHUDALLA ROAD/ARCHER ROAD 89 METERS SOUTH OF THE INTERSECTION OF WHARTON CR 117/CHUDALLA ROAD/ARCHER ROAD AND WHARTON CR 121/ WHARTON CR 119/DONALDSON ROAD IN EAST OF WHARTON	20722	1302D	13	12	HG	UI	RT	4	4	4	4		
MOUND CREEK AT BRAZORIA CR 450/JACKSON SETTLEMENT ROAD 1.22 KILOMETERS UPSTREAM OF FM 1301 IN WEST OF WEST COLUMBIA	20723	1302E	13	12	HG	UI	RT	4	4	4	4		

Site Description	Station ID	Waterbody ID	Basin	Region	SE	CE	MT	Field	Conv	Bacteria	Flow	24 hr DO	Comments
BORDENS GULLY AT SPRUCE DRIVE IN DICKINSON	20724	1103B	11	12	HG	UI	RT	4	4	4	4		
UNNAMED TRIBUTARY OF GUM BAYOU AT OWENS DRIVE 1.51 KILOMETERS UPSTREAM OF CONFLUENCE WITH GUM BAYOU IN DICKINSON	20728	1103G	11	12	HG	UI	RT	4	4	4			
CARY BAYOU IMMEDIATELY UPSTREAM OF RACCOON DRIVE BRIDGE IN BAYTOWN	21079	0901A	9	12	HG	UI	RT	4	4	4			Added in FY21 at request of assessor
CHOCOLATE BAYOU IMMEDIATELY UPSTREAM OF BRAZORIA CR 171 / MUSTANG CHOCOLATE BAYOU ROAD IN LIVERPOOL	21178	1107	11	12	HG	UI	RT	4	4	4			
MUSTANG BAYOU AT THE HEIGHTS-MANVEL ROAD /CARDINAL DRIVE BRIDGE NEAR ALVIN	21416	2432A	24	12	HG	UI	RT	4	4	4	4		
UNNAMED TRIBUTARY OF BASTROP BAYOU TIDAL AT BRAZORIA CR 213 / SHELL ROAD 7.0 KILOMETERS EAST OF ANGLETON	21735	1105D	11	12	HG	UI	RT	4	4	4	4		
BRUSHY BAYOU AT FM 213	21734	1105E	11	12	HG	UI	RT	4	4	4	4		Added again in FY2022
TURKEY CREEK AT BEAMER ROAD 1.5 KM SOUTHEAST OF FM 1959/DIXIE FARM ROAD IN FRIENDSWOOD	21925	1102D	11	12	HG	UI	RT	4	4	4	4		
AUSTIN BAYOU TIDAL 1.60 KILOMETERS UPSTREAM OF THE CONFLUENCE WITH BASTROP BAYOU TIDAL IN BRAZORIA COUNTY	22012	1105B	11	12	HG	UI	RT	4	4	4			
ARMAND BAYOU TIDAL 100 M BELOW THE CONFLUENCE WITH SPRING GULLY	22187	1113	11	12	HG	UI	RT	4	4	4			
COTTON BAYOU 10 METERS UPSTREAM OF WESTBOUND IH-10 FRONTAGE ROD IN MONT BELVIEU	22232	0801E	8	12	HG	UI	RT	12	12	12	12		Added in FY21

Appendix C: Station Location Maps

Station Location Maps

Maps of stations monitored by the Houston-Galveston Area Council (H-GAC) are provided below. The maps were generated by the H-GAC. This product is for informational purposes and may not have been prepared for or be suitable for legal, engineering, or surveying purposes. It does not represent an on-the-ground survey and represents only the approximate relative location of property boundaries. For more information concerning this map, contact Jessica Casillas at 713-993-4594 or via e-mail at jessica.casillas@h-gac.com.


FY2022 Coordinated Monitoring Schedule
N
Coordinated Monitoring Stations
Houston Health Department (HH)
Environmental Institute of Houston (UI)
Houston-Galveston Area Council (HG)
Texas Research Institute for Environmental Studies (TF)
San Jacinto River Authority (SJ)
Harris County Pollution Control (HC)
Houston Drinking Water Operations (HW)
HG 24-Hour Dissolved Oxygen Sites
UI - Flow and Field Parameters
UI 24-Hour Dissolved Oxygen Sites
Contact: Jessica.Casillas@h-gac.com
Houston-Galveston Area Council

Appendix D: Field Data Sheets

H-GAC – Ambient Monitoring Data Sheet

Date: _____/_____/_____ Station: TCEQ ID: # 20452 – Caney Creek @ Fire Tower Rd., west of Woodbranch

Time (military): _____ Samples Collected by: _____

Total Water Depth at sampling location	meters		# of Days Since Last Significant Rainfall	
Sampling Depth	meters			
Water Temperature	°C			
Specific Conductance	µS/cm			
pH	standard units			
Dissolved Oxygen	mg/L			

Secchi disk or tube	Observed Turbidity	Water Clarity	Water Color	Water Odor	Present Weather	Wind Intensity	Water Surface	Flow Severity
meters	1 – low 2 – medium 3 – high	1 – excellent 2 – good 3 – fair 4 – poor	1 – brownish 2 – reddish 3 – greenish 4 – blackish 5 – clear 6 – other	1 – sewage 2 – oily/chemical 3 – rotten egg 4 – musky 5 – fishy 6 – none 7 – other	1 – clear 2 – partly cloudy 3 – cloudy 4 – raining 5 – other	1 – calm 2 – slight 3 –moderate 4 – strong	1 – calm 2 – ripples 3 – waves	1 – no flow 2 – low 3 – normal 4 – flood 5 – high 6 – dry

Flow Method	1 – gage 2 – electric 3 – mechanical 4 – weir/flume 5 – Doppler	
Flow Equipment	1 – M9 River Surveyor 2 – Flow Tracker 3 – OTT MF Pro	
Flow (Field)	cfs	
Flow (Post Processing)	cfs	

Maximum Pool Width	meters	
Maximum Pool Depth	meters	
Pool Length	meters	
Percent Pool Coverage in 500 meter Reach	%	
Comments or Observation		

Fresh (non-tidal) ✓

Marine (tidal) _____

Containers	Preservatives	Analyses	Requested
1 x 1 L Plastic	Iced	TSS	
1 x 1 L Plastic	Iced, H_2SO_4	NH3, NO2+NO3, TPO4	
1 x 500 mL Plastic	Iced	CL, SO4 (fresh only), NO2, NO3	
1 x 100 mL Sterile Plastic	Iced	Bacteria: *E. coli*	

Surveyor SN: _____ Sonde SN: _____

H-GAC – 24-Hour Dissolved Oxygen Monitoring Data Sheet

Station: **TCEQ ID: # 21965 – Spring Branch downstream of Shakey Hollow west of Woodbranch Village**

Deployment Date: _____/_____/_____ Time (military):_____ Deployed By _____

Deployed Sonde Serial Number/ID: _____ Fresh (non-tidal) ✓ Tidal _____

Flow (CFS)_____ Flow Method _____ (USGS Gage = 1, ADP=5) Water samples collected? Yes_____ No_____

Flow Severity: _____ (1 – no flow; 2 – low; 3 – normal; 4 – flood; 5 – high; 6 – dry)

Retrieval Date: _____/_____/_____ Time (military):_____ Retrieved By_____

Flow (CFS)_____ Flow Method _____ (USGS Gage = 1, ADP=5) Water samples collected? Yes____ No____

Data Check – Performed In Field At Time Of Retrieval

Date and Time of First Sample in Series _____ DO of First Sample_____

Date and Time of Last Sample in Series _____ DO of Last Sample_____

Series reviewed for depths < 0.00 and complete DO sequences of ≥0.00 _____ (add comments below)

Data Collection Check Performed By _____ Date _____ Time_____

COMMENTS

Sonde Data Downloaded By _____ **Date**_____ **Time**_____

Flow Discharge Summary Reviewed and Printed by _____**Date**_____

Flow Entered in Ambient Database By_____ **Date**_____
Even if NO water samples are collected, enter station ID, date, time, flow and flow method in the ambient monitoring database

Reviewed by QAO _____**Date**_____

QAO COMMENTS

Updated: March 13, 2018

H-GAC Surface Water Quality Monitoring Program

Stream Flow (Discharge) Measurement Form

Stream:_____ Date:_____

Station:_____

Description:_____

Time Begin:_____ Time End:_____ Meter Type:_____

Observers:_____ Stream Width*:_____ Section Width (W):_____

Observations:_____

Section Midpoint (ft) (m)	Section Depth (ft) (m) (cm) (D)	Observational Depth** (ft)(m)	Velocity (V)		Flow (Q) (m^3/s) (ft^3/s) Q = (W)(D)(V)
			At Point (ft/s)(m/s)	Average (ft/s)(m/s)	

Pollution Control Services Department
101 S. Richey, Suite H
Pasadena, TX 77506 Fax: 713-274-6475 Phone: 713-920-2831

Sample Data and Custody Record

Id: _____ Type: _____ Permit No: _____ Date: _____ Time _____ AM PM

Site Id: _____ Name: _____ Key Map: _____

Site Info: _____

Sample Location: _____ Outfall: _____

Sample Location Info: _____

Outcome: ☐ Collected ☐ Collected (sample compromised) ☐ Field Test Only ☐ No Flow

Investigator(s): _____

Tests and Measurements

☐ Temperature (°C) ☐ Dissolved Oxygen (mg/L) ☐ Specific Conductivity (µS) ☐ Water Depth (meters)

☐ pH (standard units) ☐ Salinity (ppt) ☐ SECCHI Disk Transparency (meters)

Field Observations--Water

☐ Water Color 1-Brownish 2-Reddish 3-Greenish 4-Blackish 5-Clear 6-Other _____

☐ Surface Conditions 1-Clear 2-Scum 3-Foam 4-Debris 5-Sheen

☐ Water Odor 1-Sewage 2-Oily/Chemical 3-Rotten Egg 4-Musky 5-Fishy 6-None 7-Other _____

☐ Turbidity 1-Low 2-Medium 3-High

☐ Water Surface 1-Calm 2-Ripples 3-Waves 4-White Caps

Field Observations--Weather and Other

☐ Present Weather 1-Clear 2-Partly Cloudy 3-Cloudy 4-Rain 5-Other _____

☐ Wind Intensity 1-Calm 2-Slight 3-Moderate 4-Strong

☐ Tide Stage 1-Low 2-Falling 3-Slack 4-Rising 5-High

☐ Days Since Last Significant Rainfall Source: _____

☐ 89978(Number of people observed)

☐ 89979 (Evidence of activity)

Matrix: ☐ Air ☐ Drinking Water ☐ Liquid ☐ Oil ☐ Other Solid ☐ Particulate ☐ Sludge ☐ Soil ☐ Water ☐ Other

Collection Method ☐ Grab ☐ Composite

Samples Collected:

Bottle No.	Container Type	Container Size	Preservative	Ice?	Analysis Requested	Direct Coll. Req.	Collection Type	Split	Sampled By
				Y/N			D/I	Y/N	
				Y/N			D/I	Y/N	
				Y/N			D/I	Y/N	
				Y/N			D/I	Y/N	
				Y/N			D/I	Y/N	
				Y/N			D/I	Y/N	
				Y/N			D/I	Y/N	
				Y/N			D/I	Y/N	
				Y/N			D/I	Y/N	
				Y/N			D/I	Y/N	

Run No.: 7
Field No.: 5
Station ID: 17482
USGS Gage Station ID: 08072760

City of Houston
Houston Health Department
Bureau of Pollution Control and Prevention
7411 Park Place Blvd
832.393.5730 FAX 832-393-5726
FIELD FORM & CHAIN OF CUSTODY FORM

HOUSTON HEALTH DEPARTMENT

Location Name: Langham Creek @ Hwy 6

Date: _____ **Time (hhmm):** _____ **Samples Collected by:** _____

Number of Days Since Last Rain Fall: _____ **Field Meter #:** _____ **Calibration Date:** _____

FIELD OBSERVATIONS

Flow Severity	Tidal Stage	Color	Odor	Water Surface	Current Weather	Wind Intensity

1 – no flow	1 – low	1 – brownish	1 – sewage	1 – calm	1 – clear	1 – calm
2 – low	2 – falling	2 – reddish	2 – oily/chemical	2 – ripples	2 – partly cloudy	2 – slight
3 – normal	3 – slack	3 – greenish	3 – rotten egg	3 – waves	3 – cloudy	3 – moderate
4 – flood	4 – rising	4 – blackish	4 – musky	4 - whitecaps	4 – rain	4 - strong
5 – high	5 – high	5 – clear	5 – fishy		5 - other	
6 – dry*		6 – other*	6 – none			
			7 – other*			

Flow Method	Flow (cfs)	Secchi Depth (cm)	Sample Depth (ft)	Total Depth (ft)

1 – flow-gauge station
5 - Doppler

INSTRUMENT READINGS

Temp (°C)	Conductivity (mS/cm)	pH (s.u.)	Salinity (PSS)	Dissolved Oxygen (mg/L)
(1.0 to 38.0°C)	(0.03 to 60 mS/cm)	(5.0 to 10.0 s.u.)	(0.009 to 45.0 PSS)	(0.5 to 15.0 mg/L)

***Other Observations:**
_____
_____
_____
_____
_____

Request for Analysis (circle what is requested)

1 – pH	**5 – Cl^-**	**9 – $N\text{-}NO_2$**
2 – Conductivity	**6 – SO_4**	
3 - TSS	**7 – $N\text{-}NH_3$**	**10 – *E. coli***
4 – $N\text{-}NO_3$	**8 – $T\text{-}PO_4$**	**11 – Enterococcus**

No. of Containers:

____ 100 mL sterile plastic	**___ 1 gallon plastic**
____ 1 L plastic	**____ 1 L plastic w/ H_2SO_4**
____ 1 L plastic (TKN) bottle w/ H_2SO_4 (Analyzed by H-GAC Contract Lab)	

Acid ID#: H_2SO_4

For lab use only:

Samples Received on Ice? Yes / No **Thermometer ID:**_____

Temp (°C) _____**Corrected Temp (°C)** _____**Corrected Factor(°C)** _____

Samples relinquished by: _____ **Date/Time:** _____

Lab Sample No.: _____ **Received by:** _____ **Date/Time:** _____

Run No.: 6
Field No.: 4
Station ID: 16479

City of Houston
Houston Health Department
Bureau of Pollution Control and Prevention
7411 Park Place Blvd
832.393.5730 FAX 832-393-5726
FIELD FORM & CHAIN OF CUSTODY FORM

HOUSTON HEALTH DEPARTMENT

Location Name: Brays Bayou @ S. Wayside

Date: _____ **Time (hhmm):** _____ **Samples Collected by:** _____

Number of Days Since Last Rain Fall: _____ **Field Meter #:** _____ **Calibration Date:** _____

FIELD OBSERVATIONS

Flow Severity	Tidal Stage	Color	Odor	Water Surface	Current Weather	Wind Intensity
1 – no flow 2 – low 3 – normal 4 – flood 5 – high 6 – dry*	1 – low 2 – falling 3 – slack 4 – rising 5 – high	1 – brownish 2 – reddish 3 – greenish 4 – blackish 5 – clear 6 – other*	1 – sewage 2 – oily/chemical 3 – rotten egg 4 – musky 5 – fishy 6 – none 7 – other*	1 – calm 2 – ripples 3 – waves 4 - whitecaps	1 – clear 2 – partly cloudy 3 – cloudy 4 – rain 5 - other	1 – calm 2 – slight 3 – moderate 4 - strong

Flow Method	Flow (cfs)	Secchi Depth (cm)	Sample Depth (ft)	Total Depth (ft)

1 – flow-gauge station
5 - Doppler

INSTRUMENT READINGS

Temp (°C)	Conductivity (mS/cm)	pH (s.u.)	Salinity (PSS)	Dissolved Oxygen (mg/L)
(1.0 to 38.0°C)	(0.03 to 60 mS/cm)	(5.0 to 10.0 s.u.)	(0.009 to 45.0 PSS)	(0.5 to 15.0 mg/L)

***Other Observations:**
_____
_____
_____
_____
_____

Request for Analysis (circle what is requested)

1 – pH	**5 – Cl^-**	**9 – $N\text{-}NO_2$**
2 – Conductivity	**6 – SO_4**	
3 - TSS	**7 – $N\text{-}NH_3$**	**10 – *E. coli***
4 – $N\text{-}NO_3$	**8 – $T\text{-}PO_4$**	**11 – Enterococcus**

No. of Containers:

____ 100 mL sterile plastic **___ 1 gallon plastic**
____ 1 L plastic **____ 1 L plastic w/ H_2SO_4**
____ 1 L plastic (TKN) bottle w/ H_2SO_4 (Analyzed by H-GAC Contract Lab)

For lab use only:

Acid ID#: H_2SO_4

Samples Received on Ice? Yes / No **Thermometer ID:**_____
Temp (°C) _____ **Corrected Temp (°C)** _____ **Corrected Factor(°C)** _____

Samples relinquished by: _____ **Date/Time:** _____

Lab Sample No.: _____ **Received by:** _____ **Date/Time:** _____

CITY OF HOUSTON DRINKING WATER OPERATIONS LABORATORY

1770 Sidney street, Houston, TX 77023

LAKE HOUSTON WATERSHED SITE MONITORING

FIELD SHEET & CHAIN OF CUSTODY

Effective Date: 1 10/02/19 **Document ID:** 150 **Version:** 1.11

Date of Sampling:_____ **Air Temperature :**_____ **Days Since Last Significant Rainfall :**_____ Samples Collected By: _____

Sample Run Collected Bi-Monthly **Note: All samples taken at a one foot depth by plastic bucket unless specifically designated in 'Sample Depth' column below.**

Sample No.	Station Name	TCEQ ID	Time	Sample Depth (ft)	Total Depth (ft)	Water Temp ºC	Sp. Cond. µs/cm	pH	DO mg/L	Secchi Depth (m)	Flow Severity	Obser. Turb.	Water Color	Water Odor	Present Weather	Wind Intensity	Water Surface
1	LUCE BAYOU HUFFMAN / CLEVELAND	11187															
2	EAST FORK SAN JACINTO RIVER @ FM 1485 (gage 8070200)	11235															
3	CANEY CREEK @ FM 1485	11334															
4	PEACH CREEK @ FM 2090	11337															
5	EAST FORK SAN JACINTO @ SH 105 (gage 8070000)	11238															
6	PEACH CREEK @ FM 105	16625															
7	CANEY CREEK @Millmac Rd.	21465															
8	WEST FORK SAN JACINTO @ FM 105 (gage 8067650)	11251															
9	STEWART CREEK @ LOOP 336, CONROE	16626															
10	CRYSTAL CREEK @ FM 1314	11181															
11	WEST FORK SAN JACINTO @ FM 242	11243															
12	SPRING CREEK @ I-45 (gage 8068500)	11313															
13	CYPRESS CREEK @ I-45 (gage 8069000)	11328															

1-no flow	1-low	1-brownish	1-sewage	1-clear	1-calm	1-calm
2-low	2-medium	2-reddish	2-oily/chemical	2-p.cloudy	2-slight	2-ripple
3-normal	3-high	3-greenish	3-rotten egg	3-cloudy	3-mod.	3-wave
4-flood		4-blackish	4-musty	4-rain	4-strong	4-whitecap
5-high		5-clear	5-fishy	5-other		
6-dry		6-other	6-none			
			7-other			

Comments:

Analysis Required: VOC, WQP*, T-phos, Ammonia, Total Coliform, E. coli Matrix: Water

Bottles used: 1-100ml sterilized bottle for Bacti analysis, 1-500ml plastic bottle for WQP analysis, 2-40ml VOA bottles with 1:1 HCl, 1-500 mL plastic bottle acidified with H_2SO_4 for NH_3 analysis, 1-250ml amber bottle for T-phos. & TOC analysis. 1-1000mL plastic bottle for TSS

*** WQP analysis includes:** pH, Cond., TSS, Alk, Hard, NO_2-N, NO_3-N, F, Cl, Br, SO_4 Temperature of Samples when Received at Lab:_____

Biol. Samples Relinquished By :_____ **Date:**_____ **Time :**_____ **Chem. Samples Relinquished By :**_____ **Date:**_____ **Time :**_____

Biol. Samples Received By :_____ **Date:**_____ **Time :**_____ **Chem. Samples Received By :**_____ **Date:**_____ **Time :**_____

San Jacinto River Authority - Lake Conroe Division
LAKE CONROE MONITORING FIELD SHEET

Effective Date: 8/20/2019

Date of Sampling:_____ Samples Collected By:_____ Days Since Last Significant Rainfall:_____

◆Reservoir Stage (Feet above mean sea level:_____ ◆Reservoir Percent Full:_____ ◆Reservoir Accessibility Yes_____ No_____

Sample No.	Total Depth (ft)	Time	Sample Depth (ft)	Temp	Sp Cond	pH	D.O.	Present Weather	Wind Intensity	Water Surface	Water Color	Water Odor
1												
Station Name								1-clear	1-calm	1-calm	1-brownish	1-sewage
								2-partly cloudy	2-slight	2-ripple	2-reddish	2-oily/chemical
Walker County								3-cloudy	3-moderate	3-waves	3-greenish	3-rotten egg
								4-rain	4-strong	4-whitecaps	4-blackish	4-musty
								5-other			5-clear	5-fishy
TCEQ ID									Secchi Depth (m)		6-oter	6-none
												7-other
11344												

Comments:

Sample No.	Total Depth (ft)	Time	Sample Depth (ft)	Temp	Sp Cond	pH	D.O.	Present Weather	Wind Intensity	Water Surface	Water Color	Water Odor
2												
Station Name								1-clear	1-calm	1-calm	1-brownish	1-sewage
								2-partly cloudy	2-slight	2-ripple	2-reddish	2-oily/chemical
T. James Creek								3-cloudy	3-moderate	3-waves	3-greenish	3-rotten egg
								4-rain	4-strong	4-whitecaps	4-blackish	4-musty
								5-other			5-clear	5-fishy
TCEQ ID									Secchi Depth (m)		6-oter	6-none
												7-other
16645												

Comments:

Surveyor SN:_____ Sonde SN:_____ Sheet reviewed by:_____ Data entered by:_____Date:_____ Data reviewed by:_____ Date:_____

Water Quality Laboratory
San Jacinto River Authority
Woodlands - Clean Rivers Program Field Sheet

Date of Sampling: _____ Samples Collected By:_____ Days Since Last Significant Rainfall:_____

◆Reservoir Stage (FT above Mean Sea Level)_____
◆Reservoir Percent Full:_____

◆Reservoir Accessible?
Yes_____ No_____

Sample No.	Station Name	TCEQ ID	Time	Total Depth (ft)	Secchi Depth (m)	Water Color	Water Odor	Present Weather	Water Surface	Wind Intensity
LW # 1	Lake Woodlands # 1 - North end, downstream of Research Forest Dr.	16484								

	Sample Depth	Temp	Cond.	pH	D.O.	Comments:
Surface						
Mid-Depth						
Bottom						

Sample No.	Station Name	TCEQ ID	Time	Total Depth (ft)	Secchi Depth (m)	Water Color	Water Odor	Present Weather	Water Surface	Wind Intensity
LW # 2	Lake Woodlands # 2 - Mid point in lake	16483								

	Sample Depth	Temp	Cond.	pH	D.O.	Comments:
Surface						
Mid-Depth						
Bottom						

Sample No.	Station Name	TCEQ ID	Time	Total Depth (ft)	Secchi Depth (m)	Water Color	Water Odor	Present Weather	Water Surface	Wind Intensity
LW # 3	Lake Woodlands # 3 - Western reach near Meadow Cove & Pleasure Cove Drives	16481								

	Sample Depth	Temp	Cond.	pH	D.O.	Comments:
Surface						
Mid-Depth						
Bottom						

Sample No.	Station Name	TCEQ ID	Time	Total Depth (ft)	Secchi Depth (m)	Water Color	Water Odor	Present Weather	Water Surface	Wind Intensity
LW # 4	Lake Woodlands # 4 - South end, near West end of dam	16482								

	Sample Depth	Temp	Cond.	pH	D.O.	Comments:
Surface						
Mid-Depth						
Bottom						

Present Weather: 1 = clear, 2 = partly cloudy, 3 = cloudy, 4 = rain , 5 = other
Water Color: 1 = brownish, 2 = reddish, 3 = greenish, 4 = blackish, 5 = clear, 6 = other
Water Odor: 1 = sewage, 2 = oily / chemical, 3 = rotten egg, 4 = musky, 5 = fishy, 6 = none, 7 = other

Water Surface: 1 = calm, 2 = ripples, 3 = waves
Wind intensity: 1 = calm, 2 = slight, 3 = moderate, 4 = strong

Surveyor SN:_____ **Sonde SN:**_____ Sheet reviewed by: _____ Data enter by:_____ Date:_____ Data Reviewed by:_____ Date:_____

Form Updated: August 16, 2019

Water Quality Laboratory
San Jacinto River Authority
Woodlands - Clean Rivers Program Field Sheet

Date of Sampling:_____ Samples Collected By:_____ Days Since Last Significant Rainfall:_____

Sample No.	Station Name	TCEQ ID	Time	Total Depth (ft)	Trans Tube (m)	Water Color	Water Odor	Present Weather	Sample Depth	Temp	Cond.	pH	D.O.	Flow Severity
LPB # 2	Lower PB (footbridge) upstream of Sawdust Rd. & WWTP #1	16627												
		Comments:												

Sample No.	Station Name	TCEQ ID	Time	Total Depth (ft)	Trans Tube (m)	Water Color	Water Odor	Present Weather	Sample Depth	Temp	Cond.	pH	D.O.	Flow Severity
LPB # 3	Panther Branch - 295 M downstream of Sawdust Rd.	16422												
		Comments:												

Sample No.	Station Name	TCEQ ID	Time	Total Depth (ft)	Trans Tube (m)	Water Color	Water Odor	Present Weather	Sample Depth	Temp	Cond.	pH	D.O.	Flow Severity
UPB # 3	Bear Branch upstream of Research Forest Dr. 20 M	16631												
		Comments:												
											Gage 8068400 Reading=			CFS

Sample No.	Station Name	TCEQ ID	Time	Total Depth (ft)	Trans Tube (m)	Water Color	Water Odor	Present Weather	Sample Depth	Temp	Cond.	pH	D.O.	Flow Severity
UPB # 1	Upper Panther Branch - 80 M upstream of WWTP #2 on Research Forest Dr.	16629												
		Comments:												

Sample No.	Station Name	TCEQ ID	Time	Total Depth (ft)	Trans Tube (m)	Water Color	Water Odor	Present Weather	Sample Depth	Temp	Cond.	pH	D.O.	Flow Severity
UPB # 2	Upper PB (footpath) - 170 M downstream of WWTP #2 on Research Forest Dr.	16630												
		Comments:												

Water Color: 1 = brownish, 2 = reddish, 3 = greenish, 4 = blackish, 5 = clear, 6 = other
Water Odor: 1 = sewage, 2 = Oily / chemical, 3 = rotten egg, 4 = musky, 5 = fishy, 6 = none, 7 = other
Present Weather: 1 = clear, 2 = partly cloudy, 3 = cloudy, 4 = rain , 5 = other
Flow Severity: 1 = no flow, 2 = low, 3 = normal, 4 = flood, 5 = high, 6 = dry

Surveyor SN:_____ **Sonde SN:**_____ Sheet reviewed by: _____ Data enter by:_____ Date:_____ Data Reviewed by:_____ Date:_____

Environmental Institute of Houston, University of Houston-Clear Lake

Clean Rivers Program Field Datasheet

Station ID:_____ Date (mm/dd/yyyy):_____ Sample Time (hh:mm): _____

Location:_____ Lat:_____ Long:_____

Collected By (First initial, last name):_____

FIELD MEASUREMENTS If depth <0.5: take one measurement at 1/3 total depth. If ≥ 0.5 but < 1.5: take one measurement at 0.3m from surface
If ≥ 1.5m deep - perform profile at 0.3m from bottom, middle, and 0.3m from surface
If ≥ 3m deep take profile at 0.3m from bottom, then every whole meter until 0.3m from surface (eg:4.2 = 3.9m, 3m, 2m, 1m, 0.3m)

	1	2	3	4	5	6
Temp (C)						
Conductivity (uS)						
Salinity (psu)						
DO (%sat)						
DO mg/L						
pH						
Depth (m)						

FIELD OBSERVATIONS

_____ TOTAL DEPTH (m)

_____ WATER ODOR 1-sewage 2-oily/chemical 3-rotten egg 4-musky 5-fishy 6-none 7-other

_____ WATER SURFACE 1-calm 2-ripples 3-waves 4-whitecap

_____ WIND INTENSITY 1-calm 2-slight 3-moderate 4-strong

_____ WATER COLOR 1-brownish 2-reddish 3-greenish 4-blackish 5-clear 6-other

_____ DAYS SINCE LAST SIG. RAINFALL

_____ PRESENT WEATHER 1-clear 2-partly cloudy 3-cloudy 4-rain 5-other

_____ FLOW SEVERITY 1-no flow 2-low 3-normal 4-flood 5-high 6-dry

_____ FLOW (cfs)

_____ FLOW METHOD 1-gage 2-electric 3-mechanical 4-weir/flume 5-doppler

_____ SECCHI DISK appear (m)

_____ SECCHI DISK disappear (m)

_____ RECREATIONAL USE 1=1° observed, 2=2° observed, 3=non-contact observed, 4=1° evidence, 5=2° evidence, 6=non-contact evidence, 7=no evidence

_____ TIDE STAGE 1-low 2-falling 3-slack 4-rising 5-high

WATER SAMPLES

☐ **FRESH** (Non-Tidal) ☐ *E. coli* ☐ **MARINE** (Tidal) ☐ *Enterococcus*

Container	Preservative	Analysis Requested	Comments

ADDITIONAL INFORMATION & REMARKS

* If site has isolated pools (> 10 m in length and 0.4m deep) record:
Lat _____ Long_____ of largest pool in reach. Maximum pool width_____(m), Maximum pool depth _____ (m), Pool length _____(m), and percent pool coverage in 500m reach _____%.

Environmental Institute of Houston,
University of Houston-Clear Lake

Stream Flow (Discharge) Measurement Form

Environmental Institute of Houston

Stream:_____ Date:_____

Station:_____

Description:_____

Time Begin:_____ Time End:_____ Meter Type:_____

Observers:_____ Stream Width*:_____ Section Width (W):_____

Observations:_____

_____

Section Midpoint (ft) (m)	Section Depth (ft) (m) (cm) (D)	Observational Depth** (ft) (m)	Velocity (V)		Flow (Q) (m^3/s) (ft^3/s) Q = (W)(D)(V)
			At Point (ft/s) (m/s)	Average (ft/s) (m/s)	

m3/s x 35.3 =ft3/s

Total Flow (Discharge) (Σ Q)	*
Field Discharge (Σ Q)	

***See Attached Discharge Sheet**

Modified from TCEQ-20117 (Rev. 04/22/2004)

Page 1 of 1

Texas Research Institute for Environmental Studies - Sam Houston State University

Clean Rivers Program Field Data/Sampling Sheet

Station ID:_____ Date:_____ Sample Time: _____

Location:_____ Lat:_____ Long:_____

Collected By:_____

FIELD MEASUREMENTS (If < 1.5m deep - record @ 0.3m from surface; If≥ 1.5m deep - perform profile @ 0.3m from bottom, @ middle, and @ 0.3m from surface)

	1	2	3	4	5
Temp (C)					
Conductivity (uS)					
Salinity (psu)					
DO (%sat)					
DO mg/L					
pH					
Depth (m)					

FIELD OBSERVATIONS

	TOTAL DEPTH (m)		PRESENT WEATHER 1-clear 2-partly cloudy 3-cloudy 4-rain 5-other
	WATER ODOR 1-sewage 2-oily/chemical 3-rotten egg 4-musky 5-fishy 6-none 7-other		FLOW SEVERITY 1-no flow 2-low 3-normal 4-flood 5-high 6-dry
	WATER SURFACE 1-calm 2-ripples 3-waves 4-whitecap		FLOW (cfs)
	WIND INTENSITY 1-calm 2-slight 3-moderate 4-strong		FLOW METHOD 1-gage 2-electric 3-mechanical 4-weir/flume 5-doppler
	WATER COLOR 1-brownish 2-reddish 3-greenish 4-blackish 5-clear 6-other		SECCHI DISK (m)
	TIDE STAGE 1-low 2-falling 3-slack 4-rising 5-high		RECREATIONAL USE 1=1° observed, 2=2° observed, 3=non-contact observed, 4=1° evidence, 5=2° evidence, 6=non-contact evidence, 7=no evidence
	DAYS SINCE LAST SIG. RAINFALL		Primary Contact Rec. Observed (enter number of people)
			Evidence of Primary Contact Rec. Observed 0= no evidence observed, 1= evidence observed

WATER SAMPLES

☐ **FRESH** (Non-Tidal) ☐ **MARINE** (Tidal)

☐ *E. coli* ☐ *Enterococcus*

Field Split Collected (yes/no)

Container	Preservative	Analysis Requested	Comments
2 x 1L - Plastic	Ice	TSS	
2 x 1L - Plastic	Ice, 2 mL H_2SO_4 added	NH_3, TPO_4, NO_2+NO_3	
2 x 500ml - Plastic	Ice, 1 mL H_2SO_4 added	TKN	
2 x 500ml - Plastic	Ice	Cl, SO_4 (fresh water only)	
2 x 4L - Plastic (amber)	Ice	Chlorophyll-a (select sites)	
1 x 100ml - Plastic	Ice, $Na_2S_2O_3$ tablet	Bacteria (Entero and/or *E. coli*)	

ADDITIONAL INFORMATION & REMARKS

* If site is dry, determine if there is any pool with 500m reach, If pool(s) exists (> 10 m in length and 0.4m deep) record: Lat _____ Long_____ of largest pool in reach Maximum pool width_____(m), Maximum pool depth _____ (m), Pool length _____(m), and percent pool coverage in 500m reach _____%.

Appendix E: Chain of Custody Forms

EASTEX ENVIRONMENTAL LABORATORY, INC.

P.O. Box 1089 * Coldspring, TX 77331 (936) 653-3249 * (800) 525-0508
P.O. Box 631375 * Nacogdoches, TX 75963-1375 (936) 569-8879 * FAX (936) 569-8951
www.eastexlabs.com

White Copy-Follows Samples
Yellow Copy-Laboratory
Pink Copy-Client Copy

REPORT TO:

Company:
Address:
Attn:
Phone#:
Email:
P.O. #:
Sampler's Name (print):
Sampler's Signature:
Project Name: Clean Rivers Program

INVOICE TO:

Company:
Address:
Attn:
Phone#:

Remarks:

INSTRUCTIONS:

C or G: C= Composite G= Grab
Matrix: DW=Drinking Water WW=Wastewater SO=Soil/Sludge OT= Other
Container Size: 1=Gallon 2=1/2 Gallon 3=Quart/Liter 4=500mL 5=250mL 6=125mL (4oz) 7=60mL (2 oz) 8= 40mL Vial 9=Other
Type: P= Plastic G= Glass T= Teflon S= Sterile
Preservatives: C=Chilled S=Sulfuric Acid N=Nitric Acid B=Base/Caustic Z= Zn Acetate ST=Sodium Thiosulfate H=HCL O= Other

ANALYSIS REQUESTED

			Field Data								Containers													
Work Order ID	**Sample ID**	**Date**	**Time**	**Matrix**	**C or G**	**DO**	**pH**	**Cl2**	**Flow**	**Temp**	**#**	**Size**	**Type**	**Pres**										

Relinquished By: Received By: Date Time Received Iced: YES / NO

Relinquished By: Received By: Date Time Received Iced: YES / NO

Relinquished By: Received By and/or Checked in By: Date Time Received Iced: YES / NO

LAB USE ONLY Sample Condition Acceptable: YES / NO | Temp °C | *Therm ID | Logged In By: Date Time

Alternate Check In: Date Time

*Thermometer has 0.0 factor and recorded temperature is actual temperature

Pollution Control Services Department
101 S. Richey, Suite H
Pasadena, TX 77506 Fax: 713-274-6475 Phone: 713-920-2831

Sample Data and Custody Record

Id: _____ Type: _____ Permit No: _____ Date: _____ Time _____ : _____ AM PM

Site Id: _____ Name: _____ Key Map: _____

Site Info: _____

Sample Location: _____ Outfall: _____

Sample Location Info:

Outcome: ☐ Collected ☐ Collected (sample compromised) ☐ Field Test Only ☐ No Flow

Investigator(s): _____

Tests and Measurements

☐ Temperature (°C) ☐ Dissolved Oxygen (mg/L) ☐ Specific Conductivity (µS) ☐ Water Depth (meters)

☐ pH (standard units) ☐ Salinity (ppt) ☐ SECCHI Disk Transparency (meters)

Field Observations--Water

☐ Water Color 1-Brownish 2-Reddish 3-Greenish 4-Blackish 5-Clear 6-Other _____

☐ Surface Conditions 1-Clear 2-Scum 3-Foam 4-Debris 5-Sheen

☐ Water Odor 1-Sewage 2-Oily/Chemical 3-Rotten Egg 4-Musky 5-Fishy 6-None 7-Other _____

☐ Turbidity 1-Low 2-Medium 3-High

☐ Water Surface 1-Calm 2-Ripples 3-Waves 4-White Caps

Field Observations--Weather and Other

☐ Present Weather 1-Clear 2-Partly Cloudy 3-Cloudy 4-Rain 5-Other _____

☐ Wind Intensity 1-Calm 2-Slight 3-Moderate 4-Strong

☐ Tide Stage 1-Low 2-Falling 3-Slack 4-Rising 5-High ☐ 89978(Number of people observed)

☐ Days Since Last Significant Rainfall Source: _____ ☐ 89979 (Evidence of activity)

Matrix: ☐ Air ☐ Drinking Water ☐ Liquid ☐ Oil ☐ Other Solid ☐ Particulate ☐ Sludge ☐ Soil ☐ Water ☐ Other

Collection Method ☐ Grab ☐ Composite

Samples Collected:

Bottle No.	Container Type	Container Size	Preservative	Ice?	Analysis Requested	Direct Coll. Req.	Collection Type	Split	Sampled By
				Y/N			D/I	Y/N	
				Y/N			D/I	Y/N	
				Y/N			D/I	Y/N	
				Y/N			D/I	Y/N	
				Y/N			D/I	Y/N	
				Y/N			D/I	Y/N	
				Y/N			D/I	Y/N	
				Y/N			D/I	Y/N	
				Y/N			D/I	Y/N	
				Y/N			D/I	Y/N	

Custody	
Relinquished By:	Received By:
Date/Time: _____ AM PM	Date/Time: _____ AM PM
Samples placed in restricted area by: (Initial)	

Legend

Collection Type
D - Direct
I - Indirect

Preservatives

H2SO4	NaOH
HCL	Na2S2O3
HNO3	none

Container Sizes

1/2 gal	250 mL
1 gal	500 mL
1 qt	4 oz
40 mL	8 oz
100 mL	n/a

Container Types
P - Plasitc
G - Glass
Can - Canister
C - Cartridge
PB - Plastic Bag
S - Slide
O - Other

Run No.: 7
Field No.: 5
Station ID: 17482
USGS Gage Station ID: 08072760

City of Houston
Houston Health Department
Bureau of Pollution Control and Prevention
7411 Park Place Blvd
832.393.5730 FAX 832-393-5726
FIELD FORM & CHAIN OF CUSTODY FORM

HOUSTON HEALTH DEPARTMENT

Location Name: Langham Creek @ Hwy 6

Date: _____ **Time (hhmm):** _____ **Samples Collected by:** _____

Number of Days Since Last Rain Fall: _____ **Field Meter #:** _____ **Calibration Date:** _____

FIELD OBSERVATIONS

Flow Severity	Tidal Stage	Color	Odor	Water Surface	Current Weather	Wind Intensity

1 – no flow	1 – low	1 – brownish	1 – sewage	1 – calm	1 – clear	1 – calm
2 – low	2 – falling	2 – reddish	2 – oily/chemical	2 – ripples	2 – partly cloudy	2 – slight
3 – normal	3 – slack	3 – greenish	3 – rotten egg	3 – waves	3 – cloudy	3 – moderate
4 – flood	4 – rising	4 – blackish	4 – musky	4 - whitecaps	4 – rain	4 - strong
5 – high	5 – high	5 – clear	5 – fishy		5 - other	
6 – dry*		6 – other*	6 – none			
			7 – other*			

Flow Method	Flow (cfs)	Secchi Depth (cm)	Sample Depth (m)	Total Depth (m)

1 – flow-gauge station
5 - Doppler

INSTRUMENT READINGS

Temp (°C)	Conductivity (mS/cm)	pH (s.u.)	Salinity (PPT)	Dissolved Oxygen (mg/L)
(1.0 to 38.0°C)	(0.08 to 60 mS/cm)	(5.0 to 10.0 s.u.)	(0.009 to 45.0 PPT)	(0.5 to 15.0 mg/L)

***Other Observations:**
_____
_____
_____
_____
_____

Request for Analysis (circle what is requested)

1 – pH	5 – Cl^-	9 – $N\text{-}NO_2$
2 – Conductivity	6 – SO_4	
3 - TSS	7 – $N\text{-}NH_3$	10 – *E. coli*
4 – $N\text{-}NO_3$	8 – $T\text{-}PO_4$	11 – Enterococcus

No. of Containers:

___ 100 mL sterile plastic	___ 1 gallon plastic
___ 1 L plastic	___ 1 L plastic w/ H_2SO_4
___ 1 L plastic (TKN) bottle w/ H_2SO_4 (Analyzed by H-GAC Contract Lab)	

For lab use only:

Acid ID#: H_2SO_4

Samples Received on Ice? Yes / No Thermometer ID:_____
Temp (°C) _____ Corrected Temp (°C) _____ Corrected Factor(°C) _____

Samples relinquished by: _____ **Date/Time:** _____

Lab Sample No.: _____ **Received by:** _____ **Date/Time:** _____

FF&COC version 15 updated 07/2020

*Note: If site is dry, photo should be taken. If water present within 400 m, and pool is 10+m long, and 0.4+m deep, collect sample and record Maximum pool width, depth, length, and percent pool coverage in 500 m reach (if measurable) in observations section.

CITY OF HOUSTON DRINKING WATER OPERATIONS LABORATORY

1770 Sidney street, Houston, TX 77023

LAKE HOUSTON WATERSHED SITE MONITORING

FIELD SHEET & CHAIN OF CUSTODY

Effective Date: 1 10/02/19 **Document ID:** 150 **Version:** 1.11

Date of Sampling:_____ **Air Temperature :**_____ **Days Since Last Significant Rainfall :**_____ Samples Collected By: _____

Sample Run Collected Bi-Monthly **Note: All samples taken at a one foot depth by plastic bucket unless specifically designated in 'Sample Depth' column below.**

Sample No.	Station Name	TCEQ ID	Time	Sample Depth (ft)	Total Depth (ft)	Water Temp ºC	Sp. Cond. µs/cm	pH	DO mg/L	Secchi Depth (m)	Flow Severity	Obser. Turb.	Water Color	Water Odor	Present Weather	Wind Intensity	Water Surface
1	LUCE BAYOU HUFFMAN / CLEVELAND	11187															
2	EAST FORK SAN JACINTO RIVER @ FM 1485 (gage 8070200)	11235															
3	CANEY CREEK @ FM 1485	11334															
4	PEACH CREEK @ FM 2090	11337															
5	EAST FORK SAN JACINTO @ SH 105 (gage 8070000)	11238															
6	PEACH CREEK @ FM 105	16625															
7	CANEY CREEK @Millmac Rd.	21465															
8	WEST FORK SAN JACINTO @ FM 105 (gage 8067650)	11251															
9	STEWART CREEK @ LOOP 336, CONROE	16626															
10	CRYSTAL CREEK @ FM 1314	11181															
11	WEST FORK SAN JACINTO @ FM 242	11243															
12	SPRING CREEK @ I-45 (gage 8068500)	11313															
13	CYPRESS CREEK @ I-45 (gage 8069000)	11328															

1-no flow	1-low	1-brownish	1-sewage	1-clear	1-calm	1-calm
2-low	2-medium	2-reddish	2-oily/chemical	2-p.cloudy	2-slight	2-ripple
3-normal	3-high	3-greenish	3-rotten egg	3-cloudy	3-mod.	3-wave
4-flood		4-blackish	4-musty	4-rain	4-strong	4-whitecap
5-high		5-clear	5-fishy	5-other		
6-dry		6-other	6-none			
			7-other			

Comments:

Analysis Required: VOC, WQP*, T-phos, Ammonia, Total Coliform, E. coli Matrix: Water

Bottles used: 1-100ml sterilized bottle for Bacti analysis, 1-500ml plastic bottle for WQP analysis, 2-40ml VOA bottles with 1:1 HCl, 1-500 mL plastic bottle acidified with H_2SO_4 for NH_3 analysis, 1-250ml amber bottle for T-phos. & TOC analysis. 1-1000mL plastic bottle for TSS

*** WQP analysis includes:** pH, Cond., TSS, Alk, Hard, NO_2-N, NO_3-N, F, Cl, Br, SO_4 Temperature of Samples when Received at Lab:_____

Biol. Samples Relinquished By :_____ **Date:**_____ **Time :**_____ **Chem. Samples Relinquished By :**_____ **Date:**_____ **Time :**_____

Biol. Samples Received By :_____ **Date:**_____ **Time :**_____ **Chem. Samples Received By :**_____ **Date:**_____ **Time :**_____

DRINKING WATER OPERATIONS LABORATORY

4200 Leeland Street, Annex Building, Houston, TX 77023

San Jacinto River Authority - Lake Conroe Division

LAKE CONROE MONITORING
CHAIN OF CUSTODY

Effective Date: 8/21/2019 **Document ID: 150** **Version: 1.11**

Date of Sampling:_____ **Samples Collected By:** _____

						Analysis Requested:					
Sample No.	**Station Name**	**Watershed ID**	**TCEQ ID**	**Time**	**Grab or Composite**	**TSS**	**WQP ***	**Total Coliform & E.Coli**	**T.Phos & TOC**	**Ammonia**	**Comments:**
1	**Walker County**	23	11344								
2	**T. James Creek**	25	16645								
3	**Weir Creek**	3	16644								
4	**Caney Creek**	6	16643								
5	**Tim Cude Creek**	26	16642								
6	**Lost Lake Creek**	33	16640								
7	**Lewis Creek**	4	16641								
8	**W.C. Clark Creek**	27	16639								
9	**Atkin Creek**	5	16638								
10	**Intake Lake Conroe**	24	11342								

Bottles used:
1-1000mL plastic botte for TSS
1-500ml plastic bottle for WQP analysis
1-120ml sterilized bottle for Bacti analysis
1-250ml amber bottle acidified with H2SO4 for T-phos. & TOC analysis
1-500 mL plastic bottle acidified with H2SO4 for NH3 analysis

Matrix: Surface Water

Samples Received on Ice: Yes_____No_____

Temperature of Samples when Received at Lab:_____

*** WQP analysis includes:** pH, Cond., Alk, Hard, NO_2-N, NO_3-N, F, Cl, Br, SO_4

Sample Condition Acceptable: Yes_____No_____
If no, explain in comment section above

Biological Samples
Relinquished By :_____ **Date:**_____ **Time:**_____

Chemical Samples
Relinquished By :_____ **Date:**_____ **Time:**_____

Biological Samples
Received By :_____ **Date:**_____ **Time:**_____

Chemical Samples
Received By :_____ **Date:**_____ **Time:**_____

Texas Research Institute for Environmental Studies (TRIES) Analytical Laboratory
Sam Houston State University
Chain of Custody

REPORT TO:	BILL TO:
Name: Kaitlen Gary	**Name:** Kaitlen Gary
Company: TRIES Aquatics Laboratory	**Company:** TRIES Aquatics Laboratory
Address: 2424 Sam Houston Avenue, Suite B-8	**Address:** 2424 Sam Houston Avenue, Suite B-8
City, State, Zip: Huntsville, Tx 77340	**City, State, Zip:** Huntsville, TX 77320
Phone: 936-294-2501 **Fax** **Email:** kpgary@shsu.edu	**Phone:** 936-294-2501 **Fax:** **Email:** kpgary@shsu.edu
Sampler Name: **Sampler Signature:**	Analysis Required — TRIES Log #

Date Collected	Time Collected	Matrix Code	Type* C	Type* G	Sample Description/Location	Bottle ID	pH	°C	Preservation Code	Cl, SO4, NO2, NO3	TSS	T PO4	NH3				Sample Number
		AQ		X		B1			C	X							
		AQ		X		B2			C		X						
		AQ		X		B3			A			X					
		AQ		X		B4			D				X				

TRIES Use Only

Sample Receipt Checklist:

Shipped: _____
Hand Del: _____

Container Tape:
Present: **Y N NA** Intact **Y N NA**

Cooler Temp:_____(°C)

Broken: **Y N** Leaking: **Y N**

Preserved: **Y N**
Acid type: _____
Acid vol:_____
Acid lot: _____

COC Seals:
Present: **Y N NA** Intact: **Y N NA**

COC & Labels Match: **Y N**

Sufficient Quantity: **Y N**

Requested TAT:
Normal (10 days)
Expedite: (5 days)
Rush (1 Day)
*C=Composite
G=Grab

Matrix Code:
WW=Wastewater
AQ=water
SW=solid

Preservation
C = <6° C
A= pH <2 HNO_3
B = pH <2 HCl
D = pH <2 H_2SO_4
E = $Na_2S_2O_3$

Sample Receiving/Lab Comments:

Relinquished By:	**Date/Time:**	**Relinquished By:**	**Date/Time:**
Received By:	**Date/Time:**	**Received By:**	**Date/Time:**
Thermometer ID:	**pH strips Lot:**	**Project:** Clean Rivers Program	

2424 Sam Houston Ave. Suite B8 · Huntsville, Texas 77340 · (936)294-3715 · Fax (936)294-3822

Appendix F: Data Review Checklist

H-GAC Clean Rivers Program
Local Partner

Data Submittal Form
and
Data Review Checklist

Please complete this form, sign where applicable, and submit with copies of Field Sheets, Chain-of-Custody Forms and Lab Data Reports pertaining to data in this submittal. One form is required for each submission. Failure to complete and submit this form will impede the process whereby data is submitted to TCEQ for inclusion in the State of Texas Surface Water Quality Monitoring (SWQM) database or included in the H-GAC Data Clearinghouse. This form applies to only those sampling sites listed in the Coordinated Monitoring Schedule for FY 2022 or FY2023.

Local Partner:_____

Water Body:_____

Data Start Date:_____ Data End Date:_____

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

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

Notice: Attach extra pages to document information that exceeds the spaces provided.

Field Data Review

List instrument(s) used to collect field measurements._____
Was the instrument pre-calibrated before each sampling run? Yes___ No____
Explain why not. _____
Was an instrument post-calibration check performed within 24-hours after each use?
Yes___ No____
Explain why not. _____
Did all post-calibration checks pass? Yes___ No____
What were the minimum and maximum post-calibration errors for the field instrument data associated with this Data Review Checklist? Please express as a range.
Dissolved Oxygen (± 6% saturation **or** ± 0.5 mg/L)_____
pH (± 0.5 standard units)_____
Specific Conductance (± 5 % standard)_____
Temperature (± 1.0 ºC, annual calibration check)_____
Depth (± 0.2 at 1 meter, annual calibration check)_____
Were all field parameters measured and documented for each station location? Yes ____ No___
Were water samples collected for all required laboratory parameters at every station location? Yes____ No____
Were water samples "iced" immediately upon collection or acidified in the field as required? Yes___ No____
Were all field sheets completed using indelible ink? Yes___ No____
Were errors on field sheets corrected using a single line with initials of person making the correction and date corrected? Yes___ No____
If no, explain._____
Were empty sections of every field sheet closed-out with a diagonal line, initials and date closed-out? Yes___ No____
Were problems encountered while collecting any field measurements? Yes__ No___
Explain._____
Were these problem(s) documented on the field sheets? Yes___ No____
Were problems encountered in the field, communicated to the supervisor so the H-GAC Project Manager could be notified as required by the QAPP? Yes___ No____
Were there any results (outliers) in this data set greater than the maximum screening value or less than the minimum screening value? Yes___ No____
Were outlier(s) documented on the field sheets? Yes ___ No ___
Were all chain-of-custody forms and/or field data sheets filled out completely and accurately? Yes___ No____
Were empty sections of every Chain of Custody form and/or field data sheet closed-out with a diagonal line, initials and date closed-out? Yes___ No____
Have field data sheet(s) or chain-of-custody form(s) changed since the last data submittal to H-GAC? Yes___ No____
Explain if yes or attach a new form_____

Provide source of "Days Since Last Significant Rainfall" data:_____

Provide additional comments about Field Data on an extra page attached to this report

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

Lab Data Quality Review

Were all holding times confirmed? Yes___ No___
Were samples received at the lab "in ice" and in the process of cooling to ≤6ºC?
Yes____ No____
*Explain if no*_____
Were any water samples analyzed that exceeded holding time requirements?
Yes___ No____
Were those results removed from data set submitted to H-GAC? Yes____ No____
Were empty sections of the Chain of Custody form closed-out with diagonal lines, initials and date closed-out? Yes___ No____ Are you sure? Yes___ No____
Are all lab values reported consistent with the Limit of Quantitation (LOQ) for each parameter listed in Table A7.1 of the Regional QAPP or Special Studies QAPP? Yes___ No____
*Explain if no*_____
Have errors on lab sheets been corrected using a single line with initials of person making the correction and date corrected? Yes___ No____
Were empty sections of every lab sheet closed-out with a diagonal line, initials and date closed-out?
Yes___ No____
Were there any results that were not reported by the lab? Yes___ No____
*Explain if yes*_____

Data reasonableness and correctness of analysis have been confirmed and documented so H-GAC can easily find for the following situations.

- For bacteria densities that are too few or too numerous to count, are values reported as < or > the applicable minimum or maximum value? Yes___ No____
- Are there any results in this data set greater than the maximum screening values or less than the minimum screening values? Yes___ No____
- Are there any results in the data set that "Best Professional Judgment" would indicate a possible error and an investigation is warranted? Yes___ No____
- *If yes to any previously bulleted questions*, have the results been reconfirmed and documented as being accurate so H-GAC doesn't need to hunt for answer? Yes___ No____

What kind of QA/QC data is provided with this data submittal?_____
_____
Are all sample results submitted to H-GAC NELAP complaint? Yes_____No_____
Exceptions to NELAP compliance: _____
_____

Additional comments about Lab Data _____
_____
_____

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

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

Data Entry, Formatting and Table Structure

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

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

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

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

Were data reviewed for outliers? Yes___ No___
(Refer to www.tceq.state.tx.us/compliance/monitoring/crp/data/storet.html
"All STORET Codes" for file: sw parm.txt for Mins and Maxs of every STORET code)
Are all outliers confirmed, documented and identified so the H-GAC Data Manager can review them? Yes___ No___
Are appropriate quality assurance/quality control information or results included with the data set for verification and validation by H-GAC? Yes___ No___
Have at least 10% of data in the data set been reviewed against field and laboratory data sheets?
Yes___ No___
Additional comments about Data Entry, Formatting and Table Structure_____
_____
_____
_____
_____

Person who reviewed the database for accuracy and completeness:

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

Electronic data set was submitted to H-GAC on _____

Electronic data set was submitted to H-GAC by:

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

Appendix G: Data Summary Report

Houston-Galveston Area Council
Clean Rivers Program
Data Summary

Data Information

Data Source: **HG (source 1) HG (source 2)**

Date Submitted: **12/22/2020**

Tag ID Range: **I051103 - I051130**

Date Range: **06/16/2020 – 09/03/2020**

Comments

1. This report addresses ambient and 24-hour dissolved oxygen monitoring data, all of which are attached to this email.

2. Summary statistics for 24-hour DO monitoring events are calculated from raw data downloaded from the datasonde and are assumed to be correct if the datasonde has passed post-calibration and the data series shows the sonde was always in the water. Outliers flagged by the SWQMIS validation algorithm are reviewed and accepted by H-GAC. There is one (1) 24-hour DO events in this dataset. There were no outliers identified in this event.

3. Total Kjeldahl nitrogen (TKN) is analyzed at 12 stations on a quarterly basis. There are 11 results in this dataset.

    a. TKN was not analyzed from 11335 on 08/18/2020 due to inaccessibility from construction (see Item 4).

4. Station 11335 could not be sampled in August due to construction activity at the location.

5. The CRP QAPP specifies a limit of quantitation of 1 MPN/100 mL for *E. coli* (31699), achievable when 100 mL of sample is analyzed. Eastex Laboratory does not analyze 100 mL aliquots; the effective LOQ is 10 MPN/100 mL from 1:10 dilutions.

6. Water color (89969) and water odor (89971) are only reported as “Other” (“6” and “7” respectively) if H-GAC has confirmed that a description is included in the “Comments” field. This dataset does not contain any results as “Other” for

Water Color or Water Odor.

7. Field data are collected at stations 11181, 11243, and 16626 in support of a flow monitoring project requested by TCEQ. Laboratory samples are not collected.
    a. 11243 was inaccessible in July 2020 due to highway construction.

8. There are 25 instantaneous flow (00061) results in the dataset.

    a. 17431 reported as <0.1 as it was too shallow to take a measurement.
    b. 20462 reported as 0.0 as pools were present at the location (no flow).
    c. 20457 reported as 0.0 as pools were present but not large enough to assess by SWQM guidance (no flow).
    d. 18192 reported as 0.00 as no observable flow was present (no flow).

9. The following outliers were verified by H-GAC and/or Eastex Laboratory staff:

    a. Nitrate-N, total (00062) at 20465 on 09/02/2020 verified by Eastex Lab (September HGAC Data Review Checklist).

Houston-Galveston Area Council
CRP Data Manager Jessica Casillas Date 12/21/2020

Houston-Galveston Area Council
CRP Quality Assurance Officer Jean Wright Date 12/21/2020

Appendix H: Data Management Process

H-GAC's Surface Water Quality Data Management Process

1. When the data manager receives field and laboratory data from individual local partners, all electronic files are saved in the partner's 'Raw Data' folder. The data may be in the form of Excel spreadsheets, Access tables, scanned field data collection forms, or files downloaded directly from field instrumentation. If data summary checklists have been submitted as electronic files, they are also stored in this folder. Hard copies of data, data summary checklists, calibration records, or other physical data are filed for subsequent data entry by H-GAC staff and for reference during the data review and validation process. In addition, receipt of the data is documented in the "CRP Data Tracking" database, currently found at G:\CE\Databases\Clean_Rivers_Program\CRP Data Management \CRP Data Tracking.accdb.

   No modifications or corrections are made to files in the raw data folders.

2. Raw data files are then copied to the partner's "Working Data" folder. All modifications to the data prior to SAS processing are performed on the files in the "Working Data" folder. Compilation of the submitted data, where necessary, is performed by the H-GAC data manager. This typically involves combining and re-formatting spreadsheets or database tables, as well as other data management tasks. Field/variable names are changed to standardized formats, parameter names in the raw data files are replaced by TCEQ parameter codes, and data types are changed as required. (specific information is found below). Most of these tasks are performed after the data has been imported into the SAS environment for processing. In rare cases (e.g. to correct a data entry error or add data that was not entered prior to submission) H-GAC staff may enter data manually into the working file or add SAS code to make the change. Because the measurement performance specifications found in the A7.1 table may vary from one QAPP to another, the working data file does not include data collected under two different QAPPs. The file may, however, contain information from more than one month within the fiscal year covered by an individual QAPP.

3. Field and laboratory data for specific sample sites (monitoring stations) are combined during SAS processing.

4. During SAS processing, all fields (columns) in the compiled dataset are renamed and reformatted to comply with SWQM data management guidelines. Consult the most recent version of the "Data Management Reference Guide for Surface Water Quality Monitoring "for further information.

   a. The fields containing sample site, sample date, sample time, and sample depth are renamed STATION_ID, ENDDATE, ENDTIME, and ENDDEPTH respectively.

   b. The parameter names used by the partner are replaced by the TCEQ parameter code, preceded by an "S" to ensure that the data is read by SAS procedures as text data.

   c. Example: The field or column for dissolved oxygen is renamed "S00300".

5. The units of measurement as reported by the partner may not comply with SWQM guidelines. In most cases the SAS code will make the conversion to the correct units. If it is discovered that

the code for conversion has not been written or is incorrect, or if the partner does not report the results consistently, manual conversion of the units may be necessary. In many cases, the SAS code will flag any records reported in the wrong units for other reasons (below or above screening values, for example), and the correction can be made using SAS.

6. If the SAS code does not include an algorithm for reformatting dates and times, the data manager ensures that these data are formatted as mm/dd/yyyy and hh:mm respectively prior to import.

7. The partner may submit data for parameters that are not included in the A7.1. In most cases, the SAS code will simply omit the parameter from inclusion in the final datasets. It is better to modify the SAS code if unwanted parameters appear in the final dataset.

   Note: While references appear in this document to modification of the SAS code, these are for expository purposes only. The code should only be modified by a person who is very familiar with SAS programming in general, and the CRP processing code in particular.

8. When a database table(s) or Excel spreadsheets containing all field and laboratory data have been compiled and reformatted (if needed) as described above, they are saved to the SAS input folder within the "SAS Data Processing" folder (currently at Q:\CE\Clean Rivers\DATA\SAS_Data_Processing) as an Access database or an Excel file. The input file should be renamed to include a code identifying the partner and the date range of the data.

9. As part of SAS processing, tables containing laboratory –specific quantitation limits, TCEQ minimum and maximum screening values, and site name / monitoring station ID correspondences are imported for comparison to the partner data. At the beginning of the period under which a specific QAPP is applicable, the data manager ensures that the tables containing this information correspond (where applicable) to the A7.1 tables. The data manager updates these tables at other times as needed.

10. The data manager modifies the SAS program used for the partner's most recent dataset for processing of the current data as follows.

    a. The most recent SAS program for the partner is saved with a name identifying the partner and date range of the data.
    b. All references to input and output files within the program are replaced with a name identifying the partner and date range of the data, and the program is saved

    c. The program is executed through the step where "Flagged_Records_1" is created.

11. The SAS program creates a new Access database in the "Access" folder within the "SAS Data Processing" folder. The database should have the same name as the input file.

    a. The database contains at least two tables: The "Input_Data_Matrix" that contains all data in the input file, and the "Flagged_Records_1" table.

12. The data manager updates the "CRP Data Tracking" database to include the date of initial SAS processing.

13. The "Flagged_Records_1" table identifies questionable data that must be investigated by the data manager. The table is generated from comparisons against screening levels to identify outliers, quantitation limit tables to identify improperly reported data, and a variety of other comparisons. The program includes algorithms to identify the following:

    a. Reported values beyond TCEQ screening limits (outliers)
    b. Values reported as negative numbers
    c. Illegal values (e.g.,, results for qualitative parameters that are not in the range of allowed values)
    d. Reported orthophosphate that exceeds the reported total phosphate
    e. Nitrate+nitrite concentration is less than nitrite concentration
    f. Inconsistent observed turbidity and water clarity results
    g. Inconsistent water surface and wind intensity results
    h. Other algorithms are added to the QA protocol as needed.

14. The data manager is responsible for reviewing each flagged record against available raw data, data submittal checklists from the partner agency, instrument calibration records, and so forth, and where necessary obtaining additional information from the partner agency in order to determine the appropriate action to be taken. The flagged records table contains a variety of fields for documenting the disposition of the problem. In summary, a flagged record is accepted (on the basis of verification by the data manager), replaced with a corrected value, or deleted. A code is entered into the "Action" column, the "Verification Method" code is entered, and the initials of the responsible party are entered in the "Verified By" column.

    a. "Verification Method" codes currently in use are DR (document review) and PJ (professional judgment).

15. At present, there is a subset of data quality problems that cannot be identified or corrected using the flagged records table. It may be necessary to make changes to the input file to correct some errors and inconsistencies identified during subsequent review by the data manager or quality assurance officer.

16. All written communications with the staff of partner agencies that are made during the data verification process are printed and retained with the final data package that is retained by H-GAC. Records of telephone conversations are also retained.

17. Before changes are made to each data set, the data manager creates a "Data Summary Report/Sheet" for that specific data set. The data summary report is created from the most recent data summary report for that partner agency, and saved with the name of the current data set. All changes to the data and/or action taken on the data set are documented in this report. In addition, summary narratives discussing missing data, outliers that were verified and accepted, explanations of variations in reporting the data, failure to meet A7.1 LOQs, and so forth are also included. Pertinent information from the data submittal checklist submitted by the partner

agency is also included in the final report. This report is submitted to TCEQ with each data set.

18. The data submittal checklist submitted by the partner agency is reviewed for the following, at minimum:

    a. If the quality control information included in the report indicates that data has been reported that did not meet the measurement performance specifications of the A7.1 tables, it will be removed from the dataset. The removal will be noted on the "Data Summary Report/Sheet."

    b. If the quality control information included in the report indicates that data has been reported that did not meet method-specific quality control criteria, the impact on data usability will be evaluated. Data may be removed from the dataset if legal defensibility is questionable. The removal will be noted on the "Data Summary Report/Sheet."

    c. The post-calibration error limits in the partner agency's data submittal checklist shall be checked against requirements, as well as raw calibration records if available.

    d. Reports of missing data, and the reasons that the data is missing (QC failure, spilled sample, could not sample site, etc.)

19. The SAS program is re-run following action on all flagged records. The flagged records table is read back into the process, and a variety of new tables and files are created. The most important of these are the "Draft_Data_Matrix" and the pipe-delimited text files that are submitted directly to TCEQ.

    a. The portion of the SAS code that assigns TAG ID numbers is edited prior to generating the second group of tables and files.

20. The data manager queries a subset of data from the "Draft_Data_Matrix" table and reviews it against hard-copy raw data to check for random transcription errors. A sufficient number of records are selected so that when added to the flagged records previously evaluated, at least ten percent of submitted data has been verified against raw data. The query results are printed and retained with the data package as a record of data review.

21. The data manager creates and views a totals query of the "Draft_Data_Matrix" table to identify missing records that have not been addressed in the data summary report.

22. The data manager completes the draft data summary report, and updates the "CRP Data Tracking" database with the date the draft was completed.

23. The summary report is submitted to the quality assurance officer (QAO). The "Draft_Data_Matrix" and draft summary are reviewed by the QAO , who identifies all values that, in the QAO's judgment, are unreasonable, are unverified outliers, or are otherwise questionable. Written comments and concerns are returned to the data manager for further investigation and correction of the dataset (where warranted). Newly identified discrepancies are investigated, and documented on the data summary report.

24. The data manager reviews the written comments, takes the appropriate action, and documents any additional actions on the data summary report. In most cases, the SAS program will be run at least one more time, although a new flagged records table is not routinely created. In the event there has been extensive modification of the input dataset, a new flagged records table may be created. The written comments from the quality assurance officer, with annotations by the data manager, are retained with the data package as a record of data review and modification (where applicable). The date of data summary report approval is added to the "CRP Data Tracking" database.

25. The text files created by the SAS program and the final data summary report are then submitted to TCEQ by the data manager. The data is first submitted to the SWQMIS (database) validation algorithm to obtain a validation report; the files are then emailed to the CRP Project Manager at TCEQ.

    a. The data manager copies the event and result files to the desktop.
    b. Each file is edited to remove the header line (field names).
    c. The data manager logs into the SWQMIS system, and submits the files and data summary report as described in the most current version of the *SWQM Data Management Reference Guide* (https://www.tceq.texas.gov/waterquality/data-management/dmrg_index.html , retrieved 8/15/2017).
    d. If the system identifies validation errors, upload is canceled and the validation errors are investigated and corrected. In some cases this may involve editing the text files only. If this option is selected, document changes to text files appropriately. It may be most convenient to document minor changes to the text files in the "Comments" section of the appropriate record in the "CRP Data Tracking" database.
    e. When no validation errors are found, the upload is completed, and a validator report is created and saved report (with a unique file name) as an html file.
    f. The data manager reviews the validator report to identify remaining discrepancies between the dataset, data summary report, and A7.1 table requirements that may have been missed. The appropriate actions, to include resubmission of the data to obtain a revised validator report, are performed.
    g. The text files, data summary report, and validator report are e-mailed to the CRP Project Manager.
    h. The validator report is saved in the "Data Review and Submission Docs" folder at Q:\CE\Clean Rivers\DATA\Data\Data Review and Submission Docs."

26. The data manager updates the "CRP Data Tracking" database to include the date the files were sent to TCEQ, and add hyperlinks to the data summary and validator reports.

27. If the CRP Project Manager identifies further problems with the dataset, the appropriate action is taken and revised datasets or data correction requests (where appropriate) are submitted. Written communications with the CRP project manager are printed and retained on file with the data package to serve as a record of validation and modification of the dataset.

28. When the dataset is accepted by TCEQ and loaded into SWQMIS, the data manager updates the "CRP Data Tracking" database to include the acceptance date.

29. All data management activities are documented in an Access database ("CRP Data Tracking") maintained by the Data Manager. The database contains details of receipt, processing, submission, and acceptance by TCEQ, and includes hyperlinks to raw and final datasets, data summary reports, and data validation reports.

Appendix I: Geospatial Data Management Plan

Geospatial Data Management Plan

July 2021

HOUSTON-GALVESTON AREA COUNCIL

Community & Environmental Planning Department

Prepared in cooperation with the

Texas Commission on Environmental Quality

under the authorization of the Texas Clean Rivers Act

Table of Contents

Introduction

The Data Management Plan (The Plan) outlines the standard policies and procedures for data management within the Community and Environmental Planning (C&E) Department. The Plan covers the management of both tabular (non-geographic) and spatial (geographic) datasets. Its primary purpose is to ensure the efficient access and maintenance of these datasets within the C&E Geospatial/Geographic Information Systems (GIS) environment.

GIS technology provides a systematic means to capture, manipulate, analyze, store and display spatially referenced data. GIS supports a wide variety of applications ranging from site assessments, environmental planning, urban planning, and spatial analysis to support organizational strategies. In general, GIS supports the overall departmental goals of guiding regional planning, enhancing the quality of the region's natural environment, and public education through outreach programs. The C&E GIS team supports various programs within the C&E department through data development, spatial analysis, geospatial applications development, cartography in support of departmental goals.

The Plan is considered a dynamic working document which responds to changing technology, funding, staffing, and project requirements. Consequently, the Plan is reviewed on an annual basis and amended as necessary.

Geospatial Services

The following section explains the geospatial services provided by the H-GAC C&E GIS team as it relates to the sharing of data, development of geospatial applications, cartography, and underlying GIS resources. The C&E GIS team is responsible for the development of data and sharing of many publicly viable datasets, developing geospatial applications, cartography, and coordination of maintenance of underlying geospatial hardware and software for C&E.

The C&E GIS team maintains a centralized geospatial warehouse (C&E SDE), an online mapping platform for web-based geospatial applications (Mapping Application), and an FTP download site (Data Clearinghouse). The C&E SDE utilizes ESRI's ArcSDE software running on a Microsoft SQL Server RDBMS. The mapping application uses ESRI's ArcGIS.com & ArcGIS Server platform running on .NET. The Data Clearinghouse is an FTP server (h-gac.sharefile.com) that provides C&E with storage space where it can post publicly available datasets for downloading. The C&E SDE, Mapping Application, and Data Clearinghouse platforms are installed by the H-GAC Data Services department (Data Services), with Data Services maintaining only the lower-level technology components such as the physical hardware, software installation, and low-level server and RDBMS functions. All upgrades and maintenance are coordinated by the C&E GIS Manager. All geospatial content stored in the C&E SDE, the Data Clearinghouse, and Mapping Application, are the responsibility of the C&E GIS staff, which resides within the C&E Socio-Economic Modeling program. However,

Data Service department maintains some of the other GIS data such as transportation, 911 address, and workforce solutions, and stored in a separate SDE that everybody in H-GAC has access to them. A detailed schematic of the geospatial technical architecture and how the various systems are interconnected can be found in the *System Architecture* section below.

Data Sharing

The C&E SDE serves as the primary internal repository for geospatial data, metadata, and other information relevant to the activities and goals of the C&E department. All GIS users within C&E Socio-Economic Modeling program and users from other H-GAC departments are provided *Editor* access to data in the C&E SDE. All other users have only viewer access to data in the C&E SDE. H-GAC C&E staffs without *Editor* access to the C&E SDE server can access a copy of the geospatial data through a separate server that houses imported versions of the original SDE data to develop GIS layers for project specific editing. This system ensures that the original formatting of geospatial data on the C&E SDE remains unchanged. All user access privileges are assigned by the C&E GIS Manager based upon business needs, GIS skills, and role within the organization. No users outside of the C&E department have editor level access to any GIS data in the C&E SDE, and in some instances there are datasets that are viewable by only C&E GIS users. Instructions for connecting to the C&E SDE are provided to authorized users.

Datasets determined to be viable for publication to the public are exported to the Data Clearinghouse, thereby allowing the general public widespread access to this information via the internet. Members of the public may view metadata and download any of the datasets that are posted to the Data Clearinghouse. In some instances, these datasets are used in web-based interactive mapping applications and can be accessed online via the Mapping Server's services directory, or accessible via the Data Clearinghouse for downloading. The data sharing through downloading is facilitated through H-GAC's Sharefile system. All public C&E GIS data, applications, cartographic products, and the C&E map services directory can be accessed via "GIS, Imagery, & Online Mapping Tools" section of the H-GAC website. A screen shot of the website can be found in Appendix 7.

Geospatial Applications

The C&E department has made a strategic decision to incorporate internet-based mapping applications into its deliverables for many programs and projects. Before, the results of most projects consisted of a large-format map printed on a plotter up to 48"x36" in diameter. This form of cartography although still useful in many settings, did not allow programs to communicate results to the public or external organizations that had an interest in our analysis results. By taking results from C&E projects and coupling this with base map data and imagery, C&E has been able to share the results of projects to a far greater audience and

has created opportunities whereby map layers published on the C&E mapping server can be utilized in other organizations mapping applications.

Currently there are two platforms upon which C&E provides web-based mapping solutions.

The first platform is based on the JavaScript programming technology, and all mapping applications developed using this platform run on various operational systems including Windows, MacOS, ISO, and Android. This platform is intended to provide users with a graphics rich user interface whereby the map can be navigated, layers turned on/off, and information obtained on each feature. In some instances, features have links to additional resources such as photos of monitoring stations, external websites, and detailed reports. This mapping application technology allows the users to display its information on different screen-size devices including desktop, laptop, tablet, and mobile phone.

The second platform utilizes the capabilities of the ArcServer/Arcgis.com platform to allow users to directly access map layers published on the mapping server. This method of delivery is called 'streaming' and allows end users access to individual map layers and geoprocessing tools published on the server. Typical users of this method of delivery are other GIS users using ArcMap GIS, whereby they can connect directly to our ArcServer platform for read-only access and view our map layers. Other instances whereby Arcgis.com's users may utilize this method is where they are including our map layers in their own mapping applications.

Mapping and Cartographic Products

The C&E department produces a variety of static cartographic maps for the region because of project activities and for general usage. To facilitate the sharing of these maps in an electronic format, C&E has implemented a Map Book as part of their C&E GIS page. Maps can be downloaded in multiple formats. The C&E Map Book can be accessed via our C&E GIS page at https://www.h-gac.com/map-book/default.aspx.

System Resources

<u>System Architecture</u>

The C&E department uses an integrated architecture to support the development, analysis, and dissemination of spatial information. The diagram below illustrates this system architecture at a high level. The goal of the overall system is to allow for a streamlined workflow to develop/maintain data, optimize the data for use in online applications, and the consumption of applications via multiple platforms.

Currently the C&E GIS platform supports sharing of geospatial data via the ArcServer mapping server platform. This allows end users internally or externally to consume map layers and geoprocessing tools via GIS desktop, mobile, tablet, or interactive applications.

In some instances, applications are configured with public feedback and volunteer GIS workflows that allow the C&E GIS team to obtain information for the public on various geographic features in the region. This public feedback loop allows C&E to investigate feedback and verify its validity prior to incorporating the information into the data warehouse.

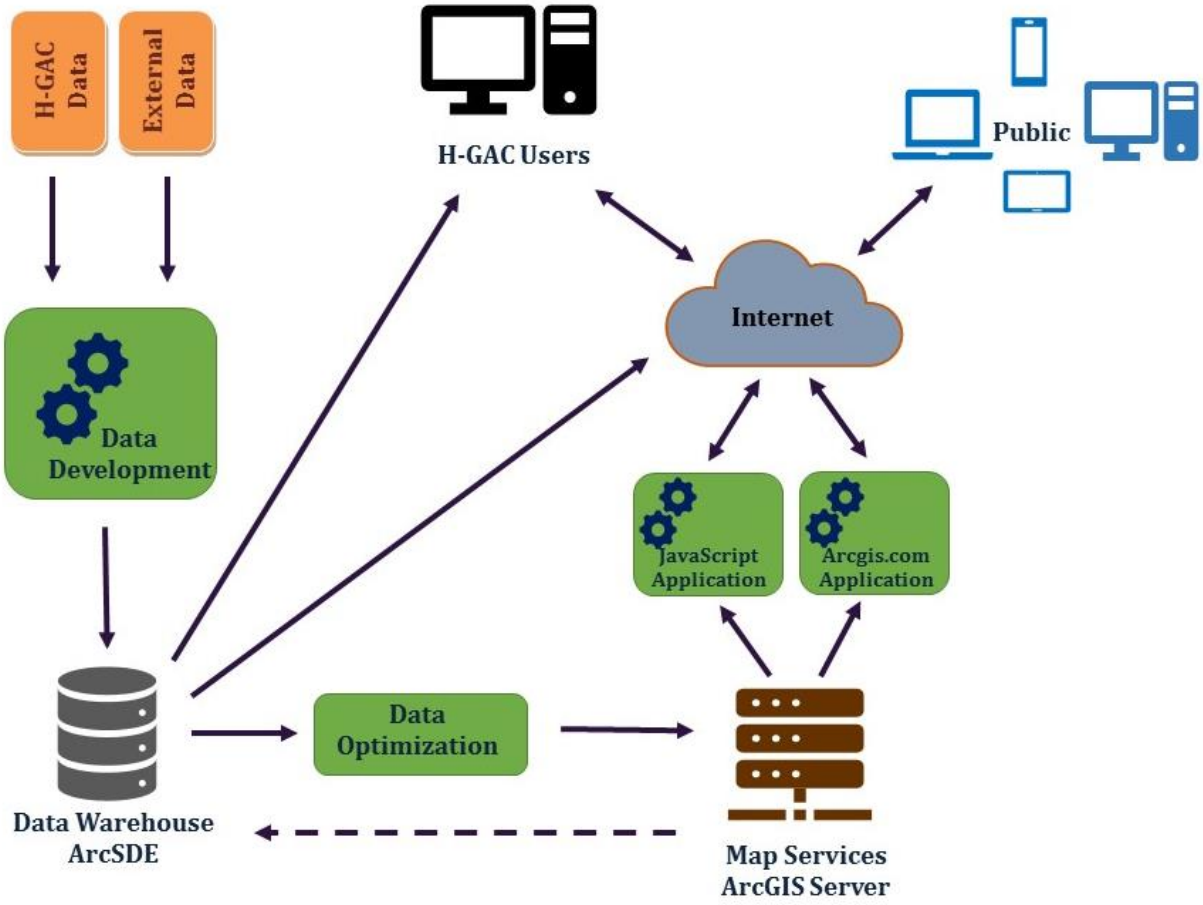


Figure 1: H-GAC Geospatial System Architecture

Hardware

The configuration of the hardware used by staff that performs GIS and data Management work is a distributed network. This network consists of several PC's which are connected to central file servers. The department also uses a central web mapping server for online mapping applications.

A complete listing of departmental hardware is found in Appendix 3.

Software

The C&E department relies upon the H-GAC Data Services department (Data Services) for its end user workstation configuration, installation, and maintenance. Each workstation for

users comes with the Microsoft Office software package which includes Outlook (e-mail), Word (word processing), Excel (spreadsheets), PowerPoint (presentations), and in some instances Access (desktop database) should the user require desktop database capabilities. Each workstation is pre-configured and setup to operate within the H-GAC internal network and has access to central servers for file storage.

The C&E GIS staff utilizes ESRI's ArcGIS 10.6.1 and ArcGIS Pro 2.4 platforms for all geospatial analysis and mapping needs. In addition, as needed, the staff also utilizes the SAS and ENVI software platforms for further analysis and data development as deemed necessary. SAS is used for statistical analysis and modeling of tabular data. Whereas, ENVI is used for remote sensing data processing and analysis. The ESRI ArcGIS 10.6.1 and ArcGIS Pro 2.4 platforms includes integrated Python programming capabilities, which allows for the creation of programming scripts or batch programs to improve efficiency and documentation of processes. The Python programming language is an Open Source platform and is freely distributable.

The centralized SDE is also provided by ESRI and provided for a centralized geospatial database where GIS staff can store geospatial data for either read-only or editable access by GIS users in the C&E department. The C&E GIS staff maintains access privileges to the SDE datasets and assigns individual users to various SDE access groups to grant approved accessed to data in the SDE. The SDE is considered the central warehouse where GIS users can go to for geospatial data to use in their analysis or mapping projects.

The software products currently used to accomplish the department's data management objectives are listed in Appendix 4.

Programming Languages

Programming services will be provided on an as needed and resource available basis. All programming efforts will follow a standard procedure from needs assessment, program planning, development and testing, to refinement and documentation. The principal programming languages to be used in task automation and project customization will depend on the nature of the need and the current state of the technology. At this time, all web-based GIS applications are developed using the ESRI ArcGIS Server platform, and user interface components to that platform are developed using the ESRI JavaScript API. Automated data development and analysis workflows utilize the Python programming language and the SAS programming platform as needed.

Data

Department staff members will be consulted annually to determine priority needs for data management. Based on this consultation, specific data sets will be acquired or further developed for the various program areas represented in the department. The current list of department-specific data sets is shown in Appendix 5.

A separate database lists all datasets regularly obtained from external sources, contact information, as well as the frequency of the datasets availability, and its cost. This database is developed using Microsoft Excel and is available to the C&E GIS team for tracking when updates to dataset may be available.

Personnel

The Data Management staff will be responsible for the maintenance and development of the C&E SDE, mapping server, geospatial applications, C&E GIS page, and Data Clearinghouse. These data management responsibilities cover a wide range from original data creation, acquisition and integration, data archiving and distribution. Additional responsibilities include enhancing the geographic extent, feature attributes, and metadata of the datasets.

The C&E GIS team is comprised of 9 full-time GIS and data analysis professionals. The C&E GIS team supports all programs within the C&E department, which include Clean Rivers/Water Quality, Sustainability, Economic Development, Solid Waste, Ped/Bike, Socio-Economic Modeling, and special project. The C&E GIS team is part of the Socio-Economic Modeling program within C&E.

H-GAC's Data Services Department plays an indirect role in the implementation and maintenance of The Plan. The Data Services Department is responsible for managing the underlying hardware and network upon which C&E stores GIS data and implements GIS-based applications.

Training

Training for all users of the system is a critical part of The Plan. C&E staff directly responsible for data management will attend conferences, seminars, and software/hardware training courses as needed. H-GAC users of the system will be trained and/or receive technical support by the C&E GIS Manger and other C&E subject matter experts.

Budget

Budgetary requirements to sustain data management efforts will be reviewed annually.

Data Maintenance, Manipulation, and Use

Quality Assurance/Quality Control

QA/QC is designed to standardize screening, documentation, entry, output, analysis, correction, and updating of data in the system. QA/QC will document those responsible for data and system maintenance.

Data Limitations

Prior to the integration of data within the C&E SDE and posting to the Data Clearinghouse, a review of the data set will be completed to determine predefined data limitations such as missing values, different sampling frequencies, multiple measurements, analytical uncertainty, censored or unavailable data, and duplicated data with existing data sets. After review of the data set, a report will be generated which records any errors detected and any corrections that may be necessary.

Data Development Protocol

The C&E GIS staff works to update existing dataset, acquire new data, and perform geospatial analysis in support of various C&E programs. All new data generated from the result of an analysis is a candidate to be stored not only in the SDE as a new dataset, but also as a layer with a mapping application should the need arise. All data development and analysis are done internally to C&E, and at times leverages outside resources such as consultants, other non-profits whom H-GAC is partnering with, as well as with other H-GAC departments to obtain necessary data. Two datasets that the C&E department uses regularly outside the C&E SDE are the Data Services StarMap road centerline dataset and the Data Services aerial imagery database.

The C&E GIS staff uses a hybrid approach to conducting geospatial analysis. Much of the analysis being performed may need to be re-processed later as new versions of datasets become available, or as inputs to the analysis models are updated themselves. Thus, to minimize the time spent re-running analysis models, the C&E GIS staff utilizes the ESRI ArcGIS platform in conjunction with SAS and Python to develop repeatable and documented workflows. This approach saves more time than interactive methods whereby a user must remember the process to follow, and then execute each step in the analysis independently.

Documentation related to data management efforts such as system evolution, structure, and procedures for use will be compiled and made available for the end user. Documentation will be made available online and in hard copy format.

Data Input

Standard conventions for data input will be determined on a per project and/or individual data set basis. To ensure Year 2000 Compliance, all data sets with date/time fields will include a four-digit year (YYYY). Either of the following formats will be used: International Standard Date notation where the date field is represented as MM/DD/YYYY (Month/Day/Year), or an ordinal format where the date field is represented as YYYYDDD.

Data Dictionary

A department-specific list of all C&E data available in the C&E SDE can be found in Appendix 5.

Metadata

Metadata is data about the original source, quality, content, history, condition, and other characteristics of the geospatial data. All GIS datasets generated by H-GAC have been fully documented as per Federal Geographic Data Committee (FGDC) compliant metadata and follow Content Standards for Digital Geospatial Metadata (CSDGM) for all geospatial data. Similarly, data obtained from outside sources and used by H-GAC will include FGDC-compliant metadata from the source agency. Datasets without a known history and documented quality will be identified as provisional and used only when noted as such. The diagram below illustrates elements of the CSDGM standards. This standard is applied to all Point, Line, Polygon, Raster, and Tabular data that are stored in the C&E SDE. The C&E GIS data manager and/or point of contact (designee) has the authorized access to edit/change the metadata when a new dataset is created or updated in the SDE. Metadata for each dataset in the C&E SDE is stored with the datasets and can be viewed by GIS users via their GIS desktop software. Any data provided for public download via the Data Clearinghouse also has a metadata html page that can be viewed via internet browsers.

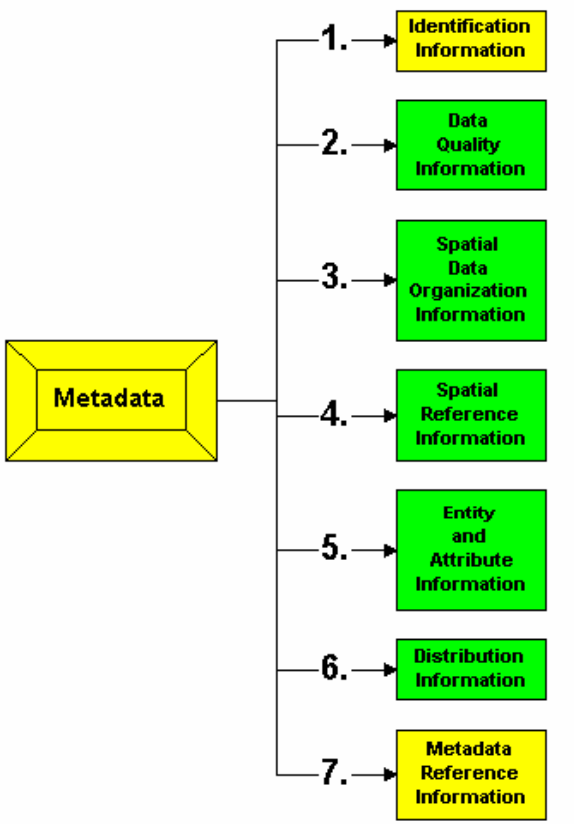


Figure 2: Elements of CSDGM Standards

Data Conversion

Data to be imported into the C&E SDE from hard copy, digital or by manual data entry, will follow a uniform conversion protocol to comply with the structure of current data sets. The type of data being converted will determine the protocol. All data is stored in ESRI geodatabase format within the C&E SDE, and when posted to the Data Clearinghouse the data is stored in the ESRI File Geodatabase file format, unless there is a specific requirement to provide the data in another format such as Shapefile or GIS Coverage.

Coordinate Systems

The Texas Stateplane Coordinate System, North American Datum 1983 (NAD83) will be the standard for geographic data at H-GAC. This coordinate system is based on the Cartesian coordinate system, or rectangular coordinates. When receiving geographic data from other sources the data will be transformed into the Stateplane Coordinate System to ensure compatibility with current data sets.

When publishing mapping services for use in web-based GIS mapping applications, the Web Mercator Auxiliary Sphere projection is used for all Data Frame projections. However, the underlying GIS data within these mapping services still use the Texas Stateplane Coordinate System, North American Datum 1983 (NAD83) projection.

Data Validation

Data Quality Control

When data are received from any source, documentation will be created to include the source name, date received, format of data and a brief description of the contents. Data will be loaded onto the system from the media received and a review of the data will be made along with any corrections being made to the source documentation. An analysis will be made to determine the means of data entry into the system whether it is only a stand-alone database, a number of linked tables, or a geographic database. The data will be converted to the appropriate format for integration with the current system whether it is a conversion into MS Access, Excel, SAS, or ESRI ArcGIS. The data will be visually examined to determine its validity and accuracy. If the data is invalid it will be corrected (if possible) otherwise the data will be incorporated into the C&E SDE, and then if applicable, posted to the Data Clearinghouse and used in conjunction with existing data. A QA/QC report of all procedures and a detailed description of how the data was incorporated into the current system (from the date received to the date of integration) will be generated.

Equipment Quality Control

All printers, workstations, and server hardware and operating systems are maintained by the Data Services department, unless otherwise noted in Appendix 3.

Genealogy

Upon receipt of data from outside sources, all data will be screened for integrity and completeness. After the preliminary evaluation of the data, a log of the data source, type and completeness is created and maintained with the associated data. A description of the data and the responsible personnel are documented.

Migration/Transfer

A copy of every C&E generated GIS dataset will be housed in the C&E SDE which C&E GIS staff manage the contents and structure of datasets. The underlying hardware and network connections for the C&E SDE are maintained by the Data Services Department. Datasets that are of public interest will be placed in the Data Clearinghouse for public access. Transfer from the C&E SDE to the Data Clearinghouse will occur on an as needed basis following department QA/QC measures and is handled by the C&E GIS team.

Data Security & Access

Data placed on the Data Clearinghouse will be available to those with Internet browsing and/or FTP capability. Data requests for non-public data from other agencies and the public will be evaluated on an individual basis. When the data requests are received, a preliminary

evaluation of the deliverable will be determined and a timeline and cost if applicable will be provided to the requesting agency or individual.

GIS and tabular data will be secure through directory permissions. H-GAC will employ Firewall or Proxy Server Technology to filter and severely restrict access to internal networks and database systems. Virus protection will be implemented to ensure system and data integrity.

Archives/Backup

Each week the C&E GIS team runs a schedule backup program to store a copy of all C&E SDE datasets on a portable hard drive with resides in a secure location within the H-GAC office. In addition, Data Services backs up and archives C&E SDE data and server configuration at regular intervals.

Disaster Recovery

In the event of a disaster, the C&E department will have access to all C&E SDE data which is stored on the portable hard drive. The C&E GIS team will restore or provide needed data to GIS users from this portable hard drive until such as time that Data Services can restore the C&E SDE onto either a new server or a temporary server.

Appendices

Appendix 1 Data Source Information Sheet

Data Title:

Source Agency:
Contact:
Title:
Address
Phone:

Data Description:
Data source:
Date created:
Accuracy:
Media:
Data items:

Description of data:

Format (specify what software)
Map:
Tabular:
Image:
Text:

Retrieval Procedure:

Command(s):

Appendix 2 Data Log Sheet

Date received: _____

Report Prepared by: _____

Source Name and Phone: _____

Format: _____

Media: _____

Check the following steps to determine the validity of the data:

1. What is the extent of the geographic area? _____
_____

2. Structure (Circle One) Vector Raster

3. Scale? _____

4. Projection and Datum? _____

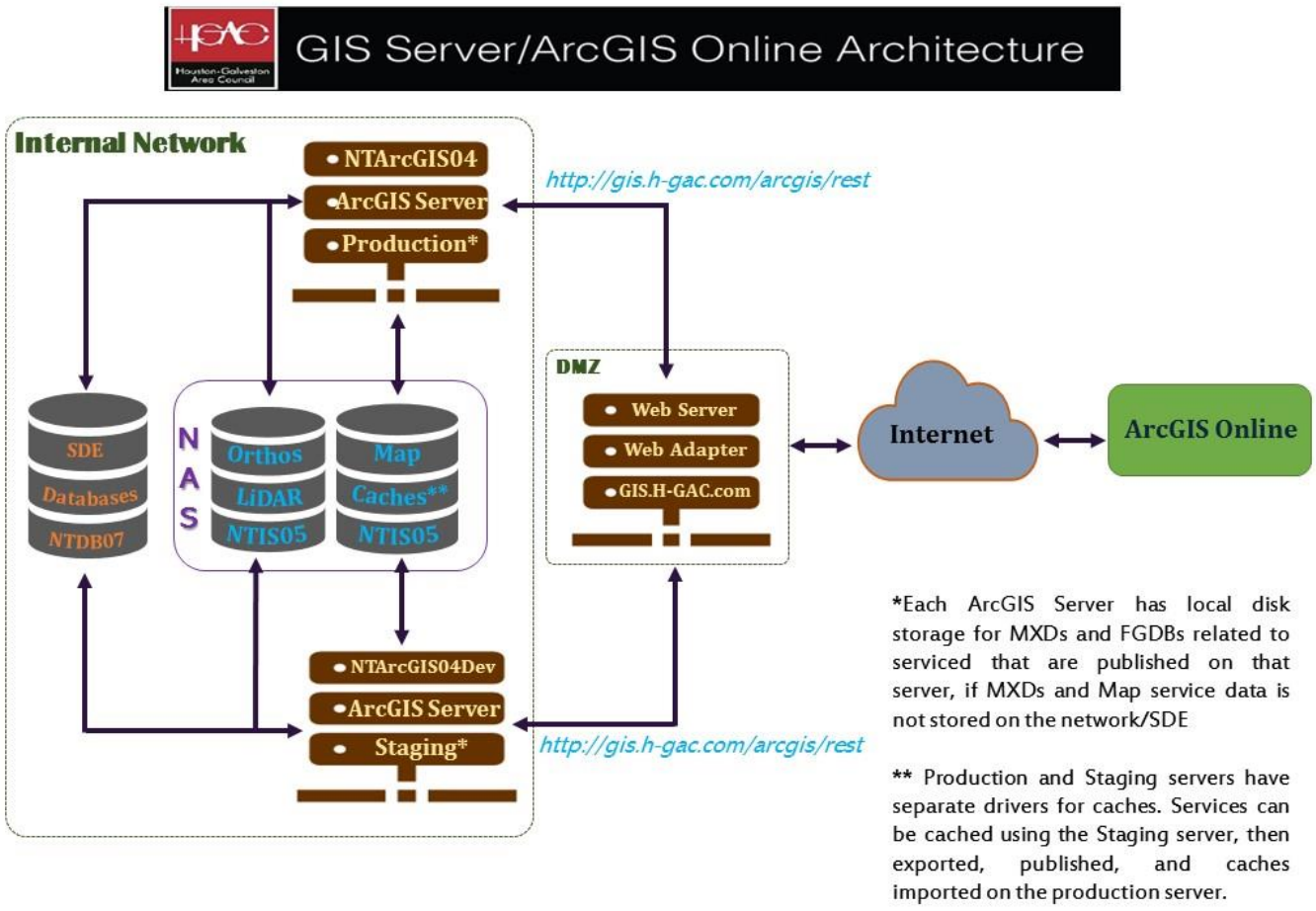
1. Do any of the key fields have missing values? If so which parameters have missing values? Yes ___ No ___
_____
_____
_____

2. Any known duplicate records? Yes ___ No ___

Appendix 3 Hardware

FTP Server
h-gac.sharefile.com

Mapping Application Servers



Desktop PC (Primarily used for GIS analysis)

1. Intel Core i7-9700 CPU @ 3.00 GHz – 32 GB RAM
2. Intel Core i7-9700 CPU @ 3.00 GHz – 32 GB RAM
3. Intel Core i7-9700 CPU @ 3.00 GHz – 32 GB RAM
4. Intel Xeon E-2186G CPU @ 3.80GHz – 16 GB RAM
5. Intel Core i7 9700 CPU @ 3.00 GHz – 16 GB RAM
6. Intel Core i7-9700 CPU @ 3.00GHz – 16 GB RAM
7. Intel Xeon E3-1245 v6 CPU @ 3.70GHz – 16 GB RAM
8. Intel Core i7-9700 CPU @ 3.00GHz – 16 GB RAM
9. Intel Core i7-8700 CPU @ 3.20GHz – 32 GB RAM

Plotters, Printers and Scanners

HP Designjet UPD Generic Plotter

HP Designjet T920 Postscript Plotter

- These two plotters are used by all H-GAC staff for large format printing of maps and schematics.

Xerox Workcenter 7845 and Cannon Advanced 4545 Printers and scanners. C&E maintains both printers.

Global Positioning System (GPS) Units

The C&E Department possesses two GPS units.

Fax Equipment

Brother Intellifax 4750e. The C&E Department owns one fax machine.

Appendix 4 Software

Geographic Information Systems (GIS)

ESRI ArcGIS (ver 10.6.1) – Computer mapping and database manipulation capable of using ArcView, ArcInfo, and ArcEditor licenses as needed.
ArcGIS Pro 2.4 – Geospatial data analysis and visualization
ESRI ArcGIS Server (ver 10.2, SP3) – Internet Mapping Application Server.
ESRI ArcSDE (ver 10.2, SP1) – Spatial data warehouse.
ENVI Remote Sensing Data Analysis Package – Harris Geospatial

Data Management

Microsoft Access (365) - Relational Database.
SQL Server (2012) - Relational Database.

Programming

Microsoft Visual Studio – Web Mapping Development Tool.
Web AppBuilder for ArcGIS (ver 1.8) – Web-based GIS application development tool
SAS (ver 9.4) – Data development and statistical analytics.

Office Productivity Software

Microsoft Office 365 - Word, Excel, Access, PowerPoint, publisher, InfoPath and Outlook.

Graphics and Desktop Publishing

Adobe Illustrator (ver 8.01) – Graphics
Adobe Photoshop (ver 5.0) – Graphics
Camtasia Studio (ver 7.0) – Screen capture and video tutorial production

Operating Systems

Windows 7 - PC working environment/Operating System
Windows 10 - PC working environment/Operating System
Windows 2012 & 2016 - Server Operating Systems

Appendix 5 Data List

H-GAC Spatial Data Warehouse (SDE) Dataset

Dataset Name	Type
CE_SDE/ACE_HEX_2017	Polygon
CE_SDE/ACS_Housing_Counties_2017	Polygon
CE_SDE/ACS_Housing_Places_2017	Polygon
CE_SDE/ACS_Housing_Tracts_2017	Polygon
CE_SDE/ActivityPopulation_2000	Polygon
CE_SDE/Barker_and_Addicks_Reservoir_Watersheds	Polygon
CE_SDE/BGs_2014	Polygon
CE_SDE/BGs_2015	Polygon
CE_SDE/BGs_2016	Polygon
CE_SDE/BGs_2017	Polygon
CE_SDE/BGs_2018	Polygon
CE_SDE/BGs_Veterans_2016	Polygon
CE_SDE/BGs_Vulnerable_2015	Polygon
CE_SDE/BGs_Vulnerable_2016	Polygon
CE_SDE/BGs_Vulnerable_2017	Polygon
CE_SDE/BGs_Vulnerable_2018	Polygon
CE_SDE/BlueMap_ActivityPopulation	Polygon
CE_SDE/BZ_Model_Predictions_v2018	Polygon
CE_SDE/Cedar_Bayou_Watershed_Project_Monitoring_Sites	Point
CE_SDE/Census_Places_2014	Point
CE_SDE/Census_Places_2015	Polygon
CE_SDE/Census_Places_pt_2015	Point
CE_SDE/Census_Tracts	Polygon
CE_SDE/Census_Tracts_1	Polygon
CE_SDE/Census_Tracts_2014	Polygon
CE_SDE/CEnsus_Tracts_2015	Polygon
CE_SDE/CH_Model_Predictions_v2018	Polygon
CE_SDE/Closed_Landfill_Inventory	Point
CE_SDE/COH_Plats_2018_2020_feb	Polygon
CE_SDE/Congressional_Districts_115th_ACS_2017	Polygon
CE_SDE/Congressional_Districts_2017	Polygon
CE_SDE/Congressional_Districts_2018	Polygon
CE_SDE/Counties_2014	Polygon
CE_SDE/Counties_2015	Polygon
CE_SDE/Counties_2016	Polygon
CE_SDE/Counties_2017	Polygon

CE_SDE/Counties_2018	Polygon
CE_SDE/Counties_TX_Veterans_2016	Polygon
CE_SDE/County_LEHD_09_17	Polygon
CE_SDE/County_LEHD_2018	Polygon
CE_SDE/Critical_Facilities_2017	Point
CE_SDE/CRP_MonitoringStations_Subwatersheds	Polygon
CE_SDE/CRP_Project_Areas	Polygon
CE_SDE/Current_Future_Land_Use	Polygon
CE_SDE/Current_Future_Land_Use_2018	Polygon
CE_SDE/Employment_2000	Polygon
CE_SDE/FB_Model_Predictions_v2018	Polygon
CE_SDE/Forecast_Census_Tracts_2017	Polygon
CE_SDE/Forecast_Census_Tracts_2018	Polygon
CE_SDE/Forecast_H3M_2017	Polygon
CE_SDE/Forecast_H3M_2018	Polygon
CE_SDE/Forecast_TAZ5217_2017	Polygon
CE_SDE/Forecast_TAZ5217_2018	Polygon
CE_SDE/Galveston_Bay_Estuary_Program_Watersheds	Polygon
CE_SDE/GV_Model_Predictions_v2018	Polygon
CE_SDE/Harris_County_FCD_Sub_Watersheds	Polygon
CE_SDE/Harris_County_FCD_Watersheds	Polygon
CE_SDE/Harris_County_Zones_58	Polygon
CE_SDE/HEX_H1M_09_17	Polygon
CE_SDE/HEX_H1M_LEHD_2018	Polygon
CE_SDE/HGAC_13_County_ACS_2015_Blockgroup_summary	Polygon
CE_SDE/HGAC_13_County_Airports	Point
CE_SDE/HGAC_13_County_Airports_ParcelIDs	Table
CE_SDE/HGAC_13_County_Brownfield_Sites	Point
CE_SDE/HGAC_13_County_Closed_Landfill_Inventory	Point
CE_SDE/HGAC_13_County_CRP_DO_Stations	Point
CE_SDE/HGAC_13_County_CRP_Monitoring_Stations_2008	Point
CE_SDE/HGAC_13_County_CRP_Monitoring_Stations_2010	Point
CE_SDE/HGAC_13_County_CRP_Monitoring_Stations_2011	Point
CE_SDE/HGAC_13_County_CRP_Monitoring_Stations_2012	Point
CE_SDE/HGAC_13_County_CRP_Monitoring_Stations_2013	Point
CE_SDE/HGAC_13_County_CRP_Monitoring_Stations_2014	Point
CE_SDE/HGAC_13_County_CRP_Monitoring_Stations_2015	Point
CE_SDE/HGAC_13_County_CRP_Monitoring_Stations_2016	Point
CE_SDE/HGAC_13_County_CRP_Monitoring_Stations_2017	Point
CE_SDE/HGAC_13_County_CRP_Monitoring_Stations_Historical	Point
CE_SDE/HGAC_13_County_Districts	Polygon

CE_SDE/HGAC_13_County_Ecological_Mapping_System_TPWD_2015	Polygon
CE_SDE/HGAC_13_County_Farmland	Polygon
CE_SDE/HGAC_13_County_Federal_Aid_Roads	Polyline
CE_SDE/HGAC_13_County_G1M	Polygon
CE_SDE/HGAC_13_County_G3M	Polygon
CE_SDE/HGAC_13_County_G5M	Polygon
CE_SDE/HGAC_13_County_Grocery_Stores	Point
CE_SDE/HGAC_13_County_Landfill_Areas	Polygon
CE_SDE/HGAC_13_County_Landfill_Areas_Historical	Polygon
CE_SDE/HGAC_13_County_Landfills	Point
CE_SDE/HGAC_13_County_Landfills_Historical	Point
CE_SDE/HGAC_13_County_Libraries	Point
CE_SDE/HGAC_13_County_Libraries_Parcel_Xref	Table
CE_SDE/HGAC_13_County_Mobile_Home_Parks_FEMA	Point
CE_SDE/HGAC_13_County_MS_Building_Footprints_2015	Polygon
CE_SDE/HGAC_13_County_Opportunity_Zones	Polygon
CE_SDE/HGAC_13_County_OSSF_Permits	Point
CE_SDE/HGAC_13_County_OSSF_Permits_2017	Point
CE_SDE/HGAC_13_County_OSSF_Permits_2018	Point
CE_SDE/HGAC_13_County_OSSF_Permits_2019	Point
CE_SDE/HGAC_13_County_OSSF_Permits_2020	Point
CE_SDE/HGAC_13_County_OSSF_Permits_2021	Point
CE_SDE/HGAC_13_County_Parks	Point
CE_SDE/HGAC_13_County_Parks_Awards	Table
CE_SDE/HGAC_13_County_Parks_Features	Table
CE_SDE/HGAC_13_County_Parks_Parcels	Table
CE_SDE/HGAC_13_County_Plats	Polygon
CE_SDE/HGAC_13_County_Recycle_Centers	Point
CE_SDE/HGAC_13_County_Service_Area_Boundaries	Polygon
CE_SDE/HGAC_13_County_Service_Area_Boundaries_2013	Polygon
CE_SDE/HGAC_13_County_Service_Area_Boundaries_2014	Polygon
CE_SDE/HGAC_13_County_Service_Area_Boundaries_2015	Polygon
CE_SDE/HGAC_13_County_Service_Area_Boundaries_2017	Polygon
CE_SDE/HGAC_13_County_Service_Area_Boundaries_Domestic_2018	Polygon
CE_SDE/HGAC_13_County_Soils	Polygon
CE_SDE/HGAC_13_County_Superfund_NPL_Sites	Polygon
CE_SDE/HGAC_13_County_Superfund_NPL_Sites_Pts	Point
CE_SDE/HGAC_13_County_Transmission_Lines_FEMA	Polyline
CE_SDE/HGAC_13_County_Wastewater_Outfall_Domestic_2018	Point
CE_SDE/HGAC_15_County_Aquifer_Recharge_Zones	Polygon
CE_SDE/HGAC_15_County_Basins	Polygon

CE_SDE/HGAC_15_County_Bio_Monitoring_Sites	Point
CE_SDE/HGAC_15_County_CRP_Impairments	Table
CE_SDE/HGAC_15_County_CRP_Lakes	Polygon
CE_SDE/HGAC_15_County_CRP_Monitoring_Stations_2019	Point
CE_SDE/HGAC_15_County_CRP_Monitoring_Stations_2020	Point
CE_SDE/HGAC_15_County_CRP_Monitoring_Stations_2021	Point
CE_SDE/HGAC_15_County_CRP_Stream_End_Points	Point
CE_SDE/HGAC_15_County_CRP_Streams	Polyline
CE_SDE/HGAC_15_COUNTY_LAND_COVER_2015_10_CLASS	Raster
CE_SDE/HGAC_15_COUNTY_LAND_COVER_2018_10_CLASS	Raster
CE_SDE/HGAC_15_COUNTY_LAND_COVER_2020_15_CLASS	Raster
CE_SDE/HGAC_15_County_NHDPlus_Streams	Polyline
CE_SDE/HGAC_15_County_NHDPlusV2_Catchment_Boundary	Polygon
CE_SDE/HGAC_15_County_Service_Area_Boundaries_2019	Polygon
CE_SDE/HGAC_15_County_Service_Area_Boundaries_2020	Polygon
CE_SDE/HGAC_15_County_Service_Area_Boundaries_2021	Polygon
CE_SDE/HGAC_15_County_Soils_2012	Polygon
CE_SDE/HGAC_15_County_Soils_2012_w_taxonomy	Polygon
CE_SDE/HGAC_15_County_Wastewater_Outfall_Domestic_2019	Point
CE_SDE/HGAC_15_County_Wastewater_Outfall_Domestic_2020	Point
CE_SDE/HGAC_15_County_Wastewater_Outfalls_2017	Point
CE_SDE/HGAC_15_County_Wastewater_Outfalls_2019	Point
CE_SDE/HGAC_15_County_Wastewater_Outfalls_2020	Point
CE_SDE/HGAC_15_County_Wastewater_Outfalls_2021	Point
CE_SDE/HGAC_15_County_Wastewater_Outfalls_Domestic_2021	Point
CE_SDE/HGAC_15_County_Wastewater_Outfalls_Historical	Point
CE_SDE/HGAC_15_County_Wastewater_Outfalls_Pre2017	Point
CE_SDE/HGAC_15_County_Water_Detailed_2018	Polygon
CE_SDE/HGAC_15_County_Watershed_Insets	Polygon
CE_SDE/HGAC_15_County_Watershed_Signs	Point
CE_SDE/HGAC_15_County_Watersheds	Polygon
CE_SDE/HGAC_8_County_Bikeway_Needs	Polyline
CE_SDE/HGAC_8_County_Bikeways	Polyline
CE_SDE/HGAC_8_County_Comprehensive_Plan_2010_pts	Point
CE_SDE/HGAC_8_County_Eco_Types	Polygon
CE_SDE/HGAC_8_County_Forecast_Cities_h	Table
CE_SDE/HGAC_8_County_Forecast_Cities_v	Table
CE_SDE/HGAC_8_County_Forecast_Counties_h	Table
CE_SDE/HGAC_8_County_Forecast_Counties_v	Table
CE_SDE/HGAC_8_County_Forecast_G025M_h	Table
CE_SDE/HGAC_8_County_Forecast_G1_h	Table

CE_SDE/HGAC_8_County_Forecast_G10K_h	Table
CE_SDE/HGAC_8_County_Forecast_G10K_v	Table
CE_SDE/HGAC_8_County_Forecast_G1M_h	Table
CE_SDE/HGAC_8_County_Forecast_G1M_v	Table
CE_SDE/HGAC_8_COUNTY_FORECAST_LU_G1_H	Table
CE_SDE/HGAC_8_County_Forecast_RAZ_h	Table
CE_SDE/HGAC_8_County_Forecast_RAZ_v	Table
CE_SDE/HGAC_8_County_Forecast_Region_v	Table
CE_SDE/HGAC_8_County_Forecast_TAZ_h_2003	Table
CE_SDE/HGAC_8_County_Forecast_TAZ_v_2003	Table
CE_SDE/HGAC_8_County_Forecast_Tracts_h	Table
CE_SDE/HGAC_8_County_Forecast_Tracts_v	Table
CE_SDE/HGAC_8_County_Forecast_Zip_Codes_h	Table
CE_SDE/HGAC_8_County_Forecast_Zip_Codes_v	Table
CE_SDE/HGAC_8_County_G025M	Polygon
CE_SDE/HGAC_8_County_G1	Polygon
CE_SDE/HGAC_8_County_G10	Polygon
CE_SDE/HGAC_8_County_G1M	Polygon
CE_SDE/HGAC_8_County_PedBike_Improvement_Areas	Polygon
CE_SDE/HGAC_8_County_PedBike_Improvement_Locations	Point
CE_SDE/HGAC_8_County_Pedestrian_Pathways	Polyline
CE_SDE/HGAC_8_County_Sector_25	Polygon
CE_SDE/HGAC_8_County_Soils	Polygon
CE_SDE/HGAC_8_County_Water	Polygon
CE_SDE/HGAC_Bastrop_Bayou_Sub_Watersheds	Polygon
CE_SDE/HGAC_CRP_Watersheds	Polygon
CE_SDE/HGAC_Lakes_AUs_2016	Polygon
CE_SDE/HGAC_Lakes_Segments_2016	Polygon
CE_SDE/HGAC_Other_CRP_Monitoring_Stations	Point
CE_SDE/HGAC_Region_WWTF_Outfalls_FY17	Point
CE_SDE/HGAC_Streams_AUs_2016	Polyline
CE_SDE/HGAC_Streams_Segments_2016	Polyline
CE_SDE/HHW_Centers	Point
CE_SDE/HouseholdPopulation_2000	Polygon
CE_SDE/Houston_Bcycle_Stations_2018	Point
CE_SDE/HR_Model_Predictions_v2018	Polygon
CE_SDE/HR_Model_Predictions_v2018_p1	Polygon
CE_SDE/HR_Model_Predictions_v2018_p2	Polygon
CE_SDE/HR_Model_Predictions_v2018_p3	Polygon
CE_SDE/Intersection_2000	Polygon
CE_SDE/ISD_2018	Polygon

CE_SDE/ISDs_2016	Polygon
CE_SDE/ISDs_2017	Polygon
CE_SDE/Job_HH_Ratio_2000	Polygon
CE_SDE/Landfill_Areas	Polygon
CE_SDE/Landfills	Point
CE_SDE/LB_Model_Predictions_v2018	Polygon
CE_SDE/LivableCenters	Polygon
CE_SDE/MG_Model_Predictions_v2018	Polygon
CE_SDE/Model_Buildings	Point
CE_SDE/Model_Buildings_2017	Point
CE_SDE/Model_Buildings_2017_events	Point
CE_SDE/Model_Buildings_2020	Point
CE_SDE/Model_Buildings_Rural	Point
CE_SDE/Model_Buildings_Uses	Table
CE_SDE/Model_Buildings_Uses_Rural	Table
CE_SDE/Model_Parcels	Polygon
CE_SDE/Model_Parcels_2017	Polygon
CE_SDE/Model_Parcels_2020	Polygon
CE_SDE/Model_Parcels_AcctNums	Table
CE_SDE/Model_Parcels_AcctNums_Rural	Table
CE_SDE/Model_Parcels_Addresses	Table
CE_SDE/Model_Parcels_Addresses_Rural	Table
CE_SDE/Model_Parcels_Features	Table
CE_SDE/Model_Parcels_Features_Rural	Table
CE_SDE/Model_Parcels_Rural	Polygon
CE_SDE/Montgomery_County_Zones_4	Polygon
CE_SDE/MS4_Permitted_Areas_2018	Polygon
CE_SDE/Nine_SQM_Grid	Polygon
CE_SDE/Nine_SQM_Grid_1	Polygon
CE_SDE/NLCD_IMPERVIOUSNESS_2016	Raster
CE_SDE/One_SQM_Grid	Polygon
CE_SDE/One_SQM_Grid_1	Polygon
CE_SDE/Ped_Bike_Destinations_2017	Point
CE_SDE/Place_LEHD_09_17	Polygon
CE_SDE/Place_LEHD_2018	Polygon
CE_SDE/Places_poly_2015	Polygon
CE_SDE/Places_poly_2016	Polygon
CE_SDE/Places_poly_2017	Polygon
CE_SDE/Places_poly_2018	Polygon
CE_SDE/Places_pt_2016	Point
CE_SDE/Places_pt_2017	Point

CE_SDE/Places_pt_2018	Point
CE_SDE/Recycling_and_HHW_Centers	Point
CE_SDE/Recycling_Centers	Point
CE_SDE/TCEQ_AU_Line_2020	Polyline
CE_SDE/Texas_Coastal_Zone_Boundary	Polygon
CE_SDE/Texas_Impairment_Streams_2008	Polyline
CE_SDE/Texas_Impairment_Waterbodies_2008	Polygon
CE_SDE/Texas_Stream_Team_Monitoring_Sites_2016	Point
CE_SDE/Texas_Stream_Team_Monitoring_Sites_2018	Point
CE_SDE/Texas_Stream_Team_Monitoring_Sites_2020	Point
CE_SDE/TexasStateHouse_2018	Polygon
CE_SDE/TexasStateSenate_2018	Polygon
CE_SDE/The_Woodlands_Pathways	Polyline
CE_SDE/TMDL_Watersheds	Polygon
CE_SDE/TPWD_13_County_LWRCRP_conservation_and_recreation_lands	Polygon
CE_SDE/Tract_LEHD_09_17	Polygon
CE_SDE/Tract_LEHD_2018	Polygon
CE_SDE/Tracts_2016	Polygon
CE_SDE/Tracts_2017	Polygon
CE_SDE/Tracts_2018	Polygon
CE_SDE/Transportation_Analysis_Zones_2954	Polygon
CE_SDE/Transportation_Analysis_Zones_2954_1	Polygon
CE_SDE/Transportation_Analysis_Zones_5217	Polygon
CE_SDE/Transportation_Analysis_Zones_5217_1	Polygon
CE_SDE/USFWS_15_County_Wetlands_2018	Polygon
CE_SDE/USGS_Stream_Gauges_2009	Point
CE_SDE/USGS_Stream_Gauges_2010	Point
CE_SDE/USGS_Stream_Gauges_2012	Point
CE_SDE/USGS_Stream_Gauges_2017	Point
CE_SDE/WA_Model_Predictions_v2018	Polygon
CE_SDE/Watershed_Based_Plans_2021	Polygon
CE_SDE/Zips_2014	Polygon
CE_SDE/Zips_2015	Polygon
CE_SDE/Zips_2016	Polygon
CE_SDE/Zips_2017	Polygon
CE_SDE/Zips_2018	Polygon
Global_SDE/Austin_County_Commissioner_Precincts	Polygon
Global_SDE/Brazoria_County_Commissioner_Precincts	Polygon
Global_SDE/Brazos_Transit_District_Bus_Routes	Polyline
Global_SDE/Brazos_Transit_District_Park_and_Rides	Point
Global_SDE/Chambers_County_Commissioner_Precincts	Polygon

Global_SDE/CoH_Council_Districts	Polygon
Global_SDE/CoH_Historical_Districts	Polygon
Global_SDE/CoH_Police_Districts	Polygon
Global_SDE/CoH_Public_Libraries	Point
Global_SDE/CoH_Street_Pavement_Edges	Polyline
Global_SDE/CoH_Traffic_Signals	Point
Global_SDE/CoH_Traffic_Signs	Point
Global_SDE/Colorado_County_Commissioner_Precincts	Polygon
Global_SDE/Colorado_Valley_Transit_Bus_Routes	Polyline
Global_SDE/Connect_Transit_Bus_Routes	Polyline
Global_SDE/Conroe_Transit_Bus_Routes	Polyline
Global_SDE/DataAxle_Businesses_2021	Point
Global_SDE/DataAxle_Businesses_Nix_2021	Point
Global_SDE/DataAxle_Businesses_Pre_2021	Point
Global_SDE/DataAxle_Businesses_Suspect_2021	Point
Global_SDE/DataAxle_Consumers_2021	Point
Global_SDE/EPA_Texas_Eco_Regions	Polygon
Global_SDE/FEMA_Floodplains_DFIRM_Q3_2010	Polygon
Global_SDE/FEMA_Floodplains_NFHL_2015	Polygon
Global_SDE/Fort_Bend_County_Commissioner_Precincts	Polygon
Global_SDE/Fort_Bend_County_Constable_Precincts	Polygon
Global_SDE/Fort_Bend_Transit_Bus_Routes	Polyline
Global_SDE/Galveston_County_Commissioner_Precincts	Polygon
Global_SDE/GCR911ECD_Counties_Coastline	Polygon
Global_SDE/GCR911ECD_Counties_Political	Polygon
Global_SDE/Gulf_Of_Mexico	Polygon
Global_SDE/Harris_County_Commissioner_Precincts	Polygon
Global_SDE/Harris_County_Constable_Precincts	Polygon
Global_SDE/Harris_County_Sheriff_Districts	Polygon
Global_SDE/Harris_County_Transit_Bus_Routes	Polyline
Global_SDE/HGAC_AEL_Providers	Point
Global_SDE/HGAC_Airport_Runways	Polygon
Global_SDE/HGAC_Airport_System	Point
Global_SDE/HGAC_Art_of_Transportation	Point
Global_SDE/HGAC_Buy_Active_EndUsers	Point
Global_SDE/HGAC_Buy_PO_EndUsers	Point
Global_SDE/HGAC_Career_Offices	Point
Global_SDE/HGAC_City_Boundaries	Polygon
Global_SDE/HGAC_City_Council_Districts	Polygon
Global_SDE/HGAC_City_ETJ_Boundaries	Polygon
Global_SDE/HGAC_City_Ordinance_Areas	Polygon

GLOBAL_SDE/HGAC_COASTAL_VIGNETTE_RASTER	Raster
Global_SDE/HGAC_CoH_Council_Districts_UI_Claims	Polygon
Global_SDE/HGAC_Commissioner_Precincts	Polygon
Global_SDE/HGAC_Commissioner_Precincts_UI_Claims	Polygon
Global_SDE/HGAC_Contours_2_Feet	Polyline
Global_SDE/HGAC_Contours_5_Feet	Polyline
Global_SDE/HGAC_Counties_Coastline	Polygon
Global_SDE/HGAC_Counties_Coastline_15C	Polygon
Global_SDE/HGAC_Counties_Coastline_Boundary	Polygon
Global_SDE/HGAC_Counties_Coastline_Boundary_15C	Polygon
Global_SDE/HGAC_Counties_COVID_19_Cases	Polygon
Global_SDE/HGAC_Counties_Demo_Jobs	Polygon
Global_SDE/HGAC_Counties_Hospital_Beds	Polygon
Global_SDE/HGAC_Counties_Political	Polygon
Global_SDE/HGAC_Counties_Political_15C	Polygon
Global_SDE/HGAC_Counties_Political_Boundary	Polygon
Global_SDE/HGAC_Counties_Political_Boundary_15C	Polygon
Global_SDE/HGAC_Counties_UI_Claims	Polygon
Global_SDE/HGAC_Counties_UI_Claims_TWC	Polygon
Global_SDE/HGAC_COVID_19_Active_Cases	Table
Global_SDE/HGAC_COVID_19_Confirmed_Cases_and_Tests	Table
Global_SDE/HGAC_COVID_19_Deceased_Cases	Table
Global_SDE/HGAC_COVID_19_Harris_County_Info	Table
Global_SDE/HGAC_COVID_19_Hospital_Beds_and_Ventilators	Table
Global_SDE/HGAC_COVID_19_Recovered_Cases	Table
Global_SDE/HGAC_COVID_19_Test_Sites	Point
Global_SDE/HGAC_COVID_19_TSA_Q_Info	Table
Global_SDE/HGAC_COVID_19_US_MSAs_Confirmed_and_Deceased_Cases	Table
Global_SDE/HGAC_Dams	Point
Global_SDE/HGAC_Election_Precincts	Polygon
Global_SDE/HGAC_Ex_Offender_Resources	Point
Global_SDE/HGAC_Flex_Zones	Polygon
Global_SDE/HGAC_FM_Roads	Polyline
Global_SDE/HGAC_Freshwater_Saltwater_Boundary	Polyline
Global_SDE/HGAC_Gulf_Coast_ETPS	Point
GLOBAL_SDE/HGAC_HILLSHADE	Raster
Global_SDE/HGAC_Hurricane_Dolly_Observations	Point
Global_SDE/HGAC_Hurricane_Dolly_Track	Polyline
Global_SDE/HGAC_Hurricane_Evacuation_Routes	Polyline
Global_SDE/HGAC_Hurricane_Evacuation_Zip_Codes	Polygon
Global_SDE/HGAC_Hurricane_Ike_High_Water_Measurements	Point

Global_SDE/HGAC_Hurricane_Ike_Observations	Point
GLOBAL_SDE/HGAC_HURRICANE_IKE_SALT_BURN_GULF_COAST	Raster
Global_SDE/HGAC_Hurricane_Ike_Storm_Surge_Model	Polygon
GLOBAL_SDE/HGAC_HURRICANE_IKE_STORM_SURGE_MODEL_RASTER	Raster
Global_SDE/HGAC_Hurricane_Ike_Track	Polyline
GLOBAL_SDE/HGAC_LAND_COVER_10_CLASS_2008	Raster
GLOBAL_SDE/HGAC_LAND_COVER_10_CLASS_ROADS_2008	Raster
GLOBAL_SDE/HGAC_LAND_COVER_3X3_MODE_FILTERED_2008	Raster
GLOBAL_SDE/HGAC_LAND_COVER_MERGED_6_CLASS_2008	Raster
Global_SDE/HGAC_Learning_Centers	Point
Global_SDE/HGAC_LiDAR_Breakline	Polyline
Global_SDE/HGAC_LiDAR_Contours_1_Foot	Polyline
Global_SDE/HGAC_LiDAR_Spot_Elevation	Point
Global_SDE/HGAC_Major_Lakes_and_Reservoirs	Polygon
Global_SDE/HGAC_Major_Rivers	Polyline
Global_SDE/HGAC_Major_Rivers_15C	Polyline
Global_SDE/HGAC_Major_Roads	Polyline
Global_SDE/HGAC_Major_Roads_15C	Polyline
Global_SDE/HGAC_MSWF_Managed_Lanes	Polyline
Global_SDE/HGAC_MSWF_Traffic_Management_Strategies	Point
Global_SDE/HGAC_NWR_Areas	Polygon
Global_SDE/HGAC_Parks	Polygon
Global_SDE/HGAC_Parole_Offices	Point
Global_SDE/HGAC_Pipelines	Polyline
Global_SDE/HGAC_RAZ	Polygon
Global_SDE/HGAC_Re_Entry_Resources	Point
Global_SDE/HGAC_Regional_Employers	Point
Global_SDE/HGAC_School_Districts	Polygon
Global_SDE/HGAC_School_Districts_UI_Claims	Polygon
Global_SDE/HGAC_Sea_Level_Rise	Polygon
Global_SDE/HGAC_Seaports	Point
Global_SDE/HGAC_Sidewalks_Final	Polyline
Global_SDE/HGAC_Sidewalks_Preliminary	Polyline
Global_SDE/HGAC_StarMap_Addresses	Point
Global_SDE/HGAC_StarMap_Centerlines	Polyline
Global_SDE/HGAC_StarMap_ZipCodes	Polygon
Global_SDE/HGAC_State_Highways	Polyline
Global_SDE/HGAC_State_House_Districts_UI_Claims	Polygon
Global_SDE/HGAC_State_Senate_Districts_UI_Claims	Polygon
Global_SDE/HGAC_TAZ_2954	Polygon
Global_SDE/HGAC_TAZ_5217	Polygon

Global_SDE/HGAC_Texas_Coastal_Vignette	Polygon
Global_SDE/HGAC_Texas_State_House_Districts	Polygon
Global_SDE/HGAC_Texas_State_Senate_Districts	Polygon
Global_SDE/HGAC_Texas_US_House_Districts	Polygon
Global_SDE/HGAC_TIRZ	Polygon
Global_SDE/HGAC_Transit_Stops	Point
Global_SDE/HGAC_Trauma_Service_Areas	Polygon
Global_SDE/HGAC_UI_Claimants	Point
Global_SDE/HGAC_Urban_Areas_2000	Polygon
Global_SDE/HGAC_Urban_Areas_2010	Polygon
Global_SDE/HGAC_US_House_Districts_UI_Claims	Polygon
Global_SDE/HGAC_Water	Polygon
Global_SDE/HGAC_Water_15C	Polygon
Global_SDE/HGAC_Water_Detailed	Polygon
Global_SDE/HGAC_Workforce_Centers	Point
Global_SDE/HGAC_Workforce_DARS	Point
Global_SDE/HGAC_Workforce_Solutions_Offices	Point
Global_SDE/HGAC_Workforce_Solutions_VR_Offices	Point
Global_SDE/HGAC_Zip_Codes_2000	Polygon
Global_SDE/HGAC_Zip_Codes_2002	Polygon
Global_SDE/HGAC_Zip_Codes_2005	Polygon
Global_SDE/HGAC_ZIP_Codes_Area_NAICS_Hexagon	Polygon
Global_SDE/HGAC_ZIP_Codes_Demo	Polygon
Global_SDE/HGAC_ZIP_Codes_Jobs	Polygon
Global_SDE/HGAC_ZIP_Codes_UI_Claims	Polygon
Global_SDE/HGAC_ZIP_Codes_UI_Claims_TWC	Polygon
Global_SDE/HRWY_Employers	Point
Global_SDE/InfoGroup_Businesses_2014	Point
Global_SDE/InfoGroup_Businesses_2015	Point
Global_SDE/InfoGroup_Businesses_2016	Point
Global_SDE/InfoGroup_Businesses_2017	Point
Global_SDE/InfoGroup_Businesses_2018	Point
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Global_SDE/InfoGroup_Businesses_Nix_2014	Table
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Global_SDE/InfoGroup_Businesses_Nix_2019	Point
Global_SDE/InfoGroup_Businesses_Nix_2020	Point

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Global_SDE/InfoGroup_Businesses_Pre_2019	Point
Global_SDE/InfoGroup_Businesses_Pre_2020	Point
Global_SDE/InfoGroup_Businesses_Suspect_2014	Point
Global_SDE/InfoGroup_Businesses_Suspect_2015	Point
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Global_SDE/InfoGroup_Businesses_Suspect_2020	Point
Global_SDE/InfoGroup_Consumers_2014	Point
Global_SDE/InfoGroup_Consumers_2015	Point
Global_SDE/InfoGroup_Consumers_2016	Point
Global_SDE/InfoGroup_Consumers_2017	Point
Global_SDE/InfoGroup_Consumers_2018	Point
Global_SDE/InfoGroup_Consumers_2019	Point
Global_SDE/InfoGroup_Consumers_2020	Point
Global_SDE/Island_Transit_Bus_Routes	Polyline
Global_SDE/Island_Transit_Bus_Stops	Point
Global_SDE/Lambert_Grid	Polygon
Global_SDE/Lambert_Grid_Product	Polygon
Global_SDE/Lambert_Grid_Products_1	Table
Global_SDE/Liberty_County_Commissioner_Precincts	Polygon
Global_SDE/LiDAR_Building_Footprints_2014_Fort_Bend_County	Polygon
Global_SDE/LiDAR_Building_Footprints_2018	Polygon
Global_SDE/LiDAR_Building_Footprints_2018_Austin_County	Polygon
Global_SDE/LiDAR_Building_Footprints_2018_Brazoria_County	Polygon
Global_SDE/LiDAR_Building_Footprints_2018_Chambers_County	Polygon
Global_SDE/LiDAR_Building_Footprints_2018_Fort_Bend_County	Polygon
Global_SDE/LiDAR_Building_Footprints_2018_Galveston_County	Polygon
Global_SDE/LiDAR_Building_Footprints_2018_Grimes_County	Polygon
Global_SDE/LiDAR_Building_Footprints_2018_Harris_County	Polygon
Global_SDE/LiDAR_Building_Footprints_2018_Jefferson_County	Polygon
Global_SDE/LiDAR_Building_Footprints_2018_Liberty_County	Polygon
Global_SDE/LiDAR_Building_Footprints_2018_Matagorda_County	Polygon
Global_SDE/LiDAR_Building_Footprints_2018_Montgomery_County	Polygon
Global_SDE/LiDAR_Building_Footprints_2018_Walker_County	Polygon
Global_SDE/LiDAR_Building_Footprints_2018_Waller_County	Polygon
Global_SDE/LiDAR_Building_Footprints_2018_Washington_County	Polygon
Global_SDE/LiDAR_Grid_2008	Polygon
Global_SDE/LiDAR_Grid_2014	Polygon

Global_SDE/LiDAR_Grid_2018_Full_Extent	Polygon
Global_SDE/LiDAR_Grid_2018_HCFCD_Extent	Polygon
Global_SDE/Matagorda_County_Commissioner_Precincts	Polygon
Global_SDE/Metro_Bus_Routes	Polyline
Global_SDE/Metro_Bus_Stops	Point
Global_SDE/Metro_LRT_Lines	Polyline
Global_SDE/Metro_LRT_Stations	Point
Global_SDE/Metro_MTA_Tax_Area	Polygon
Global_SDE/Metro_Park_and_Rides	Point
Global_SDE/Metro_Transit_Centers	Point
Global_SDE/Montgomery_County_Commissioner_Precincts	Polygon
Global_SDE/NGS_Control_Stations	Point
GLOBAL_SDE/NLCD_IMPERVIOUSNESS_2001	Raster
GLOBAL_SDE/NLCD_IMPERVIOUSNESS_2006	Raster
GLOBAL_SDE/NLCD_IMPERVIOUSNESS_2011	Raster
GLOBAL_SDE/NLCD_IMPERVIOUSNESS_2016	Raster
GLOBAL_SDE/NLCD_IMPERVIOUSNESS_CHANGE_2001_TO_2006	Raster
GLOBAL_SDE/NLCD_IMPERVIOUSNESS_CHANGE_2006_TO_2011	Raster
GLOBAL_SDE/NLCD_LAND_COVER_1992_19_CLASS	Raster
GLOBAL_SDE/NLCD_LAND_COVER_1992_19_CLASS_CORRECTED	Raster
GLOBAL_SDE/NLCD_LAND_COVER_2001_15_CLASS	Raster
GLOBAL_SDE/NLCD_LAND_COVER_2004_17_CLASS	Raster
GLOBAL_SDE/NLCD_LAND_COVER_2006_15_CLASS	Raster
GLOBAL_SDE/NLCD_LAND_COVER_2008_17_CLASS	Raster
GLOBAL_SDE/NLCD_LAND_COVER_2011_15_CLASS	Raster
GLOBAL_SDE/NLCD_LAND_COVER_2013_16_CLASS	Raster
GLOBAL_SDE/NLCD_LAND_COVER_2016_16_CLASS	Raster
GLOBAL_SDE/NLCD_LAND_COVER_CHANGE_1992_TO_2011_9_CLASS	Raster
GLOBAL_SDE/NLCD_TREE_CANOPY_2001	Raster
GLOBAL_SDE/NLCD_TREE_CANOPY_2011	Raster
GLOBAL_SDE/NLCD_TREE_CANOPY_2016	Raster
GLOBAL_SDE/NOAA_LAND_COVER_1996_22_CLASS	Raster
GLOBAL_SDE/NOAA_LAND_COVER_2001_22_CLASS	Raster
GLOBAL_SDE/NOAA_LAND_COVER_2006_22_CLASS	Raster
GLOBAL_SDE/NOAA_LAND_COVER_2011_15_CLASS	Raster
GLOBAL_SDE/NOAA_LAND_COVER_2011_22_CLASS	Raster
GLOBAL_SDE/NOAA_LAND_COVER_CHANGE_1996_TO_2010	Raster
Global_SDE/NOAA_Surge_MOM_Galveston_Bay	Polygon
Global_SDE/NOAA_Surge_MOM_Matagorda_Bay	Polygon
Global_SDE/NPS_Texas_National_Parks	Polygon
Global_SDE/NTAD_Raillines	Polyline

Global_SDE/NTAD_Raillines_General	Polyline
Global_SDE/POHA_Ship_Channel	Polygon
Global_SDE/PUCT_Texas_Area_Codes	Polygon
Global_SDE/Strava_Bike_Usage_2017	Polyline
Global_SDE/Strava_Bike_Usage_2018	Polyline
Global_SDE/Strava_Bike_Usage_2019	Polyline
Global_SDE/Strava_Bike_Usage_2020	Polyline
Global_SDE/TAMU_Texas_Coastal_Bathymetry	Point
Global_SDE/TAMU_Texas_Coastal_Bathymetry_Contour	Polyline
Global_SDE/TCEQ_Texas_Regions	Polygon
Global_SDE/TCEQ_Texas_Surface_Water_Rights_Diversion	Point
Global_SDE/TEA_School_Districts	Polygon
Global_SDE/TEA_Schools	Point
Global_SDE/TEA_Texas_Education_Service_Regions	Polygon
Global_SDE/TEA_Texas_School_Districts	Polygon
Global_SDE/TEA_Texas_Senate_Board_of_Education_Districts	Polygon
Global_SDE/TFT_Texas_Adoption_Sites	Point
Global_SDE/The_Woodlands_Township_Bus_Routes	Polyline
Global_SDE/THHS_Texas_Community_Nursing_Homes	Point
Global_SDE/TNRIS_Texas_Major_Aquifers	Polygon
Global_SDE/TNRIS_Texas_Minor_Aquifers	Polygon
Global_SDE/TNRIS_Texas_National_Forests	Polygon
Global_SDE/TPWD_Texas_Natural_Regions	Polygon
Global_SDE/TWDB_Texas_Groundwater_Conservation_Districts	Polygon
Global_SDE/TWDB_Texas_Major_Rivers	Polyline
Global_SDE/TxDOT_Highway_Milemarkers	Point
Global_SDE/TxDOT_Texas_COG_Boundaries	Polygon
Global_SDE/TxDOT_Texas_Highways	Polyline
Global_SDE/TxDOT_Texas_Hurricane_Evacuation_Routes	Polyline
Global_SDE/TxDOT_Texas_State_House_Districts	Polygon
Global_SDE/TxDOT_Texas_State_Senate_Districts	Polygon
Global_SDE/TxDOT_Texas_US_House_Districts	Polygon
Global_SDE/USCB_ACS_2018_5Yr_Block_Groups	Polygon
Global_SDE/USCB_ACS_2018_5Yr_Counties	Polygon
Global_SDE/USCB_ACS_2018_5Yr_Places	Polygon
Global_SDE/USCB_ACS_2018_5Yr_Tracts	Polygon
Global_SDE/USCB_ACS_2018_5Yr_Zip_Codes	Polygon
Global_SDE/USCB_BlockGroups_1990	Polygon
Global_SDE/USCB_BlockGroups_2000	Polygon
Global_SDE/USCB_BlockGroups_2010	Polygon
Global_SDE/USCB_Blocks_2000	Polygon

Global_SDE/USCB_Blocks_2010	Polygon
Global_SDE/USCB_Metropolitan_Statistical_Area	Polygon
Global_SDE/USCB_PL_Data_2010_Block_Groups	Table
Global_SDE/USCB_PL_Data_2010_Blocks	Table
Global_SDE/USCB_PL_Data_2010_Counties	Table
Global_SDE/USCB_PL_Data_2010_Places	Table
Global_SDE/USCB_PL_Data_2010_School_Districts	Table
Global_SDE/USCB_PL_Data_2010_Tracts	Table
Global_SDE/USCB_Places_2000	Polygon
Global_SDE/USCB_Places_2000_Pts	Point
Global_SDE/USCB_Places_2010	Polygon
Global_SDE/USCB_Places_2010_Pts	Point
Global_SDE/USCB_PSAP_Prep_BlockGroups_ACS_2017	Polygon
Global_SDE/USCB_PSAP_Prep_CDPs_and_Cities	Polygon
Global_SDE/USCB_PSAP_Prep_Tracts	Polygon
Global_SDE/USCB_PSAP_Prep_Tracts_ACS_2017	Polygon
Global_SDE/USCB_Texas_BlockGroups_1990	Polygon
Global_SDE/USCB_Texas_BlockGroups_2000	Polygon
Global_SDE/USCB_Texas_BlockGroups_2010	Polygon
Global_SDE/USCB_Texas_Blocks_2000	Polygon
Global_SDE/USCB_Texas_Blocks_2010	Polygon
Global_SDE/USCB_Texas_Coastline_Boundary	Polygon
Global_SDE/USCB_Texas_Counties_Coastline	Polygon
Global_SDE/USCB_Texas_Counties_Political	Polygon
Global_SDE/USCB_Texas_Political_Boundary	Polygon
Global_SDE/USCB_Texas_School_Districts_2010	Polygon
Global_SDE/USCB_Texas_Tracts_1990	Polygon
Global_SDE/USCB_Texas_Tracts_2000	Polygon
Global_SDE/USCB_Texas_Tracts_2010	Polygon
Global_SDE/USCB_Texas_Urban_Areas_2000	Polygon
Global_SDE/USCB_Texas_Zip_Codes_2005	Polygon
Global_SDE/USCB_Texas_Zip_Codes_2010	Polygon
Global_SDE/USCB_Tracts_1970	Polygon
Global_SDE/USCB_Tracts_1980	Polygon
Global_SDE/USCB_Tracts_1990	Polygon
Global_SDE/USCB_Tracts_2000	Polygon
Global_SDE/USCB_Tracts_2010	Polygon
Global_SDE/USCB_Urban_Areas_1990	Polygon
Global_SDE/USCB_Urban_Areas_2000	Polygon
Global_SDE/USCB_Urban_Areas_2010	Polygon
Global_SDE/USCB_US_State_Boundaries	Polygon

Global_SDE/USCB_Zip_Codes_2010	Polygon
Global_SDE/USDOT_Navigable_Waterway_Lines	Polyline
Global_SDE/USFWS_Wetlands_2009	Polygon
Global_SDE/USFWS_Wetlands_2010	Polygon
Global_SDE/USFWS_Wetlands_2011	Polygon
Global_SDE/USFWS_Wetlands_2012	Polygon
Global_SDE/USGS_15_Minute_Quad	Polygon
Global_SDE/USGS_24K_Quad	Polygon
GLOBAL_SDE/USGS_DEM_10M	Raster
Global_SDE/USGS_DOQQ_Grid	Polygon
Global_SDE/USGS_HUC_02_Regions	Polygon
Global_SDE/USGS_HUC_04_Subregions	Polygon
Global_SDE/USGS_HUC_06_Basins	Polygon
Global_SDE/USGS_HUC_08_Subbasins	Polygon
Global_SDE/USGS_HUC_10_Watersheds	Polygon
Global_SDE/USGS_HUC_12_Subwatersheds	Polygon
Global_SDE/USGS_Texas_HUC_02_Regions	Polygon
Global_SDE/USGS_Texas_HUC_04_Subregions	Polygon
Global_SDE/USGS_Texas_HUC_06_Basins	Polygon
Global_SDE/USGS_Texas_HUC_08_Subbasins	Polygon
Global_SDE/USGS_Texas_HUC_10_Watersheds	Polygon
Global_SDE/USGS_Texas_HUC_12_Subwatersheds	Polygon
GLOBAL_SDE/USGS_TEXAS_TERRAIN_COLOR_MAP	Raster
Global_SDE/Walker_County_Commissioner_Precincts	Polygon
Global_SDE/Waller_County_Commissioner_Precincts	Polygon
Global_SDE/Wharton_County_Commissioner_Precincts	Polygon
Global_SDE/World_Country_Boundaries	Polygon

C&E Non-Spatial Data

Ambient Surface Water Quality Monitoring
Wastewater Self-reporting Data
Parcel-Based Land Use, Attributes, and Valuation (9 counties)
Census Data

Appendix 6 Data Dictionary

Data Dictionary Houston-Galveston Area Council Community and Environmental Planning Department

General Information		
Thematic Layer Name		
Feature Class		
Topology		
Table Name		
Data Source		
Report Prepared by		
Phone	Fax	E-Mail

Attribute Table				
Variable	Begin Column	Item Name	Alternate Name	Item Definition

Data History
Source Agency
Originating Date

Originating Scale

Status Information
Percentage Complete
Planned Completion Date
Geographic Extent
Planned Enhancements
Known problems or limitations

Maintenance Information
Maintaining Office/Division/Section
Contact Name
Contact Telephone Number
Type of updates performed
Frequency of Updates

Data Format Information
Data Format
Software/Version
Number of features/records
Total File Size

Projection
Geographic Projection:
Spheroid:
Zone:
Datum:
Units:
Fips Zone:
Quadrant:
X Shift:
Y Shift:
1st Standard Parallel:
2nd Standard Parallel:
Central Meridian:
Lat. of Projection Origin:
False Easting:
False Northing:

Additional Documentation
Quality Assurance Quality Control
Attribute Reports Available
Additional Documentation Available

Appendix 7 H-GAC GIS Data and Mapping Applications