Texas Commission on Environmental Quality

Petroleum Storage Tank State Lead Program

Quality Assurance Project Plan

FY 2016

QTRAK#: 15-306

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A.0 PROJECT MANAGEMENT

The Texas Commission on Environmental Quality (TCEQ) prepared this Petroleum Storage Tank (PST) State Lead Program Quality Assurance Project Plan (QAPP) as part of the requirements specified in the Leaking Underground Storage Tank (LUST) Corrective Action Grant (grant). At leaking petroleum storage tank (LPST) sites, Contractors perform the data collection activities for the TCEQ. The PST State Lead Program is implemented by staff within the PST Program. The program developed the Contractor Oversight Program presented in Appendix 1.

A.1 QAPP TITLE AND APPROVAL

TCEQ PST State Lead Program Quality Assurance Project Plan (QTRAK # 15-306)

TCEQ Remediation Division Approval:

Signature *Date*

2/17/15
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TCEQ Monitoring Division Approval:

04/17/2015
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USEPA Region 6 Approval:

6/9/15
Audray Lincoln
Region 6 – UST/LUST Project Officer
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A.1.1 QAPP TITLE AND APPROVAL Addendum

TCEQ PST State Lead Program Quality Assurance Project Plan (QTRAK # 15-306)

TCEQ Remediation Division Approval:

Signature *Date*

4/1/15

Ann Strahl
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A.2.1 List of Acronyms and Abbreviations

Acronym - Abbreviations	Meaning
%R	percent recovery
abs	absolute value
BTEX	benzene, toluene, ethylbenzene, and xylenes
CAP	corrective action plan
CAPM	corrective action project manager
CAS	corrective action specialist
CASRN	chemical abstract service registry number
CFR	Code of Federal Regulations
COC	chemical of concern
DCRP	Dry Cleaning Remediation Program
DCS	detectability check sample
DQO	data quality objective
GMR	Groundwater monitoring report
GPS	global positioning data
GMU	Groundwater monitoring update
LCS	laboratory control sample
LIMS	laboratory information management system
LPST	leaking petroleum storage tank
LRC	laboratory review checklist
LUST	leaking underground storage tank
MDL	method detection limit
mg	milligram
mL	milliliter
MQL	method quantitation limit
MS	matrix spike
MSD	matrix spike duplicate
MTBE	*methyl tert-butyl ether*
NELAP	National Environmental Laboratory Accreditation Program
OPP	operating policy and procedure
OSHA	Occupational Safety and Health Administration
PAH	polynuclear aromatic hydrocarbons
PC	personal computer
PM	project manager
PST	petroleum storage tank
PSTR	petroleum storage tank remediation
QA	quality assurance
QA/QC	quality assurance/quality control
QAPP	quality assurance project plan

Acronym - Abbreviations	Meaning
QAS	quality assurance specialist
QC	quality control
QMP	quality management plan
RP	responsible party
RPD	relative percent difference
SDL	sample detection limit
SOP	standard operating procedures
SR	sample result
SSR	spiked sample result
SVOC	semivolatile organic compound
SW-846	USEPA Solid Waste Analytical Test Manual
TAC	Texas Administrative Code
TCEQ	Texas Commission on Environmental Quality
TF	trust fund
TPH	total petroleum hydrocarbon
TWC	Texas Water Code
ug	microgram
USEPA	United States Environmental Protection Agency
UST	underground storage tank
VOA	volatile organic analysis
VOC	volatile organic compound
x	measured value

A.3 DISTRIBUTION LIST

The PST Lead Quality Assurance Specialist (QAS) will distribute, in hard copy and accessible electronic copy, the approved PST State Lead Program Quality Assurance Project Plan (QAPP), and any amendments or addenda, to the following personnel:

A.3.1 U.S. EPA Region 6 Personnel:

Audray Lincoln, LUST Project Officer

A.3.2 TCEQ Remediation Division Personnel:

Beth Seaton, Director, Remediation Division
Kenneth Davis, PST/Dry Cleaner Remediation Program (PST/DCRP) Section Manager
Donald Boothby, PST State Lead Program Manager
Victoria Modak, Responsible Party Lead Program Manager
Kristine Elliott, LUST Corrective Action Grant Manager
Suzanne Vargas, Manager, Division Support Section
Ann Strahl, PST Lead Program Quality Assurance Specialist
Steven Childress, PST Project Quality Assurance Specialist
Mark Maglitto, PST Project Quality Assurance Specialist

A.3.3 Monitoring Division (MD) Personnel:

Sharon Coleman, TCEQ Quality Assurance (QA) Manager
Penny Sterling, Quality Assurance Specialist, Waste Programs

The PST State Lead Program Manager will distribute the approved QAPP, and any amendments or addenda, to the Contractors performing corrective action work for the PST Program. Contractors will acknowledge receipt of the QAPP to the PST State Lead Program Manager. The documentation of receipt of the QAPP is maintained by the PST State Lead Program Manager. The PST State Lead Program Manager will post the accessible electronic copy of the QAPP on the external Remediation Division web page.

A.4 PROJECT/TASK ORGANIZATION

The roles and responsibilities for key individuals responsible for meeting the LUST Corrective Action Grant commitments and participating in work associated with the PST State Lead Program are listed below. Figure 1 presents the lines of authority and communication for the PST State Lead Program.

A.4.1 EPA Region 6 LUST Project Officer

The USEPA LUST Project Officer is responsible for coordinating administrative issues between USEPA Region 6 and TCEQ PST Program, including processing the grant work plans and approving the TCEQ PST Program QAPP.

A.4.2 PST/Dry Cleaning Remediation Program Section Manager

The PST/DCRP Section Manager is responsible for managing TCEQ staff performing PST State Lead Program activities and for ensuring environmental activities within the PST State Lead Program are performed in accordance with applicable plans and procedures, work performance is measured against specifications, and appropriate management oversight and inspection is accomplished. The PST/DCRP Section Manager, or designee, assesses competency of contractors via an established contractor evaluation process and assesses competency of PST State Lead Program staff via an established performance review process.

A.4.3 TCEQ PST State Lead Program Manager

The TCEQ PST State Lead Program Manager is responsible for:

- Managing all aspects of the PST State Lead Program activities performed by the Remediation Division and its Contractors;
- Communicating PST State Lead Program requirements to the PST Contractors, including distributing the approved PST QAPP to the Contractors and overseeing/managing contract budgets;
- Implementing the PST State Lead Program quality assurance activities associated with site investigations or corrective actions; and
- Monitors the competency of contractors.

A.4.4 TCEQ Responsible Party Lead Program Manager

The Responsible Party (RP) Program Manager is responsible for implementing the PST RP Lead Program activities and associated investigation and corrective action activities and for performing queries of the PST database to generate reports for the public, local, state, and federal entities.

A.4.5 TCEQ LUST Corrective Action Grant Manager

The LUST Corrective Action Grant Manager is responsible for:

- Coordinating with USEPA Region 6 regarding TCEQ LUST Corrective Action Grant administrative issues, including processing the LUST Corrective Action Grant Work Plan;

- Monitoring the LUST Corrective Action activities for compliance with the PST Program QAPP;
- Providing the PST Lead QAS with dates of scheduled field sample collection activities at LUST-funded sites to assist the QAS in planning audits; and
- Providing the PST Project QAS with one or more analytical data package from LUST-funded site activities during the fiscal year to assist the Project QAS in performing audits of data quality. The TCEQ LUST Corrective Action Grant Manager will provide the data package to the QAS no later than the midpoint of each quarter of the fiscal year during which an audit of data quality is scheduled.
- Reviewing the PST Program QAPP; and
- Assisting in the resolution of internal and external audit findings related to the LUST Corrective Action Program activities and performance.

A.4.6 TCEQ PST Lead QAS

The PST State Lead Program QAS is responsible for quality assurance (QA) functions including the following:

- Preparing and maintaining the PST State Lead Program QAPP and other QA documents, e.g., annual PST QA report, related to LUST site activities;
- Providing training to the PST program staff and Contractors on the PST program QA specifications and requirements;
- Coordinating between the PST program staff and other internal/external entities (e.g., other TCEQ staff, other agencies, or Contractors) regarding QA specifications and requirements;
- Assisting the PST Program to establish specific data quality objectives (DQOs) for LPST site activities when the objectives are not specified by TCEQ and/or USEPA policy;
- Assessing the PST Program conformance to the agency quality management plan (QMP) and the program quality system requirements;
- Planning and conducting assessments and audits of environmental sampling activities funded by the LUST grant;
- Verifies the evaluation of competency of contractors and PST State Lead Program staff is performed and documented; and
- Prescribing corrective action, as needed, when DQOs are not met.

A.4.7 TCEQ PST State Lead Project Managers

The PST State Lead Project Manager (PM) is responsible for coordinating, overseeing, and managing LPST site field investigations and PST corrective action in accordance with operating procedures and the PST QAPP including:

- Reporting to the respective management any deviation from accepted field procedures and DQOs;
- Ensuring proper documentation of sampling, sample preservation, sample delivery and field analytical procedures;
- Enacting appropriate custody procedures;
- Overseeing Contractor-performed activities to monitor performance for compliance with operating procedures and QA requirements;
- Reviewing and evaluating PST site data; and
- Evaluating contractor competency via an established contractor evaluation process and maintaining documentation of competency in accordance with the applicable PST contract specifications.

A.4.8 TCEQ PST Project QA Specialist

The PST Project QA Specialist serves as a resource on analytical chemistry and QA/QC issues. The responsibilities of the project QAS include:

- reviewing of the QAPP and associated project documents;
- providing technical assistance to resolve QA/QC or analytical chemistry issues;
- assisting in the review of data packages and QC summaries at the request of the TCEQ PM; and
- assisting the TCEQ PM in problem resolutions and monitoring corrective actions.

Problems discovered during a review by the QAS will be reported to the TCEQ PM. The project QAS is available to assist the TCEQ PM in the resolution of problems and corrective actions.

A.4.9 TCEQ QA Manager

The QA Manager is responsible for:

- Developing, updating, approving, and implementing the agency QA program, QMP, and QA procedures;
- Monitoring development and implementation of QAPPs and corrective actions plans;
- Conducting quality systems audits and conducting or participating in other types of assessments as appropriate; and
- Providing assistance in the area of QA.

A.4.10 TCEQ Contractors

The TCEQ PST State Lead Contractors performing work for the PST State Lead Program are responsible for:

- Assuring field equipment is properly maintained and calibrated and the individuals operating the equipment are adequately trained;
- Recording field activities, including field measurements, pertinent field observations, and labeling, handling, storage and shipping activities to document project requirements are met;
- Complying with custody procedures;
- Notifying the TCEQ PM of circumstances having the potential to adversely affect the quality of data generated during, or derived from, LPST field activities;
- Collecting global positioning data as requested by the TCEQ;
- Preparing and maintaining a health and safety plan for each field event;
- Assisting the TCEQ PM in establishing and meeting the DQOs for the site;
- Implementing necessary corrective action;
- Informing their staff of the project DQOs, and for adhering to the required data acquisition procedures and documentation requirements; and
- Documenting the competency of their personnel and all subcontracted parties, maintaining the documentation during the active and archived life of the project, and making the documentation available to the TCEQ for review.

The Contractors are responsible for the quality of the data generated for the project and for reporting to the PST State Lead Program PM any data quality problems or problems encountered by the laboratory during the analysis of the project samples. Regarding project data, the contractor is responsible for:

- Reviewing the analytical data generated from sampling events to verify the data are of known and documented quality and to determine the usability of any data qualified by the laboratory or the data reviewer; and
- Completing the Contractor Laboratory Analytical Data Certification Form in Appendix 4 to certify:
    - the analytical data have been reviewed and evaluated for technical acceptability, including problems and anomalies associated with the data;
    - a determination has been made regarding the usability of the analytical data relative to the project objectives; and
    - at the time of data generation, the laboratory was accredited under the Texas Laboratory Accreditation Program for the matrices, methods, and parameters of analysis, unless an exception allowed under 30 Texas Administrative Code Subchapter 25.6 is approved in writing by TCEQ .

The contractor is responsible for preparing a data review summary as described in Element A.9.

A.4.11 Subcontracted or Contracted Laboratory Manager

The manager of a laboratory performing chemical analyses for the PST Program is responsible for:

- Managing calibration activities and laboratory quality control (QC) performance when generating analytical data under this QAPP;
- Verifying laboratory analyses and data processing conform to the most current standards adopted by the National Environmental Laboratory Accreditation Program (NELAP) and requirements of 30 Texas Administrative Code Chapter 25;
- Implementing and maintaining a documented QA program; and
- Identifying and documenting anomalous and/or outlying analytical results in the data package via the laboratory case narrative or the laboratory review checklist (LRC).

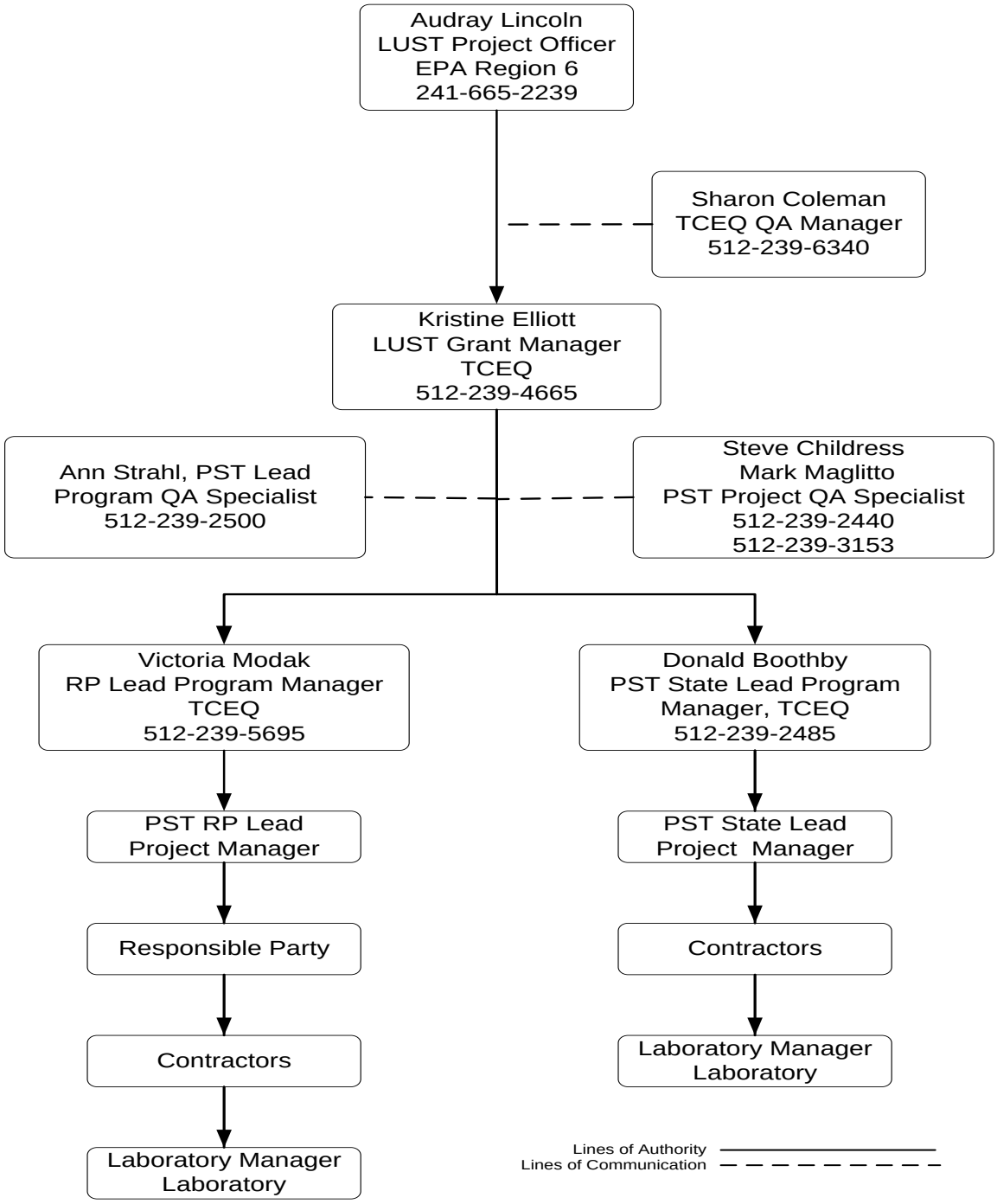

Figure 1. PST State Lead Program and Responsible Party Program Organization Chart

A.5 PROBLEM DEFINITION/BACKGROUND

Petroleum storage tanks (PSTs) have the potential to release the contents of the tank into the environment, and leaks associated with PSTs have been a major cause of groundwater contamination. In October of 1986, Congress amended Subtitle I of the Resource Conservation and Recovery Act (RCRA) to create the LUST Trust Fund (TF) to finance corrective action measures at LPST sites where the owner or operator for the LPST is unknown, unwilling, or financially unable. Federal grant funding of the LUST TF is made available through 40 CFR Part 31. Through a cooperative agreement with the USEPA, the TCEQ is responsible for administrating these funds for LUST - funded activities in Texas.

The LUST activities under the PST Program include:

- administering the allocated fund,
- inspecting facilities reported to have an existing or suspected leak from one or more underground storage tank,
- investigating LPST facilities,
- remediating LPST incidents,
- protecting human health and the environment, and
- responding to emergencies caused by an LPST.

This QAPP is implemented at LPST sites when LUST funds are used for inspections, investigations, corrective actions, cleanups and GPS data collection at LPST sites and when the Remediation Division PST/DCRP Section conducts activities at LPST sites not eligible for LUST funds.

A.6 PROJECT TASK DESCRIPTION

The PST State - Lead Program conducts data collection activities associated with the corrective action, including investigation and remediation, at LPST sites using LUST funds. The PST State Lead Program also provides technical assistance and outreach and education programs for the regulated community.

Each facility that has USTs or above ground storage tanks registered with the TCEQ is unique depending on its components, type of products stored, local hydrogeologic conditions, and history of releases. In addition, these PST facilities are located in virtually every type of Texas community ranging from rural to metropolitan. At any Texas facility where a leak from a PST has occurred, the staff of the TCEQ PST Program is responsible for ensuring all site activities are performed in accordance with accepted QA procedures.

This PST QAPP describes the TCEQ QA plan for Texas LPST site activities. Potential LPST site activities pursued by, for, or under contract to the TCEQ include the following:

- Immediate response measures required to abate or mitigate the effects to human health and/or the environment of petroleum releases from PSTs;
- Testing of PST systems;
- Conducting site contamination assessment studies to determine the source(s), and estimate the extent and magnitude, of contamination;
- Remedial action feasibility studies;
- Environmental and human health risk assessments;
- Remedial action;
- Disposal of investigative-derived waste and remediation-generated waste;
- Provision of drinking water to affected individuals; and
- Temporary or permanent relocation of affected individuals.

Specific LPST site activities will generate environmental data. These activities include soil and water sample collection and analysis; soil boring; monitoring well installation; decontamination procedures; groundwater level; geophysical and other survey measurements; and data reduction and analyses. These activities, and all other pertinent LPST site activities that generate environmental data, are subject to QAPP requirements. Potential uses for collected environmental data include source determination, estimation of the magnitude and extent of contamination, determination of the nature of contamination, characterization of site conditions for development of remedial action procedures, and documentation of the effectiveness of remediation.

Petroleum-contaminated waste may not be transported from the generating site unless the waste has been characterized and a waste manifest is initiated. Samples collected to characterize the waste should be analyzed for the major components of petroleum, including benzene, toluene, ethyl benzene, and xylene (BTEX), total petroleum hydrocarbons (TPH), and any other contaminants indicated by specific conditions at the generating site. A TCEQ petroleum-substance waste manifest is initiated by the generator and is to include the information indicated on the back of the form. The waste manifest used to transport petroleum contaminated material must conform to applicable statutes and requirements.

The primary goal of the QA program outlined in this QAPP is to ensure the data generated by or for the TCEQ relating to LPST site activities are scientifically valid, legally defensible and of known and documented quality. Specific objectives of the QA procedures include the following:

- Data generated for or by the TCEQ PST Program will be of known and documented quality;

- The intended use of data will be determined before data collection efforts begin to ensure the necessary level of data quality is attainable;
- Data produced by or for the TCEQ will be of known and acceptable precision, accuracy, representativeness, completeness, and comparability;
- The LPST projects will receive adequate supervision by the staff of the PST program to ensure adherence to applicable QA procedures; and
- The PST State Lead PM will have overall responsibility for the implementation of QA procedures related to sites managed within the PST program.

Data quality procedures for certain activities commonly required at LPST sites (e.g., groundwater and soil sampling and analysis) have been identified and the specific DQOs are detailed in Element A.7 of this QAPP. For specialized activities which are required at LPST sites, specific QA procedures and DQOs will be identified during development of the plans for site activities. The procedures required for the development of site and/or activity specific QA procedures and DQOs are also identified in Element A.7.

The PST State Lead Program will provide information on LPST program QA requirements to the regulated community, other State of Texas agencies, and private entities participating in the LPST program. Those participants who will be involved in the generation of environmental data for LPST site projects will be committed to use procedures identified in this QAPP. This QAPP will also be made available to all potential Contractors for LPST site activities. Adherence to the QA procedures specified in this QAPP will be a contractual requirement for entities contracted by the TCEQ to perform LPST site activities.

A.7 QUALITY OBJECTIVES AND CRITERIA

The TCEQ primary goal for QA procedures is to produce sufficient environmental data of known quality to support the objectives of any LPST site investigation. To meet this goal, DQOs, which qualitatively and quantitatively specify the data requirements, have been developed for data collection activities commonly performed at LPST sites. For certain data collection activities which will be developed and used only for specific LPST sites, specialized DQOs may be determined during development of site plans.

The Contractor has overall responsibility for the quality of data produced for the PST State Lead Program. Evaluations and decisions related to LPST sites that rely on collected data will be approved by the PST State Lead PM and include site contamination assessments and development of corrective action plans (CAPs).

Generally, the objectives of any LPST site investigation may include source determination, estimation of the extent and magnitude of contamination, determination of the nature of contamination, characterization of site conditions for risk assessment and development of CAPs, and verification of remedial action. The level of data quality

and quantity is dependent on the nature of the objectives, specifically the prioritized data uses, appropriate analytical levels, contaminants of concern, concentrations of concern, required detection limits, and critical sample requirements. These factors will determine the level of effort required to obtain the necessary data.

Environmental data collection activities most commonly performed during the course of an LPST site project include soil boring and monitor well installations; groundwater, soil, and surface water screening and sampling; sample preservation; and analysis.

The type of data needed to support agency decisions includes representative samples analyzed by the analytical methods and analytes specified in this QAPP. Table 1 presents the analytical methods most commonly required for analysis of samples collected at LPST sites. The methods include SW-846 Method 8021, SW-846 Method 8260, and SW-846 Method 8270. Tables 2, 3, and 4, respectively, present the method quantitation limits (MQLs), the measurement quality objectives, and the calibration and QC acceptance criteria for SW-846 Method 8021. Tables 5, 6, and 7 present that respective information for SW-846 Method 8260, and tables 8, 9, and 10 present that respective information for SW-846 Method 8270. Regarding tables 4, 7, and 10 (the calibration and quality control criteria), the laboratory shall document the corrective actions associated with project work and shall maintain the documentation records on file and available for review upon request by the TCEQ. The standard operating procedures for sampling and analysis of LPST samples are addressed in Element B. Generally, the DQOs for LPST site environmental data acquisition activities can be defined by the representativeness, comparability, completeness, sensitivity, precision, and accuracy of the collected data.

Representativeness expresses the degree to which sample data accurately and precisely represent site conditions and is mainly dependent on the sampling locations and sampling procedures. Careful selection of sample locations, use of documented sampling procedures, and use of documented analytical methods (Element B) will be implemented to increase the representativeness of samples collected under the PST program.

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared to another data set. Comparability of data is improved by adequate planning of data collection events to identify the needs of the stakeholders and intended use of the data, by establishing clear data handling and reporting specifications, and by selecting documented sampling procedures and analytical methods.

Completeness is a measure of the number of valid, individual sample results obtained from a measurement system, expressed as a percentage of the total number of results that were planned to be collected. Ideally, 100% of the data should be available. However, the possibility of data becoming unavailable due to laboratory accidents,

insufficient sample volume collected, sample locations being inaccessible, or samples being broken during shipping may occur. Also, emergency situations may arise or field conditions may prevent the implementation of the sampling plan to achieve 100% data completeness. Therefore, the completeness goal of the TCEQ PST Program is 90%. When a variance between the actual and the planned numbers of samples/analysis occurs, the degree to which available measurements meet the study requirements will be assessed and corrective actions will be considered if necessary.

The precision and accuracy of data are determined by multiple measurements of samples and measurement of known concentrations spiked into samples, respectively. Precision is defined as the degree of mutual agreement among replicate measurements of the same property under prescribed similar conditions.

Accuracy is a measure of the closeness of a measurement or the average of a number of measurements to the true value. Accuracy is a statistical measurement of correctness and includes components of random error (precision) and systematic error (bias). Accuracy is measured by spiking a known amount of the constituent into a portion of the sample and then determining how much of this spike is actually measured. Accuracy is generally reported as percent recovery (%R). The acceptable RPDs and the acceptable %Rs are dependent on many factors, including the specific analytical method used, the matrix of the sample, the laboratory used and the constituent being measured. The method acceptance criteria in terms of precision and accuracy are identified in tables 3, 6, and 9 for SW-846 Method 8021, SW-846 Method 8260, and SW-846 Method 8270, respectively. The recommended MQLs for these methods are listed in tables 2, 5, and 8, respectively.

The laboratory must routinely check the method detection limit (MDL) for reasonableness to verify the laboratory ability to reliably detect the chemicals of concern (COCs) at the MDLs used for reporting detected results and for calculating non-detected results. This check can be demonstrated by analyzing a detectability check sample (DCS). A DCS is a reagent matrix spiked by the laboratory with the COC near, or within two to three times, the calculated MDL and carried through the sample preparation procedures for the analysis. A DCS analyzed after instrument maintenance can also serve as this check. The DCS should be analyzed on a quarterly basis during the period of time PST Program samples are being analyzed. The laboratory might consider analyzing the DCS on a monthly basis if other programs outside the PST State Lead Program will allow the DCS values to be used in the annual laboratory MDL study (if an annual MDL study is required). If the laboratory does not analyze a batch of PST State Lead Program samples for a quarter of a year or more, no DCS analysis is required for that period with respect to this QAPP. Also, if the routine laboratory DCS results support the MDL, no additional MDL study is necessary with respect to the PST State Lead Program and this QAPP.

When evaluating the results of the DCS, the analytical response must meet the qualitative identification criteria specified in the method and the laboratory quality assurance plan (QAP). If no qualitative identification criteria are specified in the method or the laboratory QAP, a detection would be considered a response for which the laboratory has a high degree of confidence that the response is different from a blank. If the COC is not detected in the DCS, the DCS should be reanalyzed. If the COC is still not detected, the MDL is considered not valid for calculating non-detected results, because the MDL is not supported by successful DCS results. Therefore, the DCS is analyzed at increasing concentrations until the COC is detected. The concentration at which the COC is detected should be used in lieu of the calculated MDL for reporting detected results and calculating non-detected results. The DCS documentation maintained by the laboratory must be sufficient to allow a person with reasonable and applicable experience to concur with the laboratory conclusion that the COC was detected in the DCS.

Non-detected results must be reported as less than the value of the sample detection limit (SDL). The SDL is defined as the MDL (supported by a successful DCS) adjusted to reflect sample-specific actions, such as dilution or use of smaller aliquot sizes than prescribed in the analytical method, and takes into account sample specific factors, such as sample characteristics, sample preparation, and analytical adjustments. The SDL is that value below which the COC cannot be reliably detected.

Specialized data collection activities for which established DQOs do not exist may be required at an LPST site. Standard operating procedures and appropriate DQOs will be established during the development of site plans. Site-specific DQOs will be developed based on requirements related to specific measurement parameters, appropriate analytical methods, representativeness of sampling points, custody procedures and data completeness. The PST State Lead Program PM and the Contractor will be involved in the DQO development process. If the standard operating procedures for specialized data collection activities are developed by Contractors for the TCEQ, the Contractors will also be involved in the development of the associated DQOs.

Table 1. Analytical Methods for LPST Site Investigations

USEPA Methods*	Test	Analytes
SW-846 8021** 602 (wastewater)	Aromatic Volatile Organic Compounds (VOCs)	Benzene, Toluene, Ethylbenzene, Xylenes, and Methyl tert butyl ether (MTBE)
SW-846 8011	Halogenated volatiles	1,2-dibromoethane
SW-846 82609TP** 624 (wastewater)	VOCs	Volatile Organic Compounds
SW-846 8270 610 (wastewater) 1664 (wastewater)	Semivolatile Organic Compounds (SVOCs) Hexane Extractable Materials	Polynuclear Aromatic Hydrocarbons (PAHs) Hexane Extractable Materials
Texas Method	**Test**	**Analytes**
TCEQ Method 1005	Total Petroleum Hydrocarbons	C6 to C35 Total Petroleum Hydrocarbons

* Associated preparation methods include Method 5030B for aqueous and aqueous miscible liquid samples; Method 5032 for all types of matrices, except air, and for analytes with a boiling point below 180 degrees C (which includes all BTEX compounds); or Method 5035 for both low and high concentration soil and waste extracts. Method 5035 is required for the collection and preparation of samples analyzed for VOCs in soils using the purge and trap procedure. All analyses shall be performed in accordance with 40 CFR Part 136 and current SW-846 standards.
Note: Other methods may be used as specified by TCEQ guidance documents and site-specific work plans with prior approval by PST State Lead Program PMs.

** The most current version of each of these SW-846 methods that EPA has posted on the Office of Solid Waste Programs Test Method, for which the laboratory is accredited under the Texas Laboratory Accreditation Program, should be used for the analysis of samples.

A.7.1 Method SW8011-Ethylene Dibromide

Ethylene dibromide (EDB) in water is analyzed using Method SW8011. The sample is extracted with hexane. The extract is injected into a GC with a linearized electron capture detector for separation and analysis.

This method provides for the use of a second GC column of dissimilar phase to resolve compounds of interest from interferences that may occur. When second-column analysis is performed, retention times for the analyte must match those established for each column. Otherwise, the chromatographic peaks are considered interferences, and the analyte is not considered to be present in the sample.

Table 2 Method SW8011 MQLs

Analyte, CAS No.	Water MQL	Water Unit
Ethylene dibromide, 106-93-4	0.02	µg/L
1,2,3-Trichloropropane, 96-18-4	0.02	µg/L

Table 3 Method SW8011 QC Acceptance Criteria

Analyte	Accuracy Water (% R)	Precision Water (RPD)
Ethylene dibromide	80-120	≤ 20
1,2,3-Trichloropropane	80-120	≤ 20

Analyte	Accuracy Water (% R)	Precision Water (RPD)
Surrogate: 1,2-Dibromopropane or 1,2-Dichloropropane	70-120	

Table 4 Method SW8011 Calibration and QC Procedures for Ethylene Dibromide

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]
Five-point initial calibration for all analytes.	Initial calibration prior to sample analysis.	linear – RSD for all analytes ≤20% linear – least squares regression r > 0.995. non-linear – COD ≥0.990 (6 points shall be used for second order, 7 points shall be used for third order)	Correct problem then repeat initial calibration.
Second-source calibration verification.	Once per five-point initial calibration.	All analytes within ±20% of expected value.	Correct problem then repeat initial calibration.
Retention time window calculated for each analyte.	Each initial calibration and calibration verifications.	±3 times standard deviation for each average analyte retention time from 72-hour study or 0.03 minutes, whichever is greater.	Correct problem then reanalyze all samples analyzed since the last retention time check.
Initial calibration verification.	Daily, before sample analysis.	All analytes within ±20% of expected value.	Correct problem then repeat initial calibration.
Calibration blank.	Once per initial daily multipoint calibration.	No analyte detected ≥MQL.	Correct problem then reanalyze calibration blank and all samples associated with blank.
Calibration verification.	After every 10 samples and at the end of the analysis sequence.	All analytes within ±20% of expected value.	Correct problem then repeat initial calibration verification and reanalyze all samples since last successful calibration verification.
Demonstrate ability to generate acceptable accuracy and precision using four replicate analyses of a QC check sample.	Once per analyst.	QC acceptance criteria, Table B.5.1.1-2.	Recalculate results; locate and fix problem with system and then rerun demonstration for those analytes that did not meet criteria.
Method blank.	One per preparation batch.	No analytes detected ≥ MQL.	Correct problem then reprep and analyze method blank and all samples processed with the contaminated blank.
LCS for all analytes.	One LCS per preparation batch.	QC acceptance criteria, Table B.5.1.1-2.	Correct problem then reprep and analyze the LCS and all samples in the affected analytical batch.
Surrogate spike.	Every sample, spiked sample, standard, and method blank.	QC acceptance criteria, Table B.5.1.1-2.	Method 8000C, Section 9.6 Requirements. Describe in LRC.
MS/MSD.	One MS/MSD per every 20 project samples per matrix.	QC acceptance criteria, Table B.5.1.1-2.	Describe in LRC.
Second-column confirmation.	100% for all positive results.	Same as for initial or primary column analysis. RPD for the dual column results ≤ 40%.	Describe in LRC. If no chromatographic anomalies or problems noted, report the lower result as per Section 11.10.4.2 of Method 8000C.
MDL study.	Once per 12 month period.	Detection limits established shall be # ½ the MQLs in Table B.5.1.1-1.	If the MDL study does not meet the acceptance criteria, repeat the MDL study.

a. All corrective actions associated with TCEQ project work shall be documented, and all records shall be maintained by the laboratory.

A.7.2 Method SW8021B- Aromatic and Halogenated Volatile Organics

Aromatic and halogenated volatile organics in water and soil samples are analyzed using Method SW8021B. This method is a purge and trap GC method using preparation Method SW5030C or SW5035A. A temperature program is used in the GC to separate the compounds. Detection is achieved by a PID and an electrolytic conductivity detector (ECD) in series.

For analytes detected by both detectors, no further confirmation need be performed. For analytes detected by only one detector, confirmation on another column is required.

Table 5. SW-846 Method 8021 Method Quantitation Limits

Analyte	CASRN	Water MQL (mg/L)	Soil MQL (mg/kg)
Benzene	71-43-2	0.0002	0.01
Ethylbenzene	100-41-4	0.001	0.01
Methy-1T*tert*-butyl-ether*	1634-04-4	0.001	0.01
Naphthalene	91-20-3	0.001	0.01
o-Xylene	95-47-6	0.001	0.01
m-Xylene	108-38-3	0.001	0.01
p-Xylene	106-42-3	0.002	0.01
Toluene	108-88-3	0.001	0.01
Xylenes, Total	1330-20-7	0.001	0.01

* MTBE is not a standard analyte for this method. Confirm the laboratory includes MTBE in the initial calibration for this method.

Table 6. SW-846 Method 8021 Measurement Quality Objectives

Method 8021 Analyte	Accuracy Water (%R)	Precision Water (RPD)	Accuracy Soil (% R)	Precision Soil (RPD)
Benzene	75–125	≤ 20	65–125	≤ 30
Ethylbenzene	71–129	≤ 20	61–129	≤ 30
Methyl-*tert*-butyl ether*	65-123	≤ 20	50-135	≤ 30
Naphthalene	65–135	≤ 20	55–145	≤ 30
o-Xylene	65–135	≤ 20	55–145	≤ 30
m-Xylene	65–135	≤ 20	55–145	≤ 30
p-Xylene	65–135	≤ 20	55–145	≤ 30
Toluene	70–125	≤ 20	60–125	≤ 30
Xylenes, Total	71–133	≤ 20	61–133	≤ 30
Surrogates:				
1,4-Dichlorobutane	35–135	---	35–135	---
Bromochlorobenzene	37–137	---	37–137	---

* MTBE is not a standard analyte for this method. Confirm the laboratory includes MTBE in the initial calibration for this method.

Table 7. SW-846 Method 8021 Calibration and QC Acceptance Criteria

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action
Five-point initial calibration for all analytes.	Initial calibration prior to sample analysis.	linear - RSD for all analytes ≤20% linear – least squares regression r ≥0.995 for each analyte non-linear – COD ≥0.990 (6 points shall be used for second order, 7 points shall be used for third order).	Correct problem then repeat initial calibration.
Second-source calibration verification.	Once per five-point initial calibration.	All analytes within ±20% of expected value.	Correct problem then repeat initial calibration.
Retention time window calculated for each analyte.	Each initial calibration and calibration verifications.	±3 times standard deviation for each average analyte retention time from 72-hour study or 0.03 minutes, whichever is greater.	Correct problem then reanalyze all samples analyzed since the last retention time check.
Initial calibration verification.	Daily, before sample analysis.	All analytes within ±20% of expected value.	Correct problem then repeat initial calibration.
Calibration verification.	After every 10 samples and at the end of the analysis sequence.	All analytes within ±20% of expected value.	Correct problem then repeat initial calibration verification and reanalyze all samples since last successful calibration verification.
Demonstrate ability to generate acceptable accuracy and precision using 4 replicate analyzes of a QC check sample.	Once per analyst.	Measurement quality objectives in Table 3.	Recalculate results; locate and fix problem with system and then rerun demonstration for those analytes that did not meet criteria.
Method blank.	One per preparation batch.	No analytes detected ≥MQL.	Correct problem then reprep and analyze method blank and all samples processed with the contaminated blank.
LCS for all analytes.	One LCS per preparation batch.	Measurement quality objectives in Table 3.	Correct problem then reprep and analyze the LCS and all samples in the affected batch.
Surrogate spike.	Every sample, spiked sample, standard, and method blank.	Measurement quality objectives in Table 3.	Method 8000C, Section 9.6 Requirements. Describe in Laboratory Review Checklist.
Matrix Spike/Matrix Spike Duplicate (MS/MSD).	One MS/MSD per every 20 project samples per matrix.	Measurement quality objectives in Table 3.	Describe in Laboratory Review Checklist.
Second-column confirmation.	100% for all positive results.	Same as for initial or primary column analysis. RPD for the dual column results ≤ 40%.	Describe in Laboratory Review Checklist. If no chromatographic anomalies or problems noted, report the lower result as per Section 11.10.4.2 of Method 8000C.
Method Detection Limit (MDL) study.	Once per 12 month period.	Detection limits established shall be ≤ ½ the MQLs in Table 2.	If the MDL study does not meet the acceptance criteria, repeat the MDL study.

A.7.3 Method SW8260C–Volatile Organics

Volatile (or purgeable) organics in water and soil samples are analyzed using Method SW8260C. This method uses a capillary column GC/mass spectrometry technique. Volatile compounds are introduced into the GC by purge and trap (SW5030C for water or SW5035A for soil). An inert gas is bubbled through the water samples (or a soil-water slurry for soil samples) to transfer the purgeable organic compounds from the liquid to vapor phase. Soil samples with higher contaminant levels are extracted using methanol before purging. The vapor is then swept through a sorbent trap where the purgeable organics are trapped. The trap is back flushed and heated to desorb the purgeable organics onto a capillary GC column where they are separated and then detected with a mass spectrometer.

The mass spectrometer is tuned daily to give an acceptable spectrum for bromofluorobenzene (BFB). The tuning acceptance criteria are given in the following list as an ion abundance for each specified mass:

mass 50 15 percent to 40 percent of mass 95
mass 75 30 percent to 60 percent of mass 95
mass 95 base peak, 100 percent relative abundance
mass 96 5 percent to 9 percent of mass 95
mass 173 less than 2 percent of mass 174
mass 174 greater than 50 percent of mass 95
mass 175 5 percent to 9 percent of mass 174
mass 176 greater than 95 percent but less than 101 percent of mass 174
mass 177 5 percent to 9 percent of mass 176

The internal standard (IS) method is used for quantitation of analytes of interest. For quantitation, response factors (RFs) are calculated from the base ion peak of a specific IS added to each calibration standard, blank, QC sample, and sample.

Table 8. SW-846 Method 8260 Method Quantitation Limits

Analyte	CASRN	Water MQL (mg/L)	Soil MQL (mg/kg)
1,1,1,2-Tetrachloroethane	630-20-6	0.0005	0.003
1,1,1-Trichloroethane	71-55-6	0.001	0.005
1,1,2,2-Tetrachloroethane	79-34-5	0.0005	0.003
1,1,2-Trichloroethane	79-00-5	0.001	0.005
1,1-Dichloroethane	75-34-3	0.001	0.005
1,1-Dichloroethene	75-35-4	0.001	0.006
1,1-Dichloropropene	563-58-6	0.001	0.005
1,2,3-Trichlorobenzene	87-61-6	0.001	0.005
1,2,3-Trichloropropane	96-18-4	0.001	0.005
1,2,4-Trichlorobenzene	120-82-1	0.001	0.005
1,2,4-Trimethylbenzene	95-63-6	0.001	0.006
1,2-Dibromoethane	106-93-4	0.00001	0.0001
1,2-Dichloroethane	107-06-2	0.0005	0.003
1,2-Dichlorobenzene	95-50-1	0.001	0.005
1,2-Dibromo-3-chloropropane	96-12-8	0.002	0.01
1,2-Dichloropropane	78-87-5	0.001	0.005
1,2-Dibromoethane	106-93-4	0.001	0.005
1,3,5-Trimethylbenzene	108-67-8	0.001	0.005
1,3-Dichlorobenzene	541-73-1	0.001	0.006
1,3-Dichloropropane	142-28-9	0.0004	0.002
1,4-Dichlorobenzene	106-46-7	0.0005	0.002
1-Chlorohexane	544-10-5	0.001	0.005
2,2-Dichloropropane	594-20-7	0.001	0.005
2-Chlorotoluene	95-49-8	0.001	0.005
4-Chlorotoluene	106-43-4	0.001	0.005
Acetone	67-64-1	0.01	0.05
Benzene	71-43-2	0.0004	0.002
Bromobenzene	108-86-1	0.001	0.005
Bromochloromethane	74-97-5	0.001	0.005
Bromodichloromethane	75-27-4	0.0005	0.002
Bromoform	75-25-2	0.001	0.006
Bromomethane	74-83-9	0.003	0.01
Carbon disulfide	75-15-0	0.001	0.01
Carbon tetrachloride	56-23-5	0.001	0.005
Chlorobenzene	108-90-7	0.0005	0.002
Chloroethane	75-00-3	0.001	0.005
Chloroform	67-66-3	0.0003	0.002
Chloromethane	74-87-3	0.001	0.005
Cyclohexane	110-82-7	0.001	0.01
Cis-1,2-Dichloroethene	156-59-2	0.001	0.005
Cis-1,3-Dichloropropene	10061-01-5	0.0005	0.003
Dibromochloromethane	124-48-1	0.0005	0.003
Dibromomethane	74-95-3	0.001	0.005
Dichlorodifluoromethane	75-71-8	0.001	0.005
Ethylbenzene	100-41-4	0.001	0.005
Hexachlorobutadiene	87-68-3	0.0006	0.003
2-Hexanone	591-78-6	0.001	0.01
Isopropylbenzene	98-82-8	0.001	0.005
m-Xylene	108-38-3	0.002	0.005
Methyl acetate	79-20-9	0.001	0.01

Analyte	CASRN	Water MQL (mg/L)	Soil MQL (mg/kg)
Methylcyclohexane	108-87-2	0.001	0.01
Methyl isobutyl ketone	108-10-1	0.01	0.02
Methyl ethyl ketone	78-93-3	0.01	0.02
Methyl tert-butyl ether	1634-04-4	0.005	0.02
Methylene chloride	75-09-2	0.001	0.005
n-Butylbenzene	104-51-8	0.001	0.005
n-Propylbenzene	103-65-1	0.001	0.005
Naphthalene	91-20-3	0.001	0.005
o-Xylene	95-47-6	0.001	0.005
p-Isopropyltoluene	99-87-6	0.001	0.006
p-Xylene	106-42-3	0.002	0.005
Sec-Butylbenzene	135-98-8	0.001	0.005
Styrene	100-42-5	0.001	0.005
Trichloroethene	79-01-6	0.001	0.005
Tert-Butylbenzene	98-06-6	0.001	0.005
Tetrachloroethene	127-18-4	0.001	0.005
Toluene	108-88-3	0.001	0.005
Trans-1,2-Dichloroethene	156-60-5	0.001	0.005
Trans-1,3-Dichloropropene	10061-02-6	0.001	0.005
Trichlorofluoromethane	75-69-4	0.001	0.005
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	0.001	0.01
Vinyl chloride	75-01-4	0.001	0.005

a = To achieve the aqueous and soils MQLs for 1,2-dibromoethane cited in this table, the laboratory will need to perform either a low-level SW846 Method 8260 analysis or a modified Method 8260 analysis with select ion monitoring (SIM). Other methods of analysis can be proposed for 1,2-dibromoethane.

Table 9. SW-846 Method 8260 Measurement Quality Objectives

Analyte	Accuracy Water (% R)	Precision Water (RPD)	Accuracy Soil (% R)	Precision Soil (RPD)
1,1,1,2-Tetrachloroethane	81–129	≤ 20	74–125	≤30
1,1,1-Trichloroethane	67–132	≤20	68–130	≤30
1,1,2,2-Tetrachloroethane	63–128	≤20	59–140	≤30
1,1,2-Trichloroethane	75–125	≤20	62–127	≤30
1,1-Dichloroethane	69–133	≤20	73–125	≤30
1,1-Dichloroethene	68–130	≤ 20	65–136	≤30
1,1-Dichloropropene	73–132	≤20	70–135	≤30
1,2,3-Trichlorobenzene	67–137	≤20	62–133	≤30
1,2,3-Trichloropropane	73–124	≤20	63–130	≤30
1,2,4-Trichlorobenzene	66–134	≤20	65–131	≤30
1,2,4-Trimethylbenzene	74–132	≤ 20	65–135	≤30
1,2-Dibromoethane	80–121	≤ 20	70–124	≤30
1,2-Dichloroethane	69–132	≤20	72–137	≤30
1,2-Dichlorobenzene	71–122	≤20	74–120	≤30
1,2-Dibromo-3-chloropropane	50–132	≤20	49–135	≤30
1,2-Dichloropropane	75–125	≤20	71–120	≤30
1,3,5-Trimethylbenzene	74–131	≤20	65–133	≤30
1,3-Dichlorobenzene	75–124	≤20	72–124	≤30
1,3-Dichloropropane	73–126	≤20	76–123	≤30
1,4-Dichlorobenzene	74–123	≤20	72–125	≤30
1-Chlorohexane	70–125	≤ 20	60–135	≤30
2,2-Dichloropropane	69–137	≤20	67–134	≤30

Analyte	Accuracy Water (% R)	Precision Water (RPD)	Accuracy Soil (% R)	Precision Soil (RPD)
2-Chlorotoluene	73–126	≤20	69–128	≤30
4-Chlorotoluene	74–128	≤20	73–126	≤30
Acetone	40–135	≤20	40–141	≤30
Benzene	81–122	≤ 20	73–126	≤30
Bromobenzene	76–124	≤20	66–121	≤30
Bromochloromethane	65–129	≤20	71–127	≤30
Bromodichloromethane	76–121	≤20	72–128	≤30
Bromoform	69–128	≤20	66–137	≤30
Bromomethane	53–141	≤ 20	45–141	≤30
Carbon disulfide	10–200	≤20	10–200	≤30
Carbon tetrachloride	66–138	≤20	67–133	≤30
Chlorobenzene	81–122	≤20	75–123	≤30
Chloroethane	58–133	≤20	41–141	≤30
Chloroform	69–128	≤ 20	72–124	≤30
Chloromethane	56–131	≤20	51–129	≤30
Cyclohexane	10–200	≤20	10–200	≤30
Cis-1,2-Dichloroethene	72–126	≤20	67–125	≤30
Cis-1,3-Dichloropropene	69–131	≤20	72–126	≤30
Dibromochloromethane	66–133	≤ 20	66–130	≤30
Dibromomethane	76–125	≤20	73–128	≤30
Dichlorodifluoromethane	53–153	≤20	34–136	≤30
Ethylbenzene	73–127	≤20	74–127	≤30
Hexachlorobutadiene	67–131	≤20	53–142	≤30
2-Hexanone	50–150	≤ 20	50–150	≤30
Isopropylbenzene	75–127	≤20	77-129	≤30
m-Xylene	76–128	≤20	79–126	≤30
Methyl acetate	50–150	≤20	50–150	≤30
Methylcyclohexane	10–200	≤20	10–200	≤30
Methyl isobutyl ketone	58–134	≤ 20	47–147	≤30
Methyl ethyl ketone	49–136	≤20	40–135	≤30
Methyl tert-butyl ether	65–123	≤20	50–135	≤30
Methylene chloride	63–137	≤20	63–137	≤30
n-Butylbenzene	69–137	≤20	65–138	≤30
n-Propylbenzene	72–129	≤ 20	63–135	≤30
Naphthalene	54–138	≤20	51–135	≤30
o-Xylene	80–121	≤20	77–125	≤30
p-Isopropyltoluene	73–130	≤20	75–133	≤30
p-Xylene	76–128	≤20	79–126	≤30
Sec-Butylbenzene	72–127	≤ 20	63–132	≤30
Styrene	65–134	≤20	74–128	≤30
Trichloroethene	70–127	≤20	77–124	≤30
Tert-butylbenzene	70–129	≤20	65–132	≤30
Tetrachloroethene	66–128	≤20	67–139	≤30
Toluene	77–122	≤ 20	71–127	≤30
Trans-1,2-Dichloroethene	63–137	≤20	66–134	≤30
Trans-1,3-Dichloropropene	59–135	≤20	65–127	≤30
Trichlorofluoromethane	57–129	≤20	49–139	≤30
1,1,2-Trichloro-1,2,2-trifluoroethane	67–125	≤20	57–135	≤30
Vinyl Chloride	50–134	≤20	58–126	≤30
Surrogates:				
Toluene-d8	81–120	---	84–116	---

Analyte	Accuracy Water (% R)	Precision Water (RPD)	Accuracy Soil (% R)	Precision Soil (RPD)
4-Bromofluorobenzene	76–119	---	84–118	---
1,2-Dichloroethane-d4	72–119	---	52–149	---

Table 10 SW-846 Method 8260 Calibration and QC Acceptance Criteria

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action
Five-point initial calibration for all analytes.	Initial calibration prior to sample analysis.	Meet minimum analyte RFs specified in the method and %RSD for RFs for each analyte ≤ 20% and of following options: *Option 1* linear – RSD for all analytes ≤ 20%. *Option 2* linear – least squares regression r ≥ 0.995 for each analyte. *Option 3* non-linear – COD ≥ 0.990 (6 points shall be used for second order, 7 points shall be used for third order).	Correct problem then repeat initial calibration.
Second-source calibration verification.	Once per five-point initial calibration.	All analytes within ±30% of expected value.	Correct problem then repeat initial calibration.
Calibration verification.	Daily, before sample analysis and every 12 hours of analysis time.	Meet minimum analyte RFs specified in the method and ≤ 20% difference (when using RFs) or drift (when using least squares regression or non-linear calibration).	Correct problem then repeat initial calibration.
Calibration verification.	Daily, before sample analysis and every 12 hours of analysis time.	All calibration analytes within ±30% of expected value.	Correct problem then repeat initial calibration.
Demonstrate ability to generate acceptable accuracy and precision using four replicate analyzes of a QC check sample.	Once per analyst.	Measurement quality objectives in Table 6.	Recalculate results; locate and fix problem with system and then rerun demonstration for those analytes that did not meet criteria.
Internal standards.	Immediately after or during data acquisition of calibration check standard.	Retention time ±10 seconds from retention time of mid-point std. in the ICAL. EICP area within –50% to +100% of ICAL mid-point std.	Inspect mass spectrometer and GC for malfunctions; mandatory reanalysis of samples analyzed while system was malfunctioning.
Method blank.	One per preparation batch.	No analytes detected ≥MQL.	Correct problem then reprep and analyze method blank and all samples processed with the contaminated blank.
LCS for all analytes.	One LCS per preparation batch.	Measurement quality objectives in Table 6.	Correct problem then reprep and analyze the LCS and all samples in the affected analytical batch.
MS/MSD.	One MS/MSD per every 20 project samples per matrix.	Measurement quality objectives in Table 6.	Describe in Laboratory Review Checklist.
Use BFB to check mass spec ion intensities	Prior to initial calibration and calibration verification.	Meet method specifications.	Retune instrument and verify.
Surrogate spike.	Every sample, spiked sample, standard, and method blank.	Measurement quality objectives in Table 6.	Method 8000C, Section 9.6 Requirements. Describe in Laboratory Review Checklist.
MDL study.	Once per 12 month period.	Detection limits established shall be ≤ ½ the MQLs in Table 5.	If the MDL study does not meet the acceptance criteria, repeat the MDL study.

A.7.4 Method SW8270D-Semivolatile Organics

Semivolatile organics (also known as base/neutral and acid extractables) in water and soil samples are analyzed using Method SW8270D. This technique determines quantitatively the concentration of a number of SVOCs. Samples are extracted and both base/neutral and acid extracts are then concentrated through evaporation. Compounds of interest are separated and quantified using a capillary column GC/mass spectrometer.

The mass spectrometer is tuned every 12 hours to give an acceptable spectrum for decafluorotriphenylphosphine (DFTPP). The tuning acceptance criteria are given in the following list as an ion abundance for each specified mass:

mass 51 10 percent to 80 percent of mass 198
mass 68 less than 2 percent of mass 69
mass 70 less than 2 percent of mass 69
mass 127 10 percent to 80 percent of base peak
mass 197 less than 2 percent of mass 198
mass 198 base peak, or greater than 50 percent of mass 442
mass 199 5 percent to 9 percent of mass 198
mass 275 10 percent to 60 percent of base peak
mass 365 greater than 1 percent of mass 198
mass 441 present, but less than 24 percent of mass 442
mass 442 base peak, or greater than 50 percent of mass 198
mass 443 15 percent to 24 percent of mass 442

The IS method is used for quantitation of analytes of interest. For quantitation, RFs are calculated from the base ion peak of a specific IS that is added to each calibration standard, blank, QC sample, and sample. Table 11 includes the method quantitation limits for full scan GC/mass spectrometry and the method quantitation limits using select ion monitoring (SIM) analysis.

Table 11. SW-846 Method 8270 Method Quantitation Limits

Analyte	CASRN	Water MQL (mg/L)	Soil MQL (mg/kg)
Base/Neutral Extractables			
2,4-Dinitrotoluene	121-14-2	10.0 (0.3)	0.7 (0.02)
2,6-Dinitrotoluene	606-20-2	10.0 (0.3)	0.7 (0.02)
2-Chloronaphthalene	91-58-7	10.0 (0.3)	0.7 (0.02)
2-Methylnaphthalene	91-57-6	10.0 (0.3)	0.7 (0.02)
2-Nitroaniline	88-74-4	50.0 (1.3)	3.3 (0.08)
3-Nitroaniline	99-09-2	50.0 (1.3)	3.3 (0.08)
3,3'-Dichlorobenzidine	91-94-1	20.0 (0.5)	1.3 (0.03)

Analyte	CASRN	Water MQL (mg/L)	Soil MQL (mg/kg)
4-Bromophenyl phenyl ether	101-55-3	10.0 (0.3)	0.7 (0.02)
4-Chloroaniline	106-47-8	20.0 (0.5)	1.3 (0.03)
4-Chlorophenyl phenyl ether	7005-72-3	10.0 (0.3)	0.7 (0.02)
4-Nitroaniline	100-01-6	50.0 (1.3)	3.3 (0.08)
Acenaphthylene	208-96-8	10.0 (0.05)	0.7 (0.02)
Acenapthene	83-32-9	10.0 (0.05)	0.7 (0.02)
Acetophenone	98-86-2	10.0 (0.3)	0.3 (0.008)
Anthracene	120-12-7	10.0 (0.05)	0.7 (0.02)
Atrazine	1912-24-9	10.0 (0.3)	0.8 (0.02)
Benzaldehyde	100-52-7	10.0 (0.3)	0.3 (0.008)
Benz(a)anthracene	56-55-3	10.0 (0.05)	0.7 (0.02)
Benzo(a)pyrene	50-32-8	10.0 (0.05)	0.7 (0.02)
Benzo(b)fluoranthene	205-99-2	10.0 (0.05)	0.7 (0.02)
Benzo(k)fluoranthene	207-08-9	10.0 (0.05)	0.7 (0.02)
Benzo(g,h,i)perylene	191-24-2	10.0 (0.05)	0.7 (0.02)
Benzyl alcohol	100-51-6	20.0 (0.5)	1.3 (0.03)
1,1'-Biphenyl	92-52-4	10.0 (0.3)	0.3 (0.008)
Bis(2-chloroethoxy) methane	111-91-1	10.0 (0.3)	0.7 (0.02)
Bis(2-chloroethyl) ether	111-44-4	10.0 (0.3)	0.7 (0.02)
Bis(2-chloroisopropyl) ether	108-60-1	10.0 (0.3)	0.7 (0.02)
Bis(2-ethylhexyl) phthalate	117-81-7	10.0 (0.3)	0.7 (0.02)
Butyl benzyl phthalate	85-68-7	10.0 (0.3)	0.7 (0.02)
Caprolactum	105-60-2	10.0 (0.3)	0.3 (0.008)
Carbazole	86-74-8	10.0 (0.3)	0.3 (0.008)
Chrysene	218-01-9	10.0 (0.3)	0.7 (0.02)
Di-n-butyl phthalate	84-74-2	10.0 (0.3)	0.7 (0.02)
Di-n-octyl phthalate	117-84-0	10.0 (0.3)	0.7 (0.02)
Dibenz(a,h)anthracene	53-70-3	10.0 (0.05)	0.7 (0.02)
Dibenzofuran	132-64-9	10.0 (0.3)	0.7 (0.02)
Diethyl phthalate	84-66-2	10.0 (0.3)	0.7 (0.02)
Dimethyl phthalate	131-11-3	10.0 (0.3)	0.7 (0.02)
Fluoranthene	206-44-0	10.0 (0.05)	0.7 (0.02)
Fluorene	86-73-7	10.0 (0.05)	0.7 (0.02)
Hexachlorobenzene	118-74-1	10.0 (0.3)	0.7 (0.02)
Hexachlorobutadiene	87-68-3	10.0 (0.3)	0.7 (0.02)
Hexachlorocyclopentadiene	77-47-4	10.0 (0.3)	0.3 (0.008)
Hexachloroethane	67-72-1	10.0 (0.3)	0.7 (0.02)
Indeno(1,2,3-cd)-pyrene	193-39-5	10.0 (0.05)	0.7 (0.02)
Isophorone	78-59-1	10.0 (0.3)	0.7 (0.02)
N-Nitrosodiphenylamine	86-30-6	10.0 (0.3)	0.7 (0.02)
N-Nitrosodi-n-propylamine	621-64-7	10.0 (0.3)	0.7 (0.02)
Naphthalene	91-20-3	10.0 (0.05)	0.7 (0.02)
Nitrobenzene	98-95-3	10.0 (0.3)	0.7 (0.02)
Phenanthrene	85-01-8	10.0 (0.05)	0.7 (0.02)
Pyrene	129-00-0	10.0 (0.05)	0.7 (0.02)
Acid Extractables			
2,4,5-Trichlorophenol	95-95-4	50.0 (1.3)	3.3 (0.08)
2,4,6-Trichlorophenol	88-06-2	10.0 (0.3)	0.3 (0.008)
2,4-Dichlorophenol	120-83-2	10.0 (0.3)	0.3 (0.008)
2,4-Dimethylphenol	105-67-9	10.0 (0.3)	0.3 (0.008)
2,4-Dinitrophenol	51-28-5	50.0 (1.3)	3.3 (0.08)

Analyte	CASRN	Water MQL (mg/L)	Soil MQL (mg/kg)
2-Chlorophenol	95-57-8	10.0 (0.3)	0.3 (0.008)
2-Methylphenol	95-48-7	10.0 (0.3)	0.3 (0.008)
2-Nitrophenol	88-75-5	10.0 (0.3)	0.3 (0.008)
4,6-Dinitro-2-methylphenol	534-52-1	50.0 (1.3)	3.3 (0.08)
4-Chloro-3-methylphenol	59-50-7	20.0 (0.5)	1.3 (0.03)
4-Methylphenol	106-44-5	50.0 (1.3)	2.0 (0.05)
4-Nitrophenol	100-02-7	50.0 (1.3)	1.6 (0.04)
Benzoic acid	65-85-0	100 (2.5)	5.0 (0.13)
Pentachlorophenol	87-86-5	50.0 (1.3)	3.3 (0.08)
Phenol	108-95-2	10.0 (0.3)	0.3 (0.008)

a Values in parentheses are for select ion monitoring (SIM) or low level PAH analysis.

Table 12. SW-846 Method 8270 Measurement Quality Objectives

Analyte	Accuracy Water(% R)	Precision Water (RPD)	Accuracy Soil (% R)	Precision Soil (RPD)
2,4-Dinitrotoluene	51–120	≤20	48–125	≤30
2,6-Dinitrotoluene	49–120	≤20	48–125	≤30
2-Chloronaphthalene	49–120	≤20	45–125	≤30
2-Methylnaphthalene	46–120	≤20	47–125	≤30
2-Nitroaniline	48–120	≤20	44–125	≤30
3,3'-Dichlorobenzidine	20–120	≤20	25–128	≤30
3-Nitroaniline	20–126	≤20	27–125	≤30
4-Bromophenyl phenyl ether	52–120	≤20	46–125	≤30
4-Chloroaniline	20–120	≤20	25–125	≤30
4-Chlorophenyl phenyl ether	50–120	≤20	47–125	≤30
4-Nitroaniline	36–120	≤20	34–125	≤30
Acenaphthylene	50–120	≤20	44-125	≤30
Acenaphthene	47–120	≤20	46–125	≤30
Anthracene	54–120	≤20	53–125	≤30
Benz(a)anthracene	56–100	≤20	52–125	≤30
Benzo(a)pyrene	53–120	≤20	50–125	≤30
Benzo(b)fluoranthene	45–124	≤20	45–125	≤30
Benzo(k)fluoranthene	45–124	≤20	45–125	≤30
Benzo(g,h,i)perylene	38–123	≤20	38–126	≤30
Benzyl alcohol	30–120	≤20	25–125	≤30
Bis(2-chloroethoxy) methane	46–120	≤20	43–125	≤30
Bis(2-chloroethyl) ether	37–120	≤20	38–125	≤30
Bis(2-chloroisopropyl) ether	26–131	≤20	25–125	≤30
Bis(2-ethylhexyl) phthalate	42–126	≤20	47–127	≤30
Butyl benzyl phthalate	46–120	≤20	49–125	≤30
Chrysene	55–120	≤20	53–125	≤30
Di-n-butyl phthalate	54–120	≤20	56–125	≤30
Di-n-octyl phthalate	37–137	≤20	41–132	≤30
Dibenz (a,h) anthracene	42–127	≤20	41–125	≤30
Dibenzofuran	54–120	≤20	51–125	≤30
Diethyl phthalate	41–120	≤20	50–125	≤30
Dimethyl phthalate	25–127	≤20	49–125	≤30
Fluoranthene	54–120	≤20	54–125	≤30
Fluorene	50–120	≤20	49–125	≤30
Hexachlorobenzene	52–120	≤20	47–125	≤30
Hexachlorobutadiene	27–120	≤20	40–125	≤30

Analyte	Accuracy Water(% R)	Precision Water (RPD)	Accuracy Soil (% R)	Precision Soil (RPD)
Hexachlorocyclopentadiene	41–125	≤20	31–135	≤30
Hexachloroethane	28–120	≤20	34–125	≤30
Indeno(1,2,3-c,d)pyrene	43–125	≤20	38–125	≤30
Isophorone	50–120	≤20	43–125	≤30
n-Nitrosodi-n-propylamine	34–128	≤20	40–125	≤30
n-Nitrosodiphenylamine	48–120	≤20	49–125	≤30
Naphthalene	39–120	≤20	40–125	≤30
Nitrobenzene	44–120	≤20	41–125	≤30
Phenanthrene	51–120	≤20	50–125	≤30
Pyrene	49–128	≤20	46–125	≤30
2,4,5-Trichlorophenol	49–120	≤20	49–125	≤30
2,4,6-Trichlorophenol	49–126	≤20	43–125	≤30
2,4-Dichlorophenol	48–120	≤20	45–125	≤30
2,4-Dimethylphenol	28–120	≤20	32–125	≤30
2,4-Dinitrophenol	25–130	≤20	25–132	≤30
2-Chlorophenol	37–120	≤20	44–125	≤30
2-Methylphenol	38–120	≤20	40–125	≤30
2-Nitrophenol	39–123	≤20	42–125	≤30
4,6-Dinitro-2-methylphenol	40–130	≤20	29–137	≤30
4-Chloro-3-methylphenol	47–120	≤20	46–125	≤30
4-Methylphenol	32–120	≤20	41–125	≤30
4-Nitrophenol	20–120	≤20	25–138	≤30
Benzoic acid	20–120	≤20	25–125	≤30
Pentachlorophenol	38–120	≤20	25–125	≤30
Phenol	20–120	≤20	39–125	≤30
Surrogates:				
2,4,6-Tribromophenol	42–124	---	36–126	---
2-Fluorobiphenyl	48–120	---	43–125	---
2-Fluorophenol	20–120	---	37–125	---
Nitrobenzene-D5	41–120	---	37–125	---
Phenol-D6	20–120	---	40–125	---
p-Terphenyl-D14	51–135	---	32–125	---

Table 13. SW-846 Method 8270 Calibration and QC Acceptance Criteria

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action
Five-point initial calibration for all analytes.	Initial calibration prior to sample analysis.	Meet minimum analyte RFs in the method, %RSD for RFs for each analyte ≤ 20%, and one of the following options: *Option 1* linear - All analytes RSD ≤ 20%. *Option 2* linear – least squares regression r ≥ 0.995 for each analyte. *Option 3* non-linear – COD ≥ 0.990 (6 points used for second order, 7 points used for third order).	Correct problem then repeat initial calibration.
Second-source calibration verification.	Once per five-point initial calibration.	All analytes within ±30% of expected value.	Correct problem then repeat initial calibration.
Calibration verification.	Daily, before sample analysis and every 12 hours of analysis time.	Meet minimum analyte RFs specified in the method and ≤ 20% difference (when using Rfs) or drift (when using least squares regression or non-linear calibration).	Correct problem then repeat initial calibration.
Calibration verification.	Daily, before sample analysis and every 12 hours of analysis time.	All calibration analytes within ±30% of expected value.	Correct problem then repeat initial calibration.
Demonstrate ability to generate acceptable accuracy and precision using four replicate analyzes of a QC check sample.	Once per analyst.	Measurement quality objectives in Table 9.	Recalculate results; locate and fix problem with system and then rerun demonstration for those analytes that did not meet criteria.
Internal standards.	Immediately after or during data acquisition for each sample.	Retention time ±30 seconds from retention time of the mid-point std. in the ICAL. EICP area within -50% to +100% of ICAL mid-point std.	Inspect mass spectrometer and GC for malfunctions; mandatory reanalysis of samples analyzed while system was malfunctioning.
Method blank.	One per preparation batch.	No analytes detected ≥MQL.	Correct problem then reprep and analyze method blank and all samples processed with the contaminated blank.
LCS for all analytes.	One LCS per preparation batch.	Measurement quality objectives in Table 9.	Correct problem then reprep and analyze the LCS and all samples in the affected analytical batch.
MS/MSD.	One MS/MSD per every 20 project samples per matrix.	Measurement quality objectives in Table 9.	Describe in Laboratory Review Checklist.
Check of mass spectral ion intensities using DFTPP.	Prior to initial calibration and calibration verification.	Refer to specifications in the method.	Retune instrument and verify.
Surrogate spike.	Every sample, spiked sample, standard, and method blank.	Measurement quality objectives in Table 9.	Method 8000C, Section 9.6 Requirements. Describe in Laboratory Review Checklist.
MDL study.	Once per 12 month period.	Detection limits established shall be ≤ ½ the MQLs in Table 8.	If the MDL study does not meet the acceptance criteria, repeat the MDL study.

A.8 SPECIAL TRAINING/CERTIFICATION

The PST State Lead PMs should possess at a minimum a Bachelor degree in one of the physical or natural sciences. Quality Assurance/Quality Control (QA/QC) training for QA Specialists is provided by the USEPA Region 6. The training includes preparing and reviewing QAPPs and QMPs. Other than the certificate issued to staff following Occupational Safety and Health Administration (OSHA) training, no other certificates are required for staff to implement the PST State Lead Program.

Certifications and licenses required of personnel performing PST work via the State-Lead program are specified in the procurement documents for those companies. All companies performing PST corrective action must be registered with the TCEQ as Corrective Action Specialists (CASs). The Contractors employed by the CASs to oversee PST corrective action must possess a current Corrective Action Project Manager (CAPM) license, which requires completion of continuing education courses for renewal. In addition, a professional engineer or geoscientist license is required for personnel performing certain tasks. Contractors performing PST corrective action must be OSHA certified. To evaluate qualifications for PST work within the PST State Lead program, the previous work experience and resumes of the Contractor are reviewed and references may be checked.

The Contractors are responsible for documenting the competency of their personnel and all subcontracted parties. The Contractor will maintain documentation of competency in the field(s) of expertise (e.g., current participation in accreditation or certification programs, personnel resumes, certification and training records of key personnel, organizational chart and position descriptions showing pertinent staff with major responsibilities and qualifications) in the project files during the active and archived life of the project. The PST State Lead program staff shall maintain documentation of Contractor competency (e.g., qualifications of key personnel, evaluation of past contractor performance on similar scope of work) in accordance with the applicable PST contract specifications.

The PST State Lead program will document the competency of the PST State Lead program staff and will maintain the documentation on file and readily available for review.

The PST State Lead program management and the PST Program QAS will periodically verify the evaluation the competency of Contractors is routinely performed through the established contractor evaluation process and evaluation of the competency of PST Program staff is routinely performed through the established performance review process.

Laboratories are required to meet TCEQ QA/QC requirements and adhere to the USEPA-approved QAPP when performing PST analyses. The laboratory generating data for a PST project shall be accredited through the Texas Laboratory Accreditation Program for conformance with the most current standards adopted by the National Environmental Laboratory Accreditation Program (NELAP) and the requirements in Title 30 Texas Administrative Code (TAC) Chapter 25 (relating to Environmental Testing Laboratory Accreditation and Certification) Subchapters A and B, as amended, for the matrices, methods, and parameters of analysis, unless the TCEQ agrees in writing to allow one of the regulatory exceptions specified in 30 TAC Section 25.6. Prior to analyzing samples from TCEQ PST projects, laboratories must apply for and receive accreditation through the TCEQ for the matrices, methods, and parameters of analysis, if the laboratory resides in Texas. Laboratories that do not reside in Texas must apply for and receive primary accreditation from:

- the TCEQ, or
- the resident state for the laboratory (unless the resident state waives primary accreditation) and secondary accreditation from TCEQ, or
- any NELAP state, if the laboratory resides in a state without an accreditation program, and secondary accreditation from TCEQ.

TCEQ staff, or designee, collecting GPS data shall be certified for the GPS unit used. A copy of the GPS certification will be maintained in personnel files during the active and archived life of the dataset populated using the data collected.

A.9 DOCUMENTS AND RECORDS

The owner or operator submits an Incident Report Form to the TCEQ within 24 hours of discovering or suspecting a release. The TCEQ requires the owner or operator to assess the release and submit the results of the assessment in a Release Determination Report Form. If the completed Release Determination Report Form documents a confirmed release at a site, the TCEQ assigns an LPST number to the site. The completed Incident Report Form and Release Determination Report Form and all pertinent information, e.g., site directives to the RP or Assessment/Monitoring Reports, are kept in an LPST site file as a permanent agency record filed in numerical sequence within the TCEQ Central Records. Tables 15.a in Appendix 2 lists the primary guidance documents, forms and related regulations applicable to the work performed by the Contractor under the Site Activities Contract. Table 15.b in Appendix 2 presents the primary guidance documents, forms and related regulations applicable to work performed by the Contractor under the Engineering Services Contract.

The Contractor will document the overall field operations in the field records. The field records will comprise the following:

- Sample collection records. These records will be signed every day field work is conducted and will document the sampling protocol performed and observations made in the field. At a minimum, this documentation will include the names of the persons conducting the activity, sample identification number, sample collection points, the date and time of sample collection, maps and diagrams, site photographs, all measurements made in the field, the equipment/method used, climatic conditions, and unusual observations. The field notes will be recorded in bound field notebooks, with pre-numbered pages, using permanent ink. Incorrect entries in the notebook will be struck using a single solid line, the correct information added, and the change initialed and dated by the person making the change. The Contractor will submit the field notes with the original report containing the data generated from the samples collected during the sampling event. When the PM determines no potential exists for cost recovery, the PST State Lead PM will give the Contractor written approval to use other means for documenting field operations. Those means include field checklists and forms and the use of loose-leaf note books for maintaining the project documents. Use of other means for documenting field operations is only considered when no potential for cost recovery exists.
- Custody records. Custody records shall be used to document the custody of samples as they travel from the original sampling location to the laboratory and finally to their disposal area. Custody procedures are described in Element B.3.
- Field QC sample records. These records shall include documentation of field instrument calibration and documentation for the traceability of standards, and the frequency, conditions, level of standards, and instrument calibration history.
- General field procedures. General procedures used in the field to gather data shall be documented. The field notes will also include the procedures used in areas where routine sample collection procedures could not be followed.
- Field corrective action reports. Field corrective action reports shall document the methods used in situations where general field practices or procedures specified in the Work Order were not followed.
- Field collected GPS data.

The laboratory reports the analytical data, generated from the samples collected from the site, in data packages transmitted in site reports. The laboratory data package shall include:

- Completed field custody form(s) including:
  - field identification number for each sample,
  - date and time of sample collection,
  - date and time custody is relinquished from the field,
  - date and time of sample receipt by the laboratory,

  - temperature of samples as received by the laboratory,
  - conditions of samples as received by the laboratory, and
  - a cross reference between the field identification number and the laboratory identification number assigned to each sample.

- Analytical test reports (certificates of analysis) for each environmental sample, including:
  - the information listed in the current accreditation standard adopted by NELAP.
  - the analytical data reported as the measured or estimated concentration for detected results and as less than the SDL for non-detected results. Note: soil and sediment results will be reported on a dry-weight basis.

- QA/QC data, including:
  - Test reports for laboratory blank samples and laboratory control samples.
  - The surrogate recovery data for each environmental and each laboratory sample, as applicable to the analytical method used, and the %R and the laboratory QC limits for surrogate recovery for the method used. The surrogate recovery data can be submitted in the data package on a standard form used by the laboratory or on the test report for each sample.
  - Matrix spike/matrix spike duplicate (MS/MSD) sample results, if the sample used for the MS/MSD analysis was from the site. The MS/MSD results should include the %R and RPD for the analyte and the laboratory QC limits.
  - Laboratory control sample data.
  - Analytical duplicates, if performed by the laboratory.
  - A list of the MQLs. Note: The list can be a copy of the laboratory's standard analyte list with current MQLs for the analytical method.
  - The laboratory case narrative, or laboratory review checklist (LRC), that:
    - documents the laboratory's technical review of all of the data it generated;
    - notes any problems or anomalies observed in the receipt, handling, preparation, or analysis of the samples;
    - discusses possible effects any such problems may have on the quality of the data generated for each sample; and
    - certifies the laboratory is accredited under the Texas Laboratory Accreditation Program for the analytes, matrices, and methods reported in the data package, except as noted by the laboratory.
- An electronic data deliverable (EDD) comprising an editable Excel spreadsheet containing the field sample data. Appendix 5 contains a description of the fields to include in the spreadsheet.

The turnaround time for laboratory results and the corresponding QC documentation is specified in the contract or work order. Upon receipt of the data package from the

laboratory, the Contractor reviews the analytical data and associated case narrative or LRC and evaluates the QC parameter data for any problems in the analytical data to verify information is accurate and the quality of the data is known and documented. The Contractor also compares the detected and nondetected results to the action levels. Overall, the focus of the Contractor review is to determine if the data can be used to make project decisions.

The Contractor documents the data review in a data review summary in the QA/QC section of the report. Appendix 4 contains an example data review checklist the Contractor can use when reviewing the data. However, the Contractor will summarize in a data review summary or narrative the outcome of the review, including the field duplicate pair evaluations and site-specific MS/MSD evaluations, and address, at a minimum, the following questions:

- Were problems/anomalies observed in the data by the lab or by the Contractor?
- What actions (if any) did the lab take to resolve problems or anomalies?
- Is the quality of the data sufficient to support the project decisions?

In addition, the Contractor will document any problems and/or QC nonconformances related to field sampling, sample custody, or laboratory analyses and any corrective action(s) taken by the laboratory or the field team to address a data quality issue.

Operational procedures are documented and implemented through work plans/proposals, work orders, project plans and contracts, and reviewed for adequacy by the relevant technical or managerial personnel before use. Exceptions to plans and activities are documented by PST State Lead PMs.

The Contractor implements environmental data collection in accordance with this QAPP. Internal QC check procedures will be followed by the PST State Lead PM staff to verify the degree of quality for environmental data collected at LPST sites. These procedures will be used to evaluate the variance or bias which may have been introduced at any point during the sample collection, analysis, and reporting process. The PST State Lead PMs will perform internal QC checks by reviewing project reports for the following: sample collection, sample preservation and transportation, sample custody, sample analysis, reporting of sample results, and equipment calibration procedures.

The retention of TCEQ records maintained within the PST State Lead is addressed in the TCEQ Records Management Manual. LPST files will be retained for 25 years after site closure. The Contractor shall maintain records according to the requirements in the contract.

B.0 DATA GENERATION AND ACQUISITION

B.1 SAMPLING PROCESS DESIGN (EXPERIMENTAL DESIGN)

An LPST site investigation primarily involves sampling soils and groundwater, but also includes sampling of vapors, sediments, and/or surface waters, when applicable. The PST State Lead Program has incorporated TCEQ guidance documents for sampling soils and groundwater (Appendix 2). Because the characteristics of LPST sites vary, site-specific sampling plans may be developed to supplement the guidelines. Criteria that will be considered when developing a site-specific sampling plan include the following:

- Site hydrogeologic and soil conditions;
- Facility components;
- History of releases at the site;
- Nature of contamination;
- Potential risks to human health and the environment; and
- The amount of time and resources available.

Prior to initiating any LPST site sampling activities, the TCEQ PM will request that the Contractor prepare a work plan which includes the specific site sampling plan. The Contractor submits the work plan for approval by the TCEQ PM. Approval is communicated to the Contractor by correspondence, email or fax. The work plan contains site-specific information, including:

- the locations of and number of site samples;
- the media to be sampled;
- collection frequency and schedule;
- identification of sample strata;
- specific measurement and parameters;
- sample preservation and shipment methods;
- any other pertinent sampling plan requirements;
- sampling rationale;
- site maps indicating sampling sites and other relevant features;
- identification of responsible PST staff; and
- identification of deviations from TCEQ Guidance (see Appendix 2).

B.2 SAMPLING METHODS

Sampling procedures used during LPST site investigations include:

- Use of standard documented sample collection procedures;

- Use of sample handling, sample preservation, and field measurement methods specified in this QAPP, the applicable guidance in Appendix 2, and *SW846 Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, Third Edition with updates I-IVB (SW-846), as amended;
- Calibration of field instruments according to manufacturer specifications before, during, and after use in the field and documentation of these calibration procedures and measurements (see Element B7);
- Periodic inspection, maintenance, and servicing of field equipment/instruments according to manufacturer specifications and documentation of these activities; and
- Use of custody documentation.

The PST State Lead PMs involved in LPST site work will be familiar with these sampling procedure requirements. The Contractor and field personnel will coordinate with the analytical laboratory to verify the scheduling. Sample containers are pre-cleaned and treated according to USEPA specifications for the applicable methods. Collection and preservation of samples will be done as specified in Table 11. Additional guidance is listed in Appendix 2 and the USEPA website for SW-846. Personnel will use extreme care to ensure the samples are not contaminated from containers, pumps, tubing, bailers or any other equipment. Samples shall be properly identified, labeled, and transported to the laboratory in accordance with sample custody procedures in Element B3.

A written record of all samples collected will be maintained by the Contractor. Recorded sample information includes sample identification, sampling conditions, description of the sample, description of the sample location, date and time of sampling, sampling preservation procedures, custody procedures and any problems encountered or required deviations from standard procedures.

Table 14. Sample Containers, Volumes, Preservation, and Holding Times

Sample Matrix	Analyte Name	Analytical Methods*	Container	Sample Volume or Weight	Preservation	Maximum Holding Time
Soils and Sediment	BTEX and MTBE	SW5035 and SW8021B SW8260C	Glass, teflon-lined septum	3 X ~5 grams	≤6°C upon collection, then <-7°C if not analyzed within 48 hours.	48 hours (14 days if preserved by lab following TCEQ Method 5035 guidance)
	Volatile organic compounds	SW5035 and SW8260C	Glass, teflon lined septum	3 X ~5 grams	≤6°C upon collection, then <-7°C if not analyzed within 48 hours.	48 hours (14 days if preserved by lab following TCEQ Method 5035 SOP)
	Total petroleum hydrocarbons (TPH)	TCEQ 1005**	Glass, teflon lined septum	3 X ~5 grams	≤6°C upon collection, then <-7°C if not analyzed within 48 hours.	14 days from collection to extraction and 14 days after extraction
	Polynuclear aromatic hydrocarbons (PAHs)	SW8310	Glass, Teflon-lined cap	8 ounces	≤ 6°C upon collection, store in dark	14 days until extraction and 40 days after extraction
	Metals (except mercury)	SW6010C SW6020A	Glass	8 ounces	≤ 6°C upon collection	180 days
Aqueous	BTEX and MTBE	SW8021B (USEPA 602 for permits)	Glass, Teflon-lined septum	2 X 40-mL	≤ 6°C upon collection, pH <2 with HCl, H_2SO_4, or $NaHSO_4$; if chlorine present 0.008% $Na_2S_2O_3$	14 days (if not acid preserved only 7 days)
	Volatile organics	SW8260C (USEPA 624 for permits)	Glass with teflon lined septum	2 x 40 mL vials	≤ 6°C upon collection, pH <2 with HCl, H_2SO_4, or $NaHSO_4$; if chlorine present 0.008% $Na_2S_2O_3$	14 days (if not acid preserved only 7 days))
	Total petroleum hydrocarbons (TPH)	TCEQ 1005 (USEPA 1664 for permits)	Glass with teflon lined septum	2 x 40 mL vials	≤ 6°C upon collection, pH <2 with HCl, H_2SO_4, or $NaHSO_4$; if chlorine present 0.008% $Na_2S_2O_3$	water and soil: 14 days from collection to extraction and 14 days after extraction.
	Polynuclear aromatic hydrocarbons(PAHs)	SW8310 (USEPA 625 for permits)	Glass with Teflon-lined cap	1 liter	≤ 6°C upon collection; if chlorine present, 0.008% $Na_2S_2O_3$; store in dark.	7 days until extraction and 40 days after
	Metals (except mercury)	SW6010C SW6020A	Polypropylene	8 ounces	HNO_3 to pH <2, ≤ 6°C	180 days
Vapor	BTEX, MTBE, TPH	SW8260, SW8021	Tedlar bag	1, 3, and 5 L	Ambient temperature	Samples for human health & safety: 72 hours from collection Samples for systems efficiency: 14 days from collection to analysis

NOTES:

* SW846-Method 5035 will be used to collect soil and sediment samples for VOCs to be analyzed using the purge-and-trap procedure

** Soil samples collected for TPH analysis using Method TCEQ 1005 can be collected using the bulk sampling collection procedure in SW846-Method 5035. The reason for this allowance is the PST State Lead Program only uses TPH analysis qualitatively to determine if hydrocarbons in the greater than $nCR_{12}R$ boiling point range are present in the sample.

1 The MQLs for the analytical methods used must be less than or equal to the action levels or else the most sensitive standard available method must be used. The MQL for a chemical is the lowest nonzero standard used in the laboratory's initial calibration curve, as described in Method SW-846 8000.

2 USEPA SW-846 methods, except where noted. The latest version of the method published at <http://www.epa.gov/epawaste/hazard/testmethods/SW-846/online/index.htm> should be used for the analyses.

3 Holding time assumes preservation as noted, unless otherwise indicated.

4 The MQLs for TPH must be less than or equal to 50 mg/kg (soil) for each carbon range (i.e., nC6–nC12, > nC12–nC28, and > nC28 to nC35 or nC36). Analytical responses detected above the laboratory method detection limit (MDL) (i.e., observed above the MDLs and meeting the qualitative identification criteria specified either in the analytical method used, or in the laboratory standard operating procedure) should be reported as detected results. If the response is detected below the MQL but above the MDL, the results should be reported at the concentration estimated by the laboratory and flagged with a qualifier (e.g., J) to indicate that the value reported is an estimate.

5 Method 8270 using select ion monitoring or a low-level PAH approach is recommended because it minimizes false-positive detections of PAHs. Regardless of the method used, the MQL of the method must be less than or equal to the respective PST State Lead Program action level or else the most sensitive standard available method must be used.

B.2.1 Groundwater Collection Procedures

To the extent possible, the order the Contractor will follow when purging and sampling groundwater wells is from the least contaminated well to the most contaminated well, except as specified below for wells known or anticipated to purge dry. Before collecting a groundwater sample, the Contractor will purge the well(s) until three consecutive readings for conductivity, temperature, and pH are consistent within +10% for conductivity, ± 1°C for temperature, and ± 0.5 unit for pH. After three consecutive readings are consistent for all parameters, the Contractor will collect the groundwater sample(s). For wells known or anticipated to purge dry, the Contractor will purge these wells early in the field event, even when one or more of these wells is more contaminated than wells expected to recover more quickly. The Contractor will allow these wells to recover to at least 85 percent of original water level before sample withdrawal. In the event a well has not recovered to 85 percent by the end of the day, the Contractor will collect a sample from the well and record in the field notes the water level at the time the sample was collected and the amount of time allowed for the recovery. During purging, the contractor will decontaminate non-dedicated purging equipment between wells.

Collection of groundwater samples for VOC analysis is performed as follows: Open only one volatile organic analyte (VOA) container at a time to minimize exposure of the VOC sample to extraneous VOC contamination. If the VOA vial is not pre-preserved with HCl, open the empty container, and add preservative. When filling a VOA container, tip it at a slight angle and allow a slow steady stream of water to run down the inner wall of the vial to minimize agitation, aeration, and volatilization of the VOCs. Fill the container until a positive meniscus forms at the top. No air space (i.e., no head space) should remain in the container. If any airspace remains, VOCs in the sample can volatilize to this space and may be lost before analysis. After filling a VOA container and replacing the cap, invert the sample and tap it lightly to check for bubbles. If bubbles are present, discard the sample and fill additional VOA containers. If bubbles are unavoidable, collect numerous samples and save the ones with the smallest bubble. Do not try to reopen and add more water to samples that have bubbles.

B.2.2 Decontamination Procedures

When non-dedicated sampling equipment is used, the Contractor will decontaminate the equipment using standard procedures that include the following steps:

1. Brush or wipe the equipment down to remove visible material.
2. Thoroughly rinse equipment with potable tap water.

3. Clean the equipment with a brush in a solution of laboratory-grade detergent, e.g., Liquinox, Alconox, or equivalent, and potable water.
4. Rinse well with tap water, then rinse three times with distilled or deionized water.
5. Place on clean plastic sheeting and air dry.
6. If immediate use is not expected, place in a resealable plastic bag and seal the bag with a custody seal.

B.3 SAMPLE HANDLING AND CUSTODY

Sample custody procedures maintain and document sample possession and establish and support the use of sample data in potential enforcement, regulatory, or legislative actions.

Sample custody documents the integrity of the sample from the time of sample collection to receipt by the laboratory. Proper sample custody is a joint effort of the sampling crew, the sample transporter, and the laboratory staff.

The primary documentation the TCEQ uses to track proper sample custody from the time of sampling to the arrival of the sample at the laboratory is the custody form. An example of the form is in Appendix 3. Custody forms will be completed for samples taken at an LPST site. Information provided on the custody form includes:

- Site or plant name.
- The unique custody form number used to ship the samples that allows for absolute identification within a shipment or within a laboratory inventory.
- Sample identification number.
- Time and date of sample collection.
- The type of sample collected, i.e., grab/discrete or composite.
- The number, type, and size of sample containers used to collect the samples.
- The presence or absence of preservatives.
- The analytical methods to be performed on each sample.
- Necessary instructions regarding possible hazards associated with a sample.
- The signature of the field personnel relinquishing custody of the samples.
- The date and custody of the samples is relinquished by the field personnel.
- The signature, and associated date and time, of the laboratory personnel accepting custody of the samples upon receipt by the laboratory.

Each custody form is in paper form and has an original followed by three copies: one for the investigator (typically the Contractor), one for the transporter (if other than the investigator), and one for the laboratory, with the original returned to the investigator.

If any of this information has been omitted from the custody form, including any of the required signatures, the laboratory will document the omission and notify the Contractor. After consultation with the TCEQ State Lead PM, the Contractor will direct the laboratory regarding the analysis of the samples.

Sample integrity will be protected by preventing the intentional and/or accidental contamination of the sample during the handling, transporting, and storing of the sample. Each cooler containing samples will include a temperature blank, a custody seal and tape. In addition, each cooler containing samples for volatile analysis will include a trip blank. The receiving laboratory shall document the presence of the custody seals on the cooler at the time the samples are received by the laboratory. If the laboratory observes evidence of, or suspects, tampering, the laboratory will document the observation and notify the Contractor. The Contractor will advise the PST State Lead PM of the suspected tampering, and in consultation with the PM, will determine if the sample analyses should be completed.

The laboratory sample receipt custodian will examine arriving samples for proper documentation, temperature, and proper preservation. The custodian accepts delivery by signing the final portion of the official custody form. The sample custodian assigns a unique laboratory sample identification number to each sample on the custody form and enters the receipt of the sample into a laboratory sample log. Temperature of the samples upon receipt is recorded by the lab custodian in the log and on the custody form. This log notes the date of receipt and the corresponding sample number on the custody form.

Samples will be transported from the field in ice chests taped shut with custody seals applied in a manner to make notice if the ice chests are subjected to tampering. The Contractor will apply custody seals to ice chests containing samples for shipment off site regardless of the mode of shipment or transportation. Additional information on custody procedures are described in Appendix 3.

B.4 ANALYTICAL METHODS

For the analysis of samples collected at LPST sites, the TCEQ may procure laboratory services directly from a commercial laboratory, or indirectly via subcontracted laboratories hired by Contractors. Analytical methods commonly required for the analysis of LPST site samples are presented in Table 1.

Laboratories performing analyses must be accredited under the Texas Laboratory Accreditation Program, or the site or the laboratory must meet at least one of the exceptions in 30 TAC Section 25.6, and must ensure that quality control steps are taken

in the laboratory to demonstrate the laboratory's procedures and practices are in compliance with the most current standards adopted by the NELAP.

B.5 QUALITY CONTROL

Internal QC check procedures will be followed by the PST State Lead PMs to verify the degree of quality of environmental data collected at LPST sites. These procedures will be used to provide a measure of the consistency of samples and to provide an estimate of the variance and/or bias which may have been introduced at any point during the sample collection, analysis, and reporting process.

The PST State Lead PMs will perform internal QC checks by reviewing the following and maintaining documentation for these activities:

- sample collection;
- sample preservation and transportation;
- sample custody;
- sample analysis and associated quality control results; and
- reporting of sample results.

The PST State Lead Program requires the generation of method-required and method-recommended QC data when environmental sample data are generated.

Each laboratory will maintain an easily accessible records of internal quality control analyses and charts and current and historical corrective actions the laboratory has implemented. Each laboratory will participate in NELAP-approved proficiency testing programs by analyzing proficiency testing samples, obtained from a NELAP-approved proficiency test provider, at a frequency determined by NELAP. The laboratory must meet the acceptable performance standards, as determined by a NELAP-approved proficiency testing program.

The following field QC samples will be collected as determined by the TCEQ PM based on the objectives to be achieved during the sampling event. The QC samples should be analyzed using the analytical methods specified for the site samples:

- Trip blanks are included in each shipping container containing samples collected for VOC analysis unless otherwise specified by the PST State Lead PM. A trip blank is a sample prepared by the laboratory or Contractor contemporaneously with the preparation of the sample containers to be used on the project and using laboratory reagent grade water used to prepare analytical method blanks. A trip blank consists of a 40mL VOA sample vial filled with reagent grade water to maximum capacity with no headspace. Trip blanks are used to assess the potential cross contamination of field samples during shipment to, and storage in, the

laboratory. The prepared trip blank is placed in the shipping container prior to the container traveling to the site. The trip blank remains unopened and in the shipping container until the shipping container is received by the laboratory for sample analysis.

- Field blanks will be collected at the frequency determined by the PST State Lead PM. A field blank is prepared by filling a 40-mL VOA vial with reagent grade water with no headspace. The field blank is collected at the same location as one of the field samples immediately before or after collection of the field sample. The field blank is collected at the field sample location which is most likely to be affected by airborne COCs. When collecting the field blank, the sampler will use care to minimize any impact to the sample by the release of COCs from the medium being sampled. If, during the field event, the Contractor suspects more than one sample location may be affected by airborne COCs, the Contractor may recommend to the TCEQ PM the collection of more than one field blank. The TCEQ PM will determine if more than one field blank should be collected during the sampling event.
- MS/MSD samples will be collected for each matrix to be sampled at the site at the frequency determined by the PST State Lead PM. The MS/MSD sample is a field sample with extra volume collected. The amount of extra volume required is determined by the laboratory performing the analysis. The laboratory spikes the MS/MSD sample with a known amount of the COCs for the site and analyzes the MS/MSD by the same method as the field sample. The results of the MS/MSD analysis are evaluated to determine the effect of the sample matrix on the measurement of the site COCs.
- Equipment blanks are collected when non-dedicated sampling equipment is used. The frequency of collection is one equipment blank per day per equipment type or at a frequency determined by the PST State Lead PM. Equipment blanks are used to assess the effectiveness of field decontamination procedures. After equipment is decontaminated in the field, an equipment blank sample is collected by pouring reagent grade water into, over or pumped through the equipment and collecting the water in a sample container appropriate for the analytes of concern, e.g., a 40mL VOA vial will be used for analysis of VOCs.
- Field duplicates are collected at a frequency determined by the TCEQ PM based on the objectives of the sampling event. Field duplicates are QC samples collected at the same location as a field sample. The results of the field duplicate analysis are compared to the results of the field sample analysis to determine sample homogeneity and sampling precision. A recommended frequency is one field duplicate for every 10 samples collected.
- A temperature blank will be included in each shipping container. A temperature blank is a 40mL VOA vial filled with water and labeled as a temperature blank.

The acceptance criteria for accuracy determined by MS/MSD recovery are listed in tables 3, 6, and 9 for methods SW-846 8021, 8260, and 8270, respectively. The acceptance criteria for precision, as determined by the RPD between MSD results and the corresponding MS sample results, are also listed in tables 3, 6, and 9 for the respective method. The acceptance criteria for equipment blanks, trip blanks and field blanks are no detection of site chemicals of concern above their respective MQLs. The acceptance criterion for a temperature blank is a temperature of $\leq$6°C measured upon receipt of the shipping container by the laboratory.

For field duplicate sample results, precision is reported as the RPD or absolute difference. The QC acceptance criteria are:

- When both the sample and duplicate concentrations are greater than five times the MQL, the QC acceptance criteria in soils is an RPD less than or equal to 50%. The QC acceptance criteria in groundwater is an RPD less than or equal to 30%. The equation for calculating RPD is in Element D.2.
- When one or both of the sample and duplicate concentrations are less than five times the MQL, the QC acceptance criteria for both soils and groundwater is an absolute difference, calculated between the two concentrations, less than the value of the MQL. The equation for calculating absolute difference is in Element D.2.

The laboratory will be responsible for reporting, in the laboratory data package, the results of all quality control samples, e.g., field duplicates, field blanks, MS/MSDs, trip blanks, and equipment blanks.

Calibration standards and the frequency and type of calibration used by the laboratory shall be sufficient to meet NELAP laboratory accreditation standards. Reagent blanks will be run before, during, and at the end of any series of analyses, as recommended by the analytical method and as needed, to verify the reagents and instrument conditions are acceptable at all intervals during the analytical process.

A summary of potential actions which will ensure the necessary internal quality control checks on collected data are performed and the personnel responsible for their performance are presented in tables 12 through 14.

Table 15. Field Data Quality Reviews

Objective	Action	Responsible Party
Assure adherence to sampling or data collection plan.	Review and monitor during sample and data collection; assure specified sampling/data collection methods, locations, media, recommended QC samples, and schedules are followed.	Contractor

Objective	Action	Responsible Party
Verify completeness of all measurements.	Review daily; assure calibration criteria for field equipment is reviewed and test calibration acceptance is documented.	Contractor
Verify sample custody and integrity.	Check custody procedures, sample integrity, and transportation methods for all samples.	Contractor
Verify documentation completeness.	Review and monitor during each sample or data collection activity.	Contractor

Table 16. Laboratory Data Quality Reviews

Objective	Action	Responsible Party
Verify incoming data and sample completeness.	Provide daily accounting of number, type and condition of samples sent to the lab versus number, type and condition of samples received. Record verifications and inconsistencies in log book.	Laboratory
Verify all data forms completed.	Review during analytical tests, including check for proper sample preparation and analysis of relevant QC analyses (e.g. spikes and duplicates).	Laboratory
Verify manual data reduction procedure.	Conduct daily review of calculated values against raw data values.	Laboratory
Verify computer data reduction procedures.	Verify entered data daily. Verify retrievability of data from memory. Record transfer of data.	Laboratory
Verify completeness of laboratory notebooks.	Review weekly.	Laboratory
Verify calibration criteria.	Calibration criteria in method are reviewed and test calibration acceptance is documented.	Laboratory
Verify repeatability.	Record values of replicate analyses.	Laboratory

Table 17. Environmental Data Quality Reviews

Objective	Action	Responsible Party
Assure completeness of field and lab data.	Compare field and lab data forms against data list at each use and record results.	Contractor
Assure comparability of units.	Review units reported for consistency in calculations at each point of use and record results.	Contractor
Examine validity of collected data.	Review of all items on the case narrative or laboratory review checklist.	Laboratory and Contractor
Conduct examination of data statistics.	Apply statistical tests to data; record results.	Contractor

B.6 INSTRUMENT/EQUIPMENT TESTING, INSPECTION, AND MAINTENANCE

To minimize downtime of all measurement systems, field sampling equipment, field measurement equipment and laboratory equipment will be maintained in good working condition. Additionally, backup equipment or common spare parts will be available so that repairs or replacement can be made quickly and the measurement tasks resumed. if any piece of equipment should fail during use.

Field instruments currently used by field personnel are primarily water level indicators, pH/temperature/conductivity meters, and gas monitors used to monitor for flammable/combustible environments. Preventive maintenance for the water level indicator includes checking the integrity of the battery prior to each use. A backup water level indicator and a backup pH/temperature/conductivity meter should be available when collecting groundwater samples. Spare batteries should also be available at all times. Other types of field equipment may be used. The Contractor will maintain equipment according to the manufacturer's recommended schedules of maintenance and will implement preventive maintenance according to that schedule. Equipment used occasionally will be inspected for availability of spare parts, cleanliness, battery strength, etc. at least monthly and prior to being taken into the field. Common spare parts which should be available include, but are not limited to the following: batteries; tubes; light bulbs; rubber; tygon, polypropylene or glass tubing; replacement probes; and glassware. After use in the field, all equipment will be decontaminated and rechecked for needed maintenance.

The laboratory will follow the manufacturer's recommended maintenance procedures and the additional maintenance procedures prescribed in the laboratory quality assurance plan. The laboratory will have readily available parts routinely replaced. Such parts include, but are not limited to the following: batteries, tubes, light bulbs, tubing of all kinds, replacement ion-specific electrodes, electrical conduits, pumps, and other similar replacement parts.

The laboratory will maintain a separate log book for each type of laboratory equipment. The laboratory will record in these log books the preventive or corrective maintenance performed on the laboratory instruments and equipment. The complete history of maintenance performed on each instrument will be retained by the laboratory. The log books and maintenance records will be sufficient to meet the NELAP standards.

Prior to use, general field equipment will be inspected and determined to be in good condition to provide acceptable quality environmental data. If, in the opinion of the Contractor or the PST State Lead PM, the available equipment is not sufficient to produce data of acceptable quality, the PST State Lead PM or the Contractor will

determine if equipment replacement is required. To ensure consistently high quality data, routine inspections, and preventive maintenance will be performed on all facilities and equipment. The maintenance will be performed by qualified technical personnel using the manufacturer's prescribed procedures. Permanent records of the maintenance of the facilities and equipment will be kept by the Contractor.

B.7 INSTRUMENT/EQUIPMENT CALIBRATION AND FREQUENCY

Calibration procedures for all instruments will be performed as specified by the manufacturer. Laboratory instruments will be calibrated at the frequencies specified by the manufacturer and in the test methods. Calibration of laboratory instruments must meet the NELAP standards. Also, the Contractor will calibrate field instruments at the beginning of each day the equipment is used in the field and conduct a calibration check at the end of sampling each day. The Contractor will calibrate the pH meter using pH standards 4 and 7 unless the groundwater pH is greater than 7. If the groundwater pH is greater than 7, the Contractor will use the pH standards 7 and 10 to calibrate the meter. Periodically, during the sampling event, the Contractor will verify the instrument is operating correctly. The Contractor will record in the field notes all calibration measurements made and field measurements made.

Records of all laboratory calibrations must be maintained for a time sufficient to meet laboratory accreditation requirements. Records of all field calibrations performed will be permanently maintained by the Contractor.

B.8 INSPECTION/ACCEPTANCE OF SUPPLIES AND CONSUMABLES

The Contractors will monitor the inspection and acceptance requirements for supplies and consumables used to support their sampling and analytical operations. All supplies and consumables must meet the requirements of the equipment manufacturers and the test methods.

All laboratory supplies and consumables (e.g., support equipment, reagents, etc.) will, at a minimum, meet the standards specified in the analytical methods, e.g., USEPA SW-846, the standards recommended by the appropriate manufacturers, and the requirements of laboratory accreditation.

B.9 NON-DIRECT MEASUREMENTS

For use in the prioritization and planning of work at LPST sites, the TCEQ may gather data from the sources listed below. Descriptions of site geology and soil properties for

use in final reports and calculations must be based on data from field sampling and direct measurements. Other information regarding the environmental setting at the site can be obtained from the following sources:

- TCEQ LPST site files;
- Water well maps and files;
- Federal, state and local groundwater resources;
- Geological publications;
- Studies by academic entities;
- U.S. Department of Agriculture Soil Conservation Service surveys;
- Applicable information from other federal, state or local agencies or authorities; and
- Global positioning system data.

B.10 DATA MANAGEMENT

The Contractor will track and manage data from the point of sample collection and receipt by the laboratory to generation of the laboratory data report as specified in Element D.1. Once the laboratory data report is released by the laboratory to the Contractor, the Contractor reviews the data and generates a data review summary as part of the report. The project data is forwarded to the PST State Lead PM in an associated report, and the when approved, the report is included in the LPST site files. These site files are maintained by TCEQ Central Records. Site prioritization and status information is maintained in a database within the Remediation Division.

Data management by the Contractor will conform to the general conditions of the contract.

C.0 ASSESSMENTS AND RESPONSE ACTIONS

C.1 ASSESSMENTS AND RESPONSE ACTIONS

The PST State Lead Program will conduct readiness reviews, management systems reviews, and/or field audits periodically to verify the equipment and methods used for collection and analysis of environmental samples is compliant with the specifications in this QAPP and applicable program requirements documents. The Texas Laboratory Accreditation Program will conduct laboratory inspections once before accreditation is issued and at least once every two years thereafter, unless interim accreditations are issued.

Before an LPST investigation, the Contractor conducts readiness reviews to verify the necessary equipment is available for the field event. The Contractor also verifies the personnel involved in field activities have received sufficient training on the use of the equipment. The Contractor maintains records of these verification activities.

The Contractor will inspect general field equipment to verify the equipment is in good condition to generate acceptable quality environmental data. If, in the opinion of the Contractor (for field equipment), or the laboratory (for laboratory equipment), the available equipment is not capable of producing quality data, the PST State Lead PM will be notified and a determination will be made regarding the acceptability of a substitution of procedures when the data are to be used in enforcement or environmental compliance decisions. The Contractor will submit in writing, to the PST State Lead PM for consideration, any request to perform an alternate procedure e.g., procedures or methods not included in rules and standard methods manuals, e.g., 40 CFR Part 31 and SW-846.

The PST State Lead Program will conduct technical systems audits, i.e., field audits, and inspections periodically to assess compliance with project requirements documents including this QAPP. The audit will comprise on-site observations of field activities conducted by the Contractor and/or TCEQ staff.

The PST State Lead Program will conduct management systems reviews of the LUST quality systems to assess the implementation status and effectiveness of the systems. The management systems review is conducted by the PST Lead QAS or designee.

Additionally, the PST State Lead Program evaluates the performance of Contractors at the end of a period of performance (e.g., at the end of a phase of a project or completion of a work order). An unsatisfactory evaluation of Contractor performance can serve as documentation and justification to recommend the Contractor not work on PST projects.

Problems and/or corrective actions identified during any phase of the project will be documented in the LPST site file and collaboratively addressed by the PST PM and the respective Contractor. If issues need to be resolved concerning the appropriateness or effectiveness of a corrective action, the PST Lead QAS will be consulted.

C.2 REPORTS TO MANAGEMENT

Annually, the Lead QAS for the PST State Lead Program will issue a QA report documenting the implementation of the PST quality system on LUST-funded activities. The QA report is issued to TCEQ management and the USEPA. The lead QAS, or designee, will also issue audit reports conveying the observations, comments, and findings made during field audits and management systems reviews. Additionally, the lead QAS will informally report quality-related observations on an as-needed basis to the PST Program management through electronic mail and/or inter-office memoranda. The PST State Lead PMs, the laboratory manager, and any performance or systems auditor is responsible for formally or informally advising the lead QAS of any QA problems encountered and the corrective actions taken to ensure the status of the quality system is known and documented. The reports for projects or phases of projects completed (for example, a groundwater monitoring update (GMU) or a groundwater monitoring report (GMR)) will include a detailed QA summary as support documentation within the respective project report. The QA summary in the project report will document the technical acceptability and usability of the data reported to the TCEQ. The QA summary will also include a copy of the NELAP accreditation certificate for the laboratory or TCEQ notification of the exception(s) applicable to the data in the report. The QA summary will also address the accuracy, precision, and completeness of the measurement data used in project decisions and will discuss any problems encountered and corrective action(s) taken. The report will also include a completed Contractor Laboratory Analytical Data Certification form, as found in Appendix 4, to certify:

- Analytical data have been reviewed, including the problems and anomalies associated with the data, and have been evaluated for technical acceptability;
- A usability determination has been made of analytical data relative to project objectives; and
- The laboratory was accredited under the TLAP at the time of data generation for the matrices, methods, and parameters of analysis unless a regulatory exception under 30 TAC Section 25.6 is allowed by the PST Program.

The PST Program provides an annual QA report to the TCEQ QA Manager. This report is incorporated into the TCEQ Annual QA Report submitted to the USEPA. The PST Program also provides the following two program reports to USEPA:

- Public Record Summary Information on Underground Storage Tanks posted annually on the TCEQ webpage; and
- Strategic Targeted Activities for Results System (STARS) posted every six months on the TCEQ webpage.

This PST QAPP is reviewed and updated on an annual basis.

D.0 DATA VALIDATION AND USABILITY

D.1 DATA REVIEW, VERIFICATION AND VALIDATION

The PST Program requires data review and data verification. The Program does not require data validation. If conditions warrant validation of data, the specifications associated with that task will be issued in the work order.

The review and verification performed on the data at every level shall be documented, beginning with the laboratory review of the analytical results through the Contractor verification and review, and finally the verification and review by the TCEQ. The intent of this tiered process is to capture the review effort of each party, to minimize duplicative activities, to ensure critical elements of the review process are not overlooked, and to set in place a system that can be audited or inspected. The first level of review is performed by the laboratory to verify the data generated meet the technical requirements of the method and the laboratory standard operating procedure. The laboratory documents the review in a laboratory review checklist or a laboratory case narrative and identifies the problems and/or anomalies observed by the laboratory during the review, the corrective action taken, and the potential impact the problem or anomaly may have on the project data. The second level of review is conducted by the Contractor to verify the laboratory review is complete, accurate, and documented; to review the sample performance QC parameters; and to determine if the data are of known and documented quality and can be used in making project decisions. The Contractor documents the review in a QA summary discussing the parameters reviewed, the problems/anomalies found, any corrective action taken, the potential impact on the project data, and the usability of the data for making project decisions. The third level of review is performed by the PST State Lead PM to verify the Contractor review is complete, accurate, and documented and to verify the QA/QC summary addresses any problems/anomalies found and states the Contactor conclusion regarding the usability of the data.

Element D.1.1 describes the first level of review performed by the laboratory. Element D.1.2 describes the second level of review performed by the Contractor independent of the laboratory generating the data to evaluate the effect(s) on the usability of the analytical data. The final review performed by the TCEQ is specified in Element D.1.3.

Data Review by the Laboratory

The laboratory will review the data for technical acceptance based on the project requirements, the laboratory standard operating procedures, and the analytical methods used. The laboratory will document the review in the case narrative or laboratory review checklist. If no project-specific acceptance criteria have been specified, then the review

shall be based on the method and laboratory requirements. The laboratory will review the data reduction and verification procedures to verify the overall analysis results and reporting protocols meet method and project specifications. The laboratory will have a QA program in place that identifies and corrects problems associated with the generation of analytical data. The specific data reduction, verification, and reporting procedures may vary from laboratory to laboratory but shall be completed in accordance with the laboratory quality assurance plan and the laboratory SOPs.

The laboratory is responsible for reviewing at the bench level 100% of the data generated; the data reduction performed by the analysts, the instruments, and the laboratory information management system (LIMS); and the laboratory performance data, including calibrations and quality control parameter data. The laboratory will document this review to clearly identify any problems or anomalies that might affect the quality of the data being reported. At a minimum, the verification by laboratory will include:

- Verification of the calibrations and calibration checks for compliance with method and laboratory criteria and criteria specified in Element A.7 of this QAPP.
- Verification that batch QC samples were analyzed at the frequency specified in the method and in Element A.7 of this QAPP.
- Verification that QC sample results were within the specifications given in the laboratory SOPs, in the method, and in Element A.7 of this QAPP.
- Verification that data reductions were correctly performed.
- Comparison of the raw data (chromatograms, mass spectra, etc.) with the reported identifications and concentrations for accuracy and consistency.
- Verification that holding times for extractions and analyses were met.
- Verification that sample detection limits and method detection limits are current and correct.
- Verification that corrective actions were performed and control was adequately reestablished and documented prior to reanalysis of QC or project samples.
- Verification that all project and QC sample results were properly reported and flagged.
- Preparation of the case narrative or laboratory review checklist.

The laboratory will also perform a 10% check of the review performed on the following data (as applicable to the analytical method). This check will be conducted by a senior analyst or laboratory supervisor of the respective analytical section using the criteria specified above and in Element A.7 of this QAPP as applicable to the method:

- Calibrations and calibration verifications;

- Instrument and system performance checks (e.g., tuning, performance evaluation mixture analysis, etc.);
- Blanks;
- LCS recoveries and precision;
- MS/MSD recoveries and precision;
- Duplicate sample precision;
- Compound quantitation and identification;
- Surrogate recoveries; and
- Internal standard areas.

The Laboratory QA section shall: 1) review the completed data packages, 2) perform a reasonableness check review on all the completed data packages, and 3) ensure the required deliverables are present, the appropriate laboratory flags have been applied to the data, the custody of the samples has been maintained and is documented, and the nonconformances and other deficiencies have been addressed in the case narrative or laboratory review checklist to be included in the data packages issued by the laboratory. The content of laboratory editable Excel electronic data deliverables is included in the example in Appendix 5. The laboratory QA section shall perform a QA check on 100% of data key-punched into electronic data deliverables and shall perform a 5% spot-check of data electronically transferred into an electronic data deliverable for consistency with hard copy deliverables.

D.1.1 Data Usability Review by the Contractor

The Contractor, independent of the laboratory, shall review the contents of the data package including the case narrative or laboratory review checklist. The Contractor will evaluate both the technical acceptability and the usability of the project data. In evaluating the usability of the project data, the data reviewer will give particular attention to data qualified by the laboratory or the data reviewer as estimated to determine if the qualified data can be used to make project decisions. The Contractor will document the results of the data review in the data review summary section of the associated report submitted to the PST State Lead Program for review. The data review checklists in Appendix 5 can be used to document the review of the data and support the conclusions stated in the data review summary section of the report.

D.1.2 Data Review by the PST State Lead Program

The PST State Lead PM spot-checks the review of the data performed by the laboratory and the Contractor. The PM also evaluates the reasonableness of the professional judgment used by the Contractor to conclude qualified data can be used for making project decision.

The project QAS will perform an audit of data quality on one or more reports to check the review performed by the PM, the Contractor, and the laboratory and to confirm the Contractor used appropriate professional judgment in concluding qualified data can be used for making project decisions. The project QAS issues the results of the audit in an audit of data quality report.

D.2 VERIFICATION AND VALIDATION METHODS

Precision: Each laboratory generating measurement data will determine the precision of analyses by repeating the entire analysis of a sample once per batch or once per 20 samples, whichever is the greater frequency. The relative percent difference (RPD) is calculated using the formula:

$$\text{RPD} = \text{abs}\left(\frac{(x_1 - x_2)}{(x_1 + x_2)/2}\right) x\ 100$$

Where: *RPD = relative percent difference*
xR₁R = first measurement
xR₂R = second measurement

When evaluating the precision in field duplicates, the Contractor will calculate the RPD between the duplicate sample results, using the RPD equation above, when the chemical is detected in both the sample and the duplicate at concentrations greater than five times the MQL. When the concentration of the COC in one or both duplicate samples is within five times the MQL, the Contractor will evaluate precision in field duplicate samples by calculating the absolute difference between the duplicate results. The equation for absolute difference is:

$$abs = |x_1 - x_2|$$

Where: abs = absolute value

x_1 = *first* measurement
x_2 = second measurement

The absolute difference of two measurements is the non-negative value of the difference. For example, if first measurement is 1 and the second measurement is 5, the difference, using the absolute difference equation above, would be calculated as 1 minus 5 resulting in the difference being -4. The absolute difference between 1 and 5 is 4.

The accuracy of an analysis process can be monitored by determining the percent recovery (%R) of a known quantity of the parameter spiked into a sample taken through the analysis.

The %R is calculated using the formula:

$$\%R = \frac{SSR - SR}{SA} \times 100$$

Where: SSR = spiked sample result
SR = unspiked sample result
SA = amount of spike added to the sample

The laboratory will combine the information of 20 or more determinations of precision and accuracy and establish QC control charts with upper and lower control limits for each parameter.

D.3 RECONCILIATION WITH USER REQUIREMENTS

Whenever the procedures and guidelines established in this QAPP to meet the specified levels of data quality are not successful, corrective action may be required.

Corrective action may be initiated by any person involved in PST program activities who has observed or is made aware of any variance from QA protocols. Personnel who will potentially report these variances may include PST State Lead PMs within the PST/DCRP Section, LPST site investigation staff members, the PST project or lead QAS, Contractors, and laboratory personnel. Corrective action may also be initiated by appropriate contracted personnel and by performance and quality system auditors. The PST State Lead PM who has knowledge of the problem will be responsible for monitoring the required corrective actions taken and may involve the PST project or lead QAS when necessary. Specific LPST site project plans, including sampling plans, may specify procedures for both the review of site activities and the initiation of corrective action measures to identify variance from QA protocols.

Variances from QA protocols, which may require corrective action, may include but are not limited to the following:

- Field and/or laboratory equipment problems or failures;

- Field and/or laboratory procedural problems or failures;
- Exceedance of precision and accuracy control limits;
- Sample custody, safety, transportation, preservation;
- Holding time, handling problems, or failures;
- Preventive maintenance deficiencies; and
- Documentation deficiencies or problems.

Corrective actions can be a combination of, but are not limited to, the following: repair or replacement of faulty equipment; re-analysis of samples and standards; checking reagents for proper strength, and re-sampling. When any variance from QA protocols has been discovered, the lead QAS will be notified of the corrective action planned or taken.

Contractor activities are subject to audits during field activities for conformance with this QAPP and program guidelines listed in Appendix 2. PST staff members will monitor the audit reports during the course of the project and at the completion of the project through a report evaluation at the end of each work order for that project.

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Appendix 1
TCEQ PST/UST Contractor Oversight Program

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I. INTRODUCTION

Within the TCEQ Remediation Division, corrective action at leaking petroleum storage tank (LPST) sites is directed by the Responsible Party Lead or State Lead programs. Under State Lead direction, the PST State Lead PM guides corrective action at LPST sites through TCEQ contracts with Corrective Action Specialist (CAS) and engineering Contractors. A Risk-Based Corrective Action (RBCA) approach is utilized throughout the Remediation Division as the mechanism to determine target cleanup goals. The RBCA program entails identifying and investigating critical exposure pathways, establishing a site priority, and determining target cleanup levels based on two alternatives, designated a Plan A and Plan B. The PST program strives to promote cost effective cleanups which are protective of human health and the environment.

II. STATE LEAD ELIGIBILITY

Eligibility for the State Lead program is limited to ensure state assistance will be received by those sites most in need. To enter the State Lead program, the site must meet one of the eligibility criteria below:

- Financially unable Responsible Party (RP)
- Unwilling RP
- Unknown RP
- Emergency situation
- Multi-source plume
- Legislative directive

II.A. FINANCIALLY UNABLE

Most sites are admitted into State Lead under the first criterion; the RP proves to be financially unable to conduct the necessary corrective action. Two items are required for admission under financial inability: (1) financial information and completion of an Affidavit of Financial Inability for evaluation by the Financial Assurance Team of the Revenue Section of the TCEQ and (2) a signed access agreement providing access to the site for agents of the State of Texas. Admission to the State Lead Program is contingent upon receipt of both of these items. The financial statement submitted by the RP will be reviewed by the Financial Assurance Team, and a determination will be made regarding the ability of the RP to pay for the cleanup. A corrective action benchmark will be determined, which is the amount the RP is expected to pay for corrective action on all identified active LPST cases, before qualifying for State Lead eligibility. If found to be financially unable to perform the necessary corrective action at the site, the RP will be admitted to State Lead

II.B. UNWILLING

Sites with unwilling RPs are also handled in State Lead. In these cases, the RP has been directed to perform work and has refused. These sites are referred to the State Lead Program for corrective action and the TCEQ Enforcement Division for review of the violations and petition of penalty measures, if necessary. Corrective action expenses will be subject to possible cost recovery when performed at sites where the RP refuses to address TCEQ directives.

II.C. UNKNOWN

State Lead coordinates corrective action at sites where the RP is unknown or unavailable. These sites include responses to impacts where the source has yet to be determined, and sites where the owner of a property is known but his or her location is not known. If an RP can be determined or located, coordination of the corrective action will be referred to the Responsible Party Lead Program.

II.D. EMERGENCY RESPONSE

When the RP cannot or will not respond to an emergency situation in a timely manner, the abatement is conducted by the State Lead Program. A financial inability determination can be made after the abatement is completed, and cost recovery is undertaken where appropriate.

II.E. MULTI-SOURCE PLUME

Sites where contamination from several sources has combined into one plume may also be coordinated by State Lead. These sites may be handled via the Responsible Party Lead Program when remediation is conducted jointly by agreement among the applicable parties. If consensus cannot be reached between the RPs, the site is transferred to the State Lead Program. In these cases, enforcement action may also be pursued.

III. FUNDING SOURCES

The primary source of funding is the Petroleum Storage Tank Remediation (PSTR) Fund. These funds are generated through fees collected at bulk drop facilities at a rate listed in 30 TAC 334.19. The State Lead Program also receives federal dollars from the LUST Trust Fund. Money spent from the LUST Trust Fund can be recouped from the RP in a cost recovery action if the RP has been unwilling to conduct the necessary corrective action, if an unknown RP is identified, or if the RP has not been truthful in reporting his or her financial status. PSTR funding is recoverable only when enforcement action is taken at a site and cost recovery is pursued by the TCEQ.

IV. CONTRACTING PROCESS

Any company providing corrective action services at LPST sites, whether on a State Lead or RP Lead site, must be registered as a CAS with the TCEQ. The corrective action services must be supervised by a registered Corrective Action Project Manager (CAPM). State lead contracting opportunities are advertised by the Texas Procurement and Support Services (TPASS) on the Electronic State Business Daily database (ESBD). Professional engineering services are procured through request for qualifications. Environmental assessment services are procured through requests for proposals.

IV.A. CONTRACTING REGIONS

The State of Texas has been divided into two contracting regions. Site corrective actions in the regions are directed by TCEQ State Lead Program PMs. Each contracting region has several different types of contracts in place at the same time, procured in various ways, depending upon the services required. PMs can use different contracts to complete the necessary work depending upon the services needed. Contracts range from low-bid Contractor services to negotiated professional services contracts.

IV.B. CONTRACT TYPES

Multiple contracts are used by the State Lead Program. The types of contracts used by the State Lead Program are discussed below:

1. *Emergency Response and Supplemental Activities Contracts*

The PST State Lead Program has one emergency response Contractor available to do work statewide. This Contractor provides emergency response and abatement to situations presenting an immediate threat to human health and safety. Supplemental services, such as the installation of non-aqueous phase liquid recovery systems, may also be provided under this contract.

2. *Regional Site Activities Contracts*

The PST State Lead Program has multiple regional site activities umbrella contracts. These contracts are used to perform site assessments and related tasks such as receptor surveys, groundwater sampling and analysis, waste disposal, installation of monitor wells and recovery wells, plugging monitoring wells, and report submittal using various TCEQ corrective action forms. These professional services contracts are awarded through a proposal process with candidates selected from within the competitive range based upon a combination of their qualifications and prices.

3. *Regional Remediation Engineering Contracts*

Multiple umbrella contracts are available for use in obtaining engineering services at LPST sites. The contract services include, but are not limited to, the performance of design tests (e.g., aquifer, soil vapor extraction), preparation of Corrective Action Plans, selection and/or design of remediation equipment, preparation of bid packages for

system installations, oversight of system installations, operation and maintenance of installed systems, and system monitoring and performance evaluations of installed systems. As required by the Professional Services Procurement Act, all engineering services are procured through qualifications-based selection and subsequent negotiation for prices.

4. Water Treatment Contract

One state-wide contract is used to provide water filtration systems on impacted residential wells to protect human health. This Contract provides for the installation, maintenance, and repair of treatment systems for the TCEQ PST State Lead Program and for other programs within the Remediation Division.

5. PRP Search Contract

This contract provides for Contractors to perform records searches to identify all potentially responsible parties associated with PST sites. Information obtained using this contract can be used by the TCEQ to determine the responsible parties and to support cost recovery and enforcement actions.

Contractors may at any time market their company's services to the prime companies already selected in the State Lead Program. The addition of new subcontractors constitutes a change in personnel to the original approved contract submitted by the prime, and accordingly will be subject to State Lead review and approval.

V. RESPONSIBLE PARTY LEAD

On the RP Lead side of the PST State Lead Program, the RPs may choose their own CAS to perform the required corrective action at an LPST site under the direction of an RP-lead PM.

Appendix 2
TCEQ Guidance, Forms, and Regulations for the TCEQ PST Program

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Appendix 2
TCEQ Guidance, Forms, and Regulations
for the
TCEQ PST Program

The primary guidance documents, forms, and regulations for the TCEQ PST Program are presented in Table 15a for the Site Activities Contract and Table 15b for the Engineering Services Contract. Some documents/forms apply to both contracts and are listed in both tables.

Many of the guidance documents (Regulatory Guidance ["RG-"]) and forms (["TCEQ-"]) listed are available on the TCEQ Leaking Petroleum Storage Tanks web site at

http://www.tceq.texas.gov/remediation/pst_rp/downloads.html.

Single copies of RG guidance documents can also be obtained free of charge from:

TCEQ Publications Office at MC-195

P.O. Box 13087

Austin, TX 78711-3087

phone (512) 239-0028.

e-mail: puborder@tceq.texas.gov

These guidance documents and forms can also be obtained by calling (512) 239-2201.

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Table 15a. Guidance, Forms, and Regulations Applicable to the PST Site Activities Contract

Regulatory Guidance Documents Referenced in the Technical Specifications:	
RG-36	Risk-Based Corrective Action for Leaking Petroleum Storage Tank Sites.
RG-175	Guidance for Risked-Based Assessments at LPST Sites in Texas.
RG-366/TRRP-8	Groundwater Classification.
RG-411	Investigating and Reporting Releases from Petroleum Storage Tanks.
RG-428	Preparation of a Drinking Water Survey Report.
RG-523/PST-06	Groundwater Monitoring and Reporting for LPST Sites
TCEQ	PST Quality Assurance Project Plan.
ASTM D888	Standard Test Methods for Dissolved Oxygen in Water.
ASTM D1498	Standard Test Method for Oxidation-Reduction Potential of Water.
ASTM D2487	Standard Classification of Soils for Engineering Purposes.
ASTM D2937	Standard Test Method for Density of Soil in Place by the Drive-Cylinder Method.
ASTM D5092	Standard Practice for Design and Installation of Groundwater Monitoring Wells.
ASTM D5521	Development of Ground-Water Monitoring Wells in Granular Aquifers.
EPA SW-846	Test Methods for Evaluating Solid Waste Physical/Chemical Methods
Forms and Permits Referenced in the Technical Specifications:	
Form TCEQ-00013	Groundwater Monitoring Report.
Form TCEQ-0017	Field Activity Report.
Form TCEQ-0025	Product Recovery Report.
Form TCEQ-0028	Site Closure Request.
Form TCEQ-0030	Final Site Closure Report.
Form TCEQ-0562	Assessment Report.
Form TCEQ-0621	Release Determination Report.
Form TCEQ-10338	Class V Injection Well Inventory/Authorization.
Form TCEQ-20122	Regional Notification/Standard Permits by Rule Relocation.
Regulations Referenced in the Technical Specifications:	
16 TAC Chapter 76 Part 4	Water Well Drillers and Water Well Pump Installers.
29 CFR 1910.120	OSHA Personal Protection Equipment (PPE).
Texas Health & Safety Code (TH&S) 374.1535	Relating to Institutional Controls and Deed Recordation.
30 TAC 334.206	Relating to Institutional Controls and Deed Recordation.
30 TAC 334.208	Relating to Institutional Controls and Deed Recordation.
30 TAC 334.85	Relating to Waste Classification & Management
30 TAC 334 Subchapter K	Relating to Waste Classification and Management.
30 TAC 335	Relating to Waste Classification and Management.
40 CFR 261	Relating to Waste Classification and Management.
Texas Government Code Section 2254	Professional Services Procurement Act - Procurement of Professional Services.
Texas Water Code Section 26.408	Notice Of Groundwater Contamination.

Table 15b. Guidance, Forms and Regulations Applicable to the Engineering Services Contract

Regulatory Guidance Documents Referenced in the Technical Specifications	
RG-36	Risk-Based Corrective Action for Leaking Petroleum Storage Tank Sites.
RG-41	Corrective Action Plans for LPST Sites.
RG-261	Operation Monitoring and Performance of Remedial Systems at LPST Sites.
RG-411	Investigating and Reporting Releases from Petroleum Storage Tanks.
RG-428	Preparation of a Drinking Water Survey Report.
RG-523/PST-06	Groundwater Monitoring and Reporting for LPST Sites
PST QAPP	TCEQ PST Quality Assurance Project Plan
ASTM D5092	Standard Practice for Design and Installation of Groundwater Monitoring Wells.
ASTM D5521	Development of Ground-Water Monitoring Wells in Granular Aquifers.
EPA SW-846	Test Methods for Evaluating Solid Waste, Physical/Chemical Methods.
Forms and Permits Referenced in the Technical Specifications	
Form TCEQ-00013	Groundwater Monitoring Report.
Form TCEQ-0017	Field Activity Report.
Form TCEQ-0025	Product Recovery Report.
Form TCEQ-0028	Site Closure Request.
Form TCEQ-0030	Final Site Closure Report.
Form TCEQ-0695	Remedial Technology Screening.
Form TCEQ-0696	Operation, Monitoring, and Performance Report.
Form TCEQ-0707	CAP Worksheet.
Form TCEQ-10338	Class V Injection Well Inventory/Authorization.
Form TCEQ-10488	Notice of Intent.
Form TCEQ-20122	Regional Notification/Standard Permits by Rule Relocation.
Form TCEQ-20342	Notice of Termination.
TPDES General Permit TXG830000	Relating to Petroleum Fuel or Petroleum Substance Discharges.
Form TPDES EPA No. 3320-1	Discharge (or Zero Discharge) Monitoring Report.
Regulations Referenced in the Technical Specifications	
16 TAC Part 4 Chapter 76	Water Well Drillers and Water Well Pump Installers
29 CFR 1910.120	OSHA Personal Protection Equipment (PPE).
Texas Health & Safety Code (TH&S) 374.1535	Relating to Institutional Controls and Deed Recordation.
30 TAC 334.206	Relating to Institutional Controls and Deed Recordation.
30 TAC 334.208	Relating to Institutional Controls and Deed Recordation.
30 TAC 334.85	Relating to Waste Classification & Management.
30 TAC 334 Subchapter D & K	Relating to Waste Classification and Management.
30 TAC 330	Relating to Waste Classification and Management.
30 TAC 335	Relating to Waste Classification and Management.
40 CFR 261	Relating to Waste Classification and Management.
Texas Government Code Section 2254	Professional Services Procurement Act - Procurement of Professional Services.

Appendix 3

Example Sample Custody Form

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CUSTODY PROCEDURES

An unbroken chain of custody documentation will be maintained for samples collected under this QAPP. Permanent records of all sample handling and shipment will be maintained by TCEQ to confirm sample integrity and to support the legal and technical defense of the data.

One member of the investigation team is assigned to be responsible for initiating and monitoring custody procedures and documenting the sample source. The assigned team member will keep the sample container in view or in locked storage with limited access until custody is relinquished and formal documentation of the custody transfer is complete. The person collecting a sample will start the custody procedure.

Figure 3 is an example of the TCEQ custody form for PST samples. The form has a unique identification number, commonly referred to as the custody number. The form is in quadruplicate comprising a four part form with an original page and three carbon pages. One copy is for the investigator, one for the courier (if other than the investigator) and one for the laboratory, with the original returned to the investigator. No form is given to a common carrier, such as, bus lines, airlines, or express delivery services, e.g., Fed Ex. The custody form contains site identification information, such as the LPST number, site name, and region number; site and sampling location; and sample information, such as, sampler identification, sample type (composite or grab), sample matrix (liquid or solid), sample container type, sample preservation used, type of analyses requested for each sample, and comments for the laboratory regarding the samples. The form also contains areas used by the laboratory to record laboratory sample identification numbers and the condition of the samples upon receipt by the laboratory.

In completing the form, the field team will use care and will verify all necessary information is correct and legibly entered onto the form with a black waterproof ink pen.

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Figure 2. Example Field Custody Form

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Chain of Custody Record

48101

Location: (Do not fill in this shaded area if the facility information must be confidential)

Permit #:

Region:	Organization #:	PCA Code:	Program:	Sampler telephone number:
E-Mail ID:	Sampler: (signature)			Sampler: (please print clearly)

Lab ID Number	Sample ID	Date	Time	# of Bottles	Grab/ Comp.	Matrix L,S,M,O,T	CL2	pH	Cond.	Analyses Requested	REMARKS
	-01										
	-02										
	-03										
	-04										
	-05										
	-06										
	-07										
	-08										
	-09										
	-10										

Relinquished by:	Date	Time	Received by:	For Laboratory Use:
Relinquished by:	Date	Time	Received by:	Received on ice: Y N deg. C
Relinquished by:	Date	Time	Received by:	Preservatives: Y N
Relinquished by:	Date	Time	Received by:	COC Seal: Y N
Shipper name:	Shipper Number:			Seals Intact: Y N

TCEQ-10065 (11/02) White (Original) -Lab Yellow-Lab Pink-Contract Lab Manager Goldenrod-Collector Copy

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Appendix 4

Example Contractor Laboratory Analytical Data Certification Form

Example Organic Data Review Checklist for Solid/Aqueous/Vapor Samples

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Texas Commission on Environmental Quality - Remediation Division

CONTRACTOR LABORATORY ANALYTICAL DATA CERTIFICATION

Contractor Laboratory Analytical Data Certification is a requirement of the Petroleum Storage Tank Programs (PST) Quality Assurance Project Plan (QAPP). This form must be completed by the contractor performing work for the PST Program and included in all reports that contain laboratory analytical data. Form should be filed as the first page of the laboratory analysis results, followed immediately with the laboratory NELAP accreditation certificate.

☐ Contractor performing work for the PST Program certifies that analytical data has been reviewed and evaluated for technical acceptability, including problems and anomalies associated with the data.

☐ Contractor performing work for the PST Program certifies that a determination has been made of usability of analytical data, with regard to project objectives.

☐ Contractor performing work for the PST Program certifies the laboratory was NELAP accredited under the Texas Laboratory Accreditation Program at the time of data generation for the matrices, methods, and parameters of analysis or a regulatory exception under 30 TAC 25.6 has been approved by the PST Program.

☐ Contractor confirms the report includes documentation of laboratory accreditation or the regulatory exception the PST Program approved for matrices, methods, and parameters of analysis.

Contractor Certifier Signature	Contractor Certifier Printed Name
Contractor Name	Site ID Number
Date	

Rev: 08/11/10 DRB

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TCEQ PST State Lead Analytical Organic Data Review Checklist (modify, as necessary, for metals analyses)			Lab Report ID: Lab Report Date:	
Project Number/Name: Laboratory Name & Texas NELAP Cert. No.:				
Sample Date(s):			Sample matrix:	
Custody Information	**Y/N**	**NA**	**Affects Usability?**	**Comments**
Date and time of sample collection recorded on COC?				
Date and time of sample receipt recorded on COC?				
Field IDs assigned to each sample on COC?				
Sample preservatives correctly?				
Receipt temp between 2 and 6 ^{o}C?				
Samples received intact and not broken?				
Laboratory Data Package	**Y/N**	**NA**	**Affects Usability?**	**Comments**
Laboratory NELAP accreditation referenced on report?				
Is each sample cross-referenced to laboratory ID?				
Are case narratives, laboratory review checklists, and/or exception reports included, if applicable?				
Analytical & prep methods listed on the report?				
Analytical results reported as quantified or when below MQL reported as estimated concentrations?				
Are MQLs listed for each analyte?				
Are soil samples reported on a dry weight basis?				
Are surrogate recoveries reported?				
Are matrix spike (MS/MSD) results reported from project samples?				
Field blank or trip blank samples submitted?				
Field duplicate samples submitted?				
Holding times within limits?				
Project Samples	**Y/N**	**NA**	**Affects Usability?**	**Comments**
Are laboratory results sufficient to meet the purpose(s) for which the samples were collected?				
Surrogate recovery (%R) within the lab-defined range?				
Is the RPD, or absolute difference, between field duplicate results within the PST QAPP QC acceptance criteria?				
Are any project sample results flagged by the laboratory indicating unresolved issues or questionable/unreliable data?				
Were there problems or anomalies in the receipt, handling, prep, or analysis of samples?				
Did lab take corrective actions in response to problems or anomalies in the receipt/handling/prep/analysis of samples?				
Does the data review address issues identified in the case narrative, laboratory review checklists, or exception reports?				
Field/Trip/ Laboratory Method Blanks	**Y/N**	**NA**	**Affects Usability?**	**Comments**
Are analytes detected in any blanks?				
Are sample results flagged to indicate analytes were detected in an associated blank?				

TCEQ PST State Lead Analytical Organic Data Review Checklist (modify, as necessary, for metals analyses)	Lab Report ID:
	Lab Report Date:
Project Number/Name:	
Laboratory Name & Texas NELAP Cert. No.:	
Sample Date(s):	Sample matrix:

Laboratory Control Samples (LCS/LCSD)	**Y/N**	**NA**	**Affects Usability?**	**Comments**
LCS/LCSD recoveries (%R) within the laboratory defined range?				
LCS/LCSD RPDs within laboratory defined range?				
LCS/LCSD results flagged indicating problems/anomalies not corrected by laboratory?				
Matrix Spike Samples (MS/MSD)	**Y/N**	**NA**	**Affects Usability?**	**Comments**
Were samples from the site used for MS/MSD analysis?				
MS/MSD recoveries (%R) within the laboratory defined range?				
MS/MSD RPDs within laboratory defined range?				
MS/MSD results flagged indicating problems/anomalies not corrected by laboratory?				
Laboratory Duplicates	**Y/N**	**NA**	**Affects Usability?**	**Comments**
Are laboratory duplicates within laboratory defined range?				
Are laboratory duplicate results flagged indicating problems/anomalies not corrected by laboratory?				
Supplemental Review	**Y/N**	**NA**	**Affects Usability?**	**Comments**
Does the above review indicate systematic problems warrant supplemental review of raw data to determine the data usability?				
Were other data usability checklists used to perform further or supplemental review?				

Comments / Qualifiers Attached to Data

Laboratory Usability Review Attachments	**Y/N**	**NA**	**Affects Usability?**	**Comments**
Laboratory Data Package				
NELAP Accreditation for laboratory				
TCEQ - Remediation Division Contractor Laboratory Analytical Data Certification Form				
Data Package Review Conducted By:			Review Date:	

Appendix 5
Data Fields for Electronic Data Deliverable

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Data Fields for FY 2016 QAPP Electronic Data Deliverable Green Tabs

Download the FY 2016 QAPP Electronic Data Deliverable File at: https://www.tceq.texas.gov/remediation/teds/teds.html

Green Tabs	Col	Column Headings	Format	Required?	Explanation	Example
sample_v1 (green tab)	A	sample_id	Text 40	Required	Enter the field ID for the sample as written on custody form; each sample must have a unique field ID value. This entry must be the same as the entry on the TestResultsQC_v1 spreadsheet under Column A, heading "sample_id".	GW-40-201502271347
sample_v1 (green tab)	G	sample_delivery_group	Text 10	Required	Lab work order # or lab group # or lab project #.	
sample_v1 (green tab)	H	sample_date	Date Time	**Required - Use Valid Format**	MM/DD/YYYY HH:MM	04/22/2015 4:20 PM
sample_v1 (green tab)	O	sample_receipt_date	Date Time	**Required - Use Valid Format**	MM/DD/YYYY HH:MM	04/23/2015 9:00 AM

Data Fields for FY 2016 QAPP Electronic Data Deliverable Blue Tabs

Download the FY 2016 QAPP Electronic Data Deliverable File at: https://www.tceq.texas.gov/remediation/teds/teds.html

Blue Tabs	Col	Column Headings	Format	Required?	Explanation	Example
Lab Information _v1 (blue tab)	A	lab_name_code	Text 20	**Required - Use Pulldown**	The TCEQ Lab code of the lab that analyzed the sample and generated the test results for this submittal. This entry must be same as the entry on the 'TestResultsQC_v1' spreadsheet under Column O, heading 'lab_name_code'. Find the codes on the "RT_Company" spreadsheet of the "Reference Values" Excel workbook located at https://www.tceq.texas.gov/remediation/teds/teds.html	TX00123
Lab Information _v1 (blue tab)	B	lab_name	Text 40	Required	Full name of lab responsible for analysis.	ABC Lab, Inc.
Lab Information _v1 (blue tab)	C	lab_certification_number	Text 30	Required	Texas Laboratory accreditation ID number for lab that analyzed the sample. Format is 'T' followed by 9-digit ID number, e.g., T#########.	T123456789
Lab Information _v1 (blue tab)	D	lab_contact_person	Text 30	Required	Name of contact person for the lab.	John Doe

Data Fields for FY 2016 QAPP Electronic Data Deliverable Red Tabs

Download the FY 2016 QAPP Electronic Data Deliverable File at: https://www.tceq.texas.gov/remediation/teds/teds.html

RedTabs	Col	ColumnHeadings	Format	Required?	Explanation	Example
TestResultsQC _v1 (red tab)	A	sample_id	Text 40	Required	Enter the field ID for the sample as written on custody form; each sample must have a unique field ID value. This entry must be the same as the entry on the sample_v1 spreadsheet under Column A, heading "sample_id".	GW-40-20150227134 7
TestResultsQC _v1 (red tab)	B	analytic_method	Text 35	Required	Laboratory analytical method name or description.	Method 8260
TestResultsQC _v1 (red tab)	C	analysis_date	Date Time	**Required - Use Valid Format**	Date of sample analysis in 'MM/DD/YYYY HH:MM' format. May refer to either beginning or end of the analysis as required by the method or TCEQ.	05/01/2015 10:21 PM
TestResultsQC _v1 (red tab)	D	total_or_dissolved	Text 1	**Required - Use Pulldown**	For groundwater analysis, enter "D" for 0.45 um filtered concentration; enter "T" for concentration in unfiltered groundwater or groundwater filtered using filter with pore size greater than 0.45 um; and enter "N" if not applicable	T
TestResultsQC _v1 (red tab)	F	test_type	Text 10	**Required - Use Pulldown**	Type of analytical run, e.g., INITIAL, DILUTION, DILUTION1, EXTRACT, EXTRACT1. Default is 'INITIAL'.	INITIAL
TestResultsQC _v1 (red tab)	G	lab_matrix_code	Text 10	**Required - Use Pulldown**	Use code to describe sample matrix. (e.g., 'SO' for soil, 'AQ" for aqueous, 'W' for waste)	AQ
TestResultsQC _v1 (red tab)	H	analysis_location	Text 2	**Required - Use Pulldown**	Enter 'FI' for field instrument, probe or test, 'FL' for mobile field laboratory analysis, or 'LB' for fixed-based laboratory analysis. Default value is 'LB'	LB
TestResultsQC _v1 (red tab)	I	basis	Text 10	**Required - Use Pulldown**	Enter DRY, WET or NA	DRY
TestResultsQC _v1 (red tab)	J	dilution_factor	Numeric	Required	The final volume divided by the initial volume. If sample is not diluted then = 1	1.0

RedTabs	Col	ColumnHeadings	Format	Required?	Explanation	Example
TestResultsQC _v1 (red tab)	K	prep_method	Text 20	**Required - Use Pulldown**	If applicable	Method 5035
TestResultsQC _v1 (red tab)	L	prep_date	Date Time	**Required - Use Valid Format**	MM/DD/YYYY HH:MM	05/01/2015 1:21 PM
TestResultsQC _v1 (red tab)	O	lab_name_code	Text 20	**Required - Use Pulldown**	The TCEQ Lab code of the lab that analyzed the sample and generated the test results for this submittal. This entry must be same as the entry on the 'Labinformation_v1' spreadsheet under Column A, heading 'lab_name_code'. Find the codes on the "RT_Company" spreadsheet of the "Reference Values" Excel workbook located at https://www.tceq.texas.gov/remediation/teds/teds.html	TX00123
TestResultsQC _v1 (red tab)	Q	test_batch_type	Text 10	**Required - Use Pulldown**	Lab batch type. Valid values include 'PREP', 'ANALYSIS', and 'LEACH'. This field is required for all batches. Default value is 'ANALYSIS'	ANALYSIS
TestResultsQC _v1 (red tab)	R	test_batch_id	Text 20	Required	Unique identifier for each lab batch. Default value is '99999'.	
TestResultsQC _v1 (red tab)	S	lab_sample_id	Text 20	Required	Enter lab assigned sample ID number.	12345-678
TestResultsQC _v1 (red tab)	T	percent_moisture	Text 5		Number between 0 and 100 with no "%" sign for moisture.	70.10
TestResultsQC _v1 (red tab)	V	subsample_amount_unit	Text 15	If applicable Use Pulldown	If applicable. Unit of measurement for subsample_amount. Cell can be left blank.	
TestResultsQC _v1 (red tab)	Z	preservative	Text 20	If applicable Use Pulldown	If applicable. Sample preservative used. Cell can be left blank.	

RedTabs	Col	ColumnHeadings	Format	Required?	Explanation	Example
TestResultsQC _v1 red tab	AB	final_volume_unit			If applicable. Unit of measurement for final_volume. Cell can be left blank.	
TestResultsQC _v1 red tab	AC	cas_rn	Text 15	Required	Enter the CAS number.	
TestResultsQC _v1 (red tab)	AD	result_value	Numeric		Enter analytical result adjusted for sample-specific factors, e.g., dilution and/or initial sample size or volume, and at an appropriate number of significant digits. Leave blank for analytes not detected in this test.	
TestResultsQC _v1 (red tab)	AF	result_type_code	Text 10	**Required - Use Pulldown**	Must be either 'TRG' for a calibrated analyte, 'TIC' for tentatively identified compound, 'IS' for internal standard, 'SUR' for surrogate, or 'SC' for spiked compound. Default value is 'TRG'.	TRG
TestResultsQC _v1 (red tab)	AG	reportable_result	Text 1	**Required - Use Pulldown**	Y' for results considered reportable and 'N' for other results. This entry is used to identify the reportable result from multiple runs and to identify the primary result between first and second column runs. When multiple results are generated for an analyte by this test, only one result can be flagged as reportable. Default value is 'Y'.	Y
TestResultsQC _v1 (red tab)	AH	detect_flag	Text 2	**Required - Use Pulldown**	Enter 'Y' if greater than MDL, otherwise enter 'N'.	Y
TestResultsQC _v1 (red tab)	AI	lab_qualifiers	Text 7		Enter flags such as U, J, B, as applicable.	U

RedTabs	Col	ColumnHeadings	Format	Required?	Explanation	Example
TestResultsQC _v1 (red tab)	AM	method_detection_limit	Text 20	Required	The method detection limit (MDL) is the minimum concentration of an analyte that can be measured and reported with 99% confidence that the analyte concentration in the sample is greater than zero when the response for the analyte meets the method-specified qualitative identification criteria. The MDL is determined for each analyte from the analysis of a laboratory grade sample of a given matrix containing the analyte and carried through the entire method procedure.	
TestResultsQC _v1 (red tab)	AN	reporting_detection_limit	Text 20	Required	The MDL adjusted for sample specific factors, i.e., the sample detection limit (SDL).	
TestResultsQC _v1 (red tab)	AO	method_quantitation_limit	Text 8	Required	Provide, if possible, otherwise provide in separate table.	
TestResultsQC _v1 (red tab)	AP	reporting_quantitation_limit	Text 8	Required	The MQL adjusted for sample specific factors, i.e., the sample quantitation limit (SQL).	
TestResultsQC _v1 (red tab)	AQ	result_unit	Text 15	**Required - Use Pulldown**	Use mg/Kg for solid results, mg/L for aqueous results, and mg/m^3 for vapor results.	mg/L
TestResultsQC _v1 (red tab)	AR	detection_limit_unit	Text 15	If applicable Use Pulldown	If applicable. Units of measurement for the detection limit(s). This field is required if a reporting_detection_limit is reported.	mg/L
TestResultsQC _v1 (red ta	AU	detectability_check_result_yn	Text 1	**Required - Use Pulldown**	Use 'Y' if the analyte was detected in the detectability check sample at a concentration within 2 times the method detection limit used to calculate the reporting detection limit; otherwise, use 'N'.	Y

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