Quality Assurance Project Plan

Grim Hotel
301 North State Line Avenue
Texarkana Texas 77501

City of Texarkana, Texas

Revision 1
November 2018
Brownfields Agreement: BF-00F62501

Stanley Consultants INC.
A Stanley Group Company
Engineering, Environmental and Construction Services - Worldwide

Introduction

The City of Texarkana, Texas (City) developed this Quality Assurance Project Plan (QAPP) for use during the cleanup of asbestos and lead-based paint contamination within the Grim Hotel, and soil and groundwater contamination on the approximately 0.89-acre property (Project) located at 301 North State Line Avenue in Texarkana (Site). This QAPP was developed to define the specific quality assurance (QA) and quality control (QC) activities that will be applied so that the environmental data collected are of the type and quality needed for a specific decision or use. The City plans to provide funding assistance for the cleanup to Texarkana Grim Housing Partners LP (Borrower) through the U.S. Environmental Protection Agency (EPA) Revolving Loan Funds (RLF) Cooperative Agreement BF-00F62501 Modification No. 3 dated September 11, 2018. Additional funding for redevelopment activities will be provided by the City through a U.S, Department of Housing and Development (HUD) Section 108 Loan. Due to the historical significance of the building, the Borrower is coordinating the cleanup and redevelopment of the Site with the Texas Historical Commission.

As stated in the RLF cooperative agreement, “Sixty days prior to the initiation of any environmental measurements or data generation, the recipient shall submit to the EPA Project Officer, for review and approval, a written QAPP for this grant project. The QAPP shall comply with the guidelines specified in the document entitled "EPA Requirements for Quality Assurance Project Plans for Environmental Data Operations", EPA QA/R5. If any change is required after EPA approval, the recipient must notify the Project Officer immediately and request approval for the change prior to implementation. At the end of each Federal Fiscal Year, September 30, the grantee shall certify in writing to the EPA Project Officer that the QAPP is current and include a copy of the recipient's new approval pages for the QAPP. Any costs for environmental measurements or data generation incurred prior to approval of the Quality Assurance Project Plan by the EPA Project Officer will be ineligible for reimbursement.”

The Texarkana Grim Housing Partners, LP is scheduled to purchase the Site in March 2019, before the cleanup activities begin. The cleanup will be performed by the Borrower with oversight and quality assurance provided by their environmental consultant.

This QAPP emphasizes the use of proven, validated, and EPA-approved sampling methods and analytical methods. The QAPP, in conjunction with the Quality Management Plan (QMP) dated May 2010 and updated September 2017, provides the plan to ensure that data generated for this project are accurate and sufficient to fulfill their intended use. The sampling and analytical methods are identified in appropriate sections of this QAPP and will be followed during the cleanup activities. This QAPP was prepared per EPA’s Requirements for Quality Assurance Project Plans (EPA QA/R-5), March 2001. This QAPP will be updated if any change is required and will be reviewed and re-certified each year by September 30.

Document Review and Revision Record

- *Quality Assurance Project Plan, Draft, March 2018* - Submitted to EPA on March 2, 2018
- EPA comments received April 6, 2018
- *Quality Assurance Project Plan, Revision 1, November 2018* - Submitted to EPA on January 9, 2019

November 2018 response to April 2018 EPA comments

Comment 1: *Overall comment – Please add "laboratory certifications" (that include the date that the lab is validated for) as an appendix to the QAPP.*

Response 1: The laboratory certifications have been added to Appendix D. Note that TestAmerica has been added to replace ESC laboratory on pages 4, 7 and 17.

Comment 2: *Section A.1 Title and Approval Page, page 1 – Please provide signatures*.

Response 2: The Title and Approval Page was updated and signatures have been added. The borrower information was updated throughout the document.

Comment 3: *Section A.3 Distribution List, page 4 – Please provide the correct address for the Texas Health Department.*

Response 3: The distribution list was updated and the address for the Texas Health Department (TDSHS) has been revised to 1100 West 49th Street, Austin, Texas 78756-3199.

Comment 4: *Section A.4 Project Organization, page 5 and page 6 – Please identify the personnel/roles who will have stop work authority for this QAPP*.

Response 4: The stop work authority has been added on page 5 and page 6 to include the Grantee QA manager, the Project Coordinator, the QEPs.

Comment 5: *Section A.5.2 Project Definition, Lead-based Paint, page 9 (and page 15) – Please verify the 800 µg/sq ft. clearance criteria concerning the window troughs. The normal clearance limit is 400 µg/sq ft*.

Response 5: The clearance criteria for window trough has been revised to 400 µg/sq ft. on pages 9 and 16.

Comment 6: *Section A.7 Quality Objectives and Criteria for Measurement Data, Completeness, page 11 – Please re-evaluate the 100% completeness goal for this project or provide an explanation for corrective action measures if the 100% project goal is not met.*

Response 6: The completeness goals were revised.

In addition, the schedule on page 9 was revised and laboratory certifications and Quality Assurance Manuals were added to Appendix D.

Acronyms and Abbreviations

µg/m3	micrograms per cubic meter
%R	percent recovery
ACM	asbestos containing material
AHERA	Asbestos Hazard Emergency Response Act
AMT	Air Monitoring Technician
Borrower	Texarkana Grim Housing Partners LP
CAP	Corrective Action Program
CFR	Code of Federal Regulations
City	City of Texarkana, Texas
COC	chain-of-custody
DQI	Data quality indicator
DQA	data quality assessment
DQO	Data Quality Objectives
EPA	U.S. Environmental Protection Agency
ERT	Environmental Response Team
f/cc	fiber per cubic centimeter
GC	gas chromatography
Grantee	City of Texarkana, Texas
HAZWOPER	OSHA 40-hour Hazardous Waste Operations and Emergency Response
HEPA	high-efficiency particulate air
HPLC	high performance liquid chromatography
HUD	Department of Housing and Development
LCS	laboratory control samples
LCSD	laboratory control sample duplicate
mg/kg	milligrams per kilogram
MDL	method detection limit
MS	mass spectrometry
MS/MSD	matrix spikes/matrix spike duplicate
MSD	Municipal Settings Designation
NESHAP	National Emission Standards for Hazardous Air Pollutants
NIOSH	National Institute of Occupational Safety and Health
NMAM	NIOSH Manual of Analytical Methods
OSHA	U.S. Occupational Safety and Health Administration
PCL	protective concentration level
PCM	Phase Contrast Microscopy
PEL	permissible exposure limit
ppm	parts per million
Project	Grim Hotel environmental cleanup
QA	quality assurance
QAM	Quality Assurance Manual
QAPP	Quality Assurance Project Plan
QC	quality control
QEP	Qualified Environmental Professional
QMP	Quality Management Plan
RLF	Revolving Loan Fund
RPD	relative percent difference
Site	301 North State Line Avenue, Texarkana Texas
SOP	standard operating procedures
TBD	to be determined

TCEQ	Texas Commission on Environmental Quality
TDSHS	Texas Department of State Health Service
TEM	Transmission Electronic Microscopy
TRRP	Texas Risk Reduction Program
TSBC	Texas-specific background concentration
VCP	Voluntary Cleanup Program

A.1. Title and Approval Page

Grim Hotel Cleanup
Quality Assurance Project Plan (QAPP)

Approved By:	Julie Oriano	
Title:	Julie Oriano P.G Stanley Consultants, Inc. Project Manager	Date: 11/20/2018
Approved By:	Todd Knause	
Title:	Todd Knause P.G. Stanley Consultants, Inc. Quality Assurance Manager	Date: 11-20-2018
Approved By:	Antonio Williams	
Title:	Antonio Williams, Secretary/ CEO Texarkana Grim Housing Partners LP Borrower	Date: 1/8/2019
Approved By:	Daphnea Ryan	
Title:	Daphnea Ryan City of Texarkana, Brownfields Program Manager	Date: 1-8-19
Approved By:	Holden Fleming	
Title:	Holden Fleming City of Texarkana, Quality Assurance Manager	Date: 1-8-19
Approved By:	Camisha Scott 3/14/19	
Title:	Camisha Scott EPA Region 6 Project Officer	Date:
Approved By:		
Title:		Date:
Approved By:		
Title:		Date:
Approved By:		
Title:		Date:

EPA Region 6 Brownfields Program Agreement:
EPA Revolving Loan Fund Program BF-00F62501

Prepared for (Grantee):
City of Texarkana
220 Texas Boulevard, Texarkana, Texas 75501

Site Name:
Grim Hotel Cleanup
301 North State Line Avenue
Texarkana, Bowie County, Texas

Revisions: Revision 1
Date: November 20, 2018

Prepared by:
Stanley Consultants
2658 Crosspark Road, Suite 100
Coralville, IA 52241
Julie Oriano, P.G.

Project Number: 27285

For Use By (Borrower):
Texarkana Grim Housing Partners LP
1611 N Robison Road
Texarkana, TX 75501

A.2. Table of Contents

APPENDICES

A.3. Distribution List

RECIPIENT NAME	PROJECT ROLE	ORGANIZATION	CONTACT INFORMATION
Daphnea Ryan	Grantee Brownfields Program Manager	City of Texarkana	Planning and Community Development P.O. Box 1967 220 Texas Blvd., 4th Floor Texarkana, Texas 75504 903-798-3934 dryan@txkusa.org
Holden Fleming	Grantee Brownfields Program Quality Assurance Manager	City of Texarkana	Planning and Community Development P.O. Box 1967 220 Texas Blvd., 4th Floor Texarkana, Texas 75504 903-798-3901 Holden.Fleming@txkusa.org
Julie Oriano P.G.	Grantee's QEP Project Manager	Stanley Consultants, Inc	2658 Crosspark Road, Suite 100 Coralville, Iowa 52241 319-626-5330 orianojulie@stanleygroup.com
Todd Knause P.G.	Grantee's QEP Quality Assurance Manager	Stanley Consultants, Inc	8000 South Chester Street, Suite 500 Centennial, Colorado 80112 303-925-8292 knausetodd@stanleygroup.com
Antonio Williams	Secretary/CEO Borrower	Texarkana Grim Housing Partners LP	1611 N Robison Road Texarkana, TX 75501
TBD	Borrower's Project Coordinator, Quality Assurance Manager	TBD	TBD
TBD	Asbestos and Lead-Based Paint Abatement Contractor	TBD	TBD

RECIPIENT NAME	PROJECT ROLE	ORGANIZATION	CONTACT INFORMATION
TBD	Soil and Groundwater Contractor	TBD	TBD
Camisha Scott	Project Officer	US EPA - Region 6,	1445 Ross Avenue, Suite 1200 Dallas, Texas 75202 214-665-6755 Scott.Camisha@epa.gov
TBD	Quality Assurance Officer	US EPA - Region 6	1445 Ross Avenue, Suite 1200 Dallas, Texas 75202
TBD	Asbestos and Lead-Based Paint Cleanup Regulatory Oversight	TDSHS	1100 West 49th Street Austin, Texas 78756-3199 512-834-6770
Kristy Mauricio Livingston	Soil and Groundwater Regulatory Oversight	TCEQ Remediation Division	PO Box 13087 MC-127 Austin, Texas, 78711 512-239-2252 Kristian.Livingston@tceq.texas.gov
Cindy Nguyen	Asbestos and Lead Paint Analytical Laboratory	EMSL Laboratory	2307 Springlake Road, Suite 510, Dallas, TX, 75234 972-892-9928
Sachin Kudchadkar	Analytical Laboratory Project Manager	TestAmerica Laboratory	6310 Rothway Street Houston, TX 77040 713-690-4444 ext. 114
TBD	Drilling Contractor	TBD	TBD

The QAPP will be distributed electronically to all individuals listed in Section A-3, and to subcontractors as needed and as dictated by types of services. The Borrower will be responsible for providing the QAPP to the Project Coordinator/Quality Assurance Manager and all subcontractors.

It is the responsibility of the Grantee Brownfields Quality Assurance Manager to prepare and maintain amended versions of the QAPP, and to distribute the amended QAPPs to the individuals in Section A.3.

TBD- To be determined

A.4. Project Organization

Grantee:
Daphnea Ryan, Planner II, City of Texarkana, Brownfields Program Manager
The Grantee Program Manager has primary responsibility for the coordination and implementation of the City of Texarkana Brownfields Program. The coordinator has the responsibility to oversee and monitor EPA brownfield grants. As part of that responsibility, she must ensure compliance with the terms and conditions of the RLF.

Holden Fleming, Quality Assurance Manager (QA Manager)
The Grantee QA Manager is the official QA contact for all environmental assessment and cleanup activities performed under the Brownfields Program. The QA Manager is responsible for the preparation and submittal of the QAPP and reporting any changes to the EPA Region 6 Quality Assurance Manager for approval and distribution thereafter. The QA Manager may rely on delegation of technical plans, QA reviews, audits or other activities to contractors' quality assurance managers, providing there is a demonstrated separation of reporting from technical implementation. The QA Manager is responsible, with input from the Program Manager, for annual review and update of the QAPP and revision of the QAPP, if necessary.He manages the document repository and provides public relations for the Project. Mr. Ryan has stop-work authority to stop any un-safe activity until corrections are made.

EPA Region 6:
Camisha Scott, EPA Region 6 Brownfields Project Officer
EPA Region 6 will conduct Brownfields grant management through the EPA Project Officer. This position interacts directly with the Grantee through the Cooperative Agreement. The EPA Project Officer will review and approve the QAPP and documents required by the Grant.

TBD, EPA Region 6 QA Manager
EPA Region QA Manager is the individual designated as the principal manager having management oversight and the responsibilities for planning, implementing, documenting, assessing, reporting, and quality improvements of the services provided to the grantee by the agency.

Texas State Departments:
Texas Department of State Health Services (TDSHS)
The asbestos and lead-based paint abatement activities will be conducted under the oversight of the TDSHS. A notification will be filed with the TDSHS at least ten working days prior to commencement of the asbestos abatement.

Texas Commission on Environmental Quality (TCEQ)
The soil and groundwater contamination will be addressed under the TCEQ Texas Risk Reduction Program (TRRP) rules. The cleanup requirements for soil and groundwater will be determined by the response action approved by the TCEQ.

Borrower:
Texarkana Grim Housing Partners LP, Antonio Williams, Secretary/CEO
The Borrower is responsible for the development and execution of the environmental cleanup. As the recipient of the RLF loan, they are responsible for knowing and following the loan terms and conditions, complying with eligible fund uses, and following the documentation requirements of the loan and RLF grant. They are responsible for ensuring that contractors on the project are given copies of the QAPP and follow the QAPP requirements.

Borrower's Contractors:
TBD – Project Coordinator (Borrower's Representative and Quality Assurance Manager)
The Borrower's Project Coordinator and QA Manager will be responsible for quality control and will ensure that quality control measures are implemented in the field. This person will attend weekly coordination and safety meetings on-site and report the status to the Grantee Program Manager. The Project Coordinator has stop-work authority to stop any un-safe activity until corrections are made.

Asbestos and Lead-Based Paint:
TBD – Abatement Contractor
This person will represent the abatement contractor and will design the abatement, be responsible for developing and implementing health and safety plans, be responsible for ensuring that workers meet training and licensing requirements, and will meet the requirements of a "Competent Person" per OSHA requirements. He or she will provide oversight for the asbestos and lead-based paint activities, and will ensure that the work meets federal and state requirements.

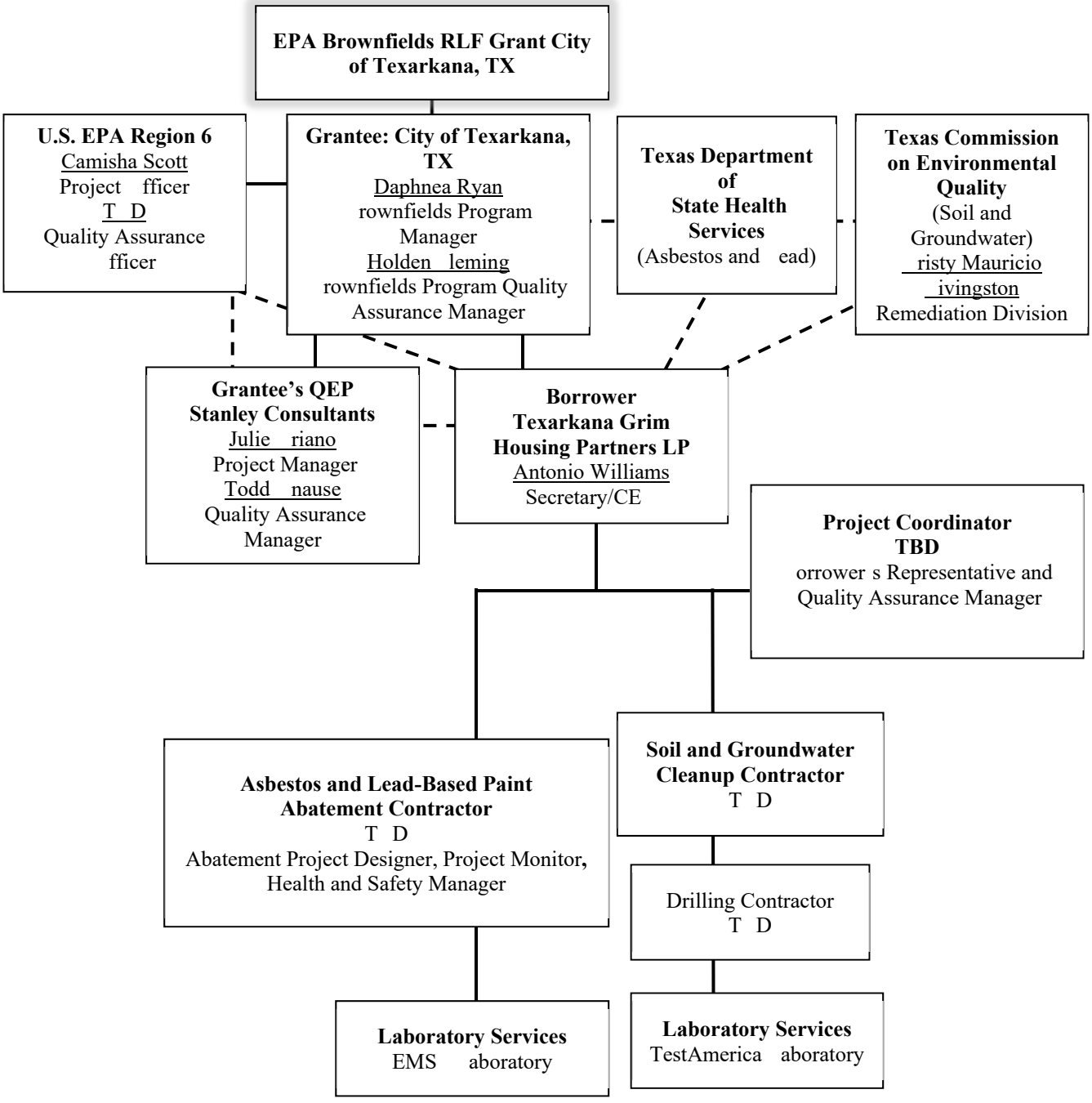
Cindy Nguyen - Project Manager, EMSL Analytical – Asbestos and lead laboratory

Soil and Groundwater:
Soil and Groundwater Cleanup Contractor - TBD
Drilling Contractor - TBD
Sachin Kudchadkar – Project Manager, TestAmerica, Analytical Testing Laboratory
The Borrower's Contractors are responsible for completing the work in accordance with approved methods.

Grantee Qualified Environmental Professional (QEP):
Julie Oriano P.G. – Principal Environmental Scientist, Stanley Consultants, Project Manager
The QEP Project Manager assists the Grantee with completing documents required by the RLF terms and conditions, project schedules, and monitoring the cleanup activities. The QEP Project Manager also assists with public relations for the Project. The QEP has stop-work authority.

Todd Knause P.G. – Principal Environmental Scientist, Stanley Consultants, Project Quality Assurance Manager
The QEP QA Manager will help the Project Manager to implement a technical quality process on the project. The QEP QA Manager will provide specialized knowledge to determine if the cleanup activities are appropriate and follow State and Federal guidelines. The QEP has stop-work authority.

Organizational Chart



A.5. Problem Definition/Background

The QAPP is the critical planning document for the environmental data collection process as it documents how quality assurance (QA) and quality control (QC) activities will be implemented during the duration of the cleanup project. In order to collect defensible and replicable environmental data for decision making purposes, a project should be conducted in three phases: planning, implementation, and assessment. During the Planning Phase, Data Quality Objectives (DQO) are developed that define the expectations and requirements of the decision maker (i.e., data user). In the Implementation Phase, the specifications or standard operating procedures (SOP) for the data collection activities are established to meet the DQO of the data user. During the Assessment Phase, the data is evaluated to determine whether the DQO have been satisfied. Statistical tools are used to determine whether the error in the data is small enough to meet the DQO of the decision maker.

This QAPP is comprised of four elements which are as follows:
Section A – Project Management
Section B – Measurements and Data Acquisition
Section C – Assessment and Oversight
Section D – Data Validation and Usability

A.5.1 Background

This QAPP was developed for the cleanup of asbestos and lead-based paint contamination at the Site at 301 North State Line Avenue, Bowie County, Texarkana, Texas. The City plans to provide funding assistance for the cleanup through their EPA RLF grant. Built in 1925, the Grim Hotel was originally an eight-story hotel with a basement and approximately 103,000 square feet of floor space. When completed, the building was the second tallest building in the City of Texarkana and was the hub of downtown and community activity. The building was added to the National Historic Registry in 2015 for its local historic significance and distinct architecture. Several businesses were formerly in operation within the Grim Hotel, including a barber shop, drug store, and cigar store. The building has been vacant since 1990, when the building was boarded up with some furnishings left in place. Vandalism and a compromised roof have led to damage of interior surfaces including asbestos and lead contamination of debris throughout the building. The Grim Hotel is located on the southern portion of the Site, and on the northern portion is vacant lot enclosed by chain-link fencing. See figures in Appendix A.

A.5.2 Project Definition

This QAPP was prepared to ensure that data collected and procedures implemented during the cleanup activities can be used to confirm that the corrective remedies met the performance criteria and goals for the Site, ensures compliance with applicable environmental laws, and addresses current and future risk to human health, welfare, and the environment.

<u>Asbestos</u>
Final clearance air monitoring will be performed after the asbestos containing material (ACM) and asbestos contaminated debris is removed. Clearance air monitoring must be completed for all abatement projects except where demolition will commence immediately following completion of abatement and successfully passed final visual clearance. The final air clearance will be conducted using aggressive air sampling techniques as defined in the EPA Asbestos Hazard Emergency Response Act AHERA regulation 40 Code of Federal Regulations (CFR) 763, Subpart E, Appendix A.

The final clearance requirements will be either for National Institute of Occupational Safety and Health (NIOSH) Phase Contrast Microscopy (PCM) Method for PCM sampling and analysis using NIOSH Manual of Analytical Methods (NMAM) Method 7400 or EPA Transmission Electronic Microscopy (TEM) Method.

Lead-based paint
Lead-based paint is defined by the EPA as any paint that contains more than 5,000 milligrams per kilogram (mg/kg) or parts per million (ppm) or 0.5 percent lead by weight. HUD Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing were used a guideline for the development of the following clearance criteria.
Building Interior: Floors - 40 micrograms/square foot;
Interior Window Sills - 250 micrograms/square foot;
Window Troughs - 400 micrograms/square foot.

During abatement or demolition, air monitoring and respiratory protection must be provided in accordance with 29 CFR 1926.62 if to prevent workers exposed to lead concentrations above the permissible exposure limit (PEL) of 50 micrograms/cubic meter (µg/m3).

Soil and groundwater
The cleanup standards for soil and groundwater will be determined by the approved the TCEQ response action. The TCEQ Action Levels identified in previous reports include the Tier 1 protective concentration level (PCL) – The lower of the TCEQ Residential Tier 1 Protective Concentration Levels for a 0.5-acre source area protective of combined human exposures or soil migration to groundwater. For certain metals in the soil, the Texas-specific background concentration (TSBC) may be used as the PCL. Evaluation of exposure pathways and/or property restrictions could allow contaminants to be managed in place at current concentrations. A Municipal Settings Designation (MSD) could be pursued as a remedial option to eliminate the groundwater ingestion pathway. The MSD, supported by a City Ordinance and TCEQ Certification would prohibit the use of shallow groundwater and restrict access to the affected groundwater via deed restriction prohibiting installation of water wells and groundwater use within the affected property.

A.6. Project/Task Description and Schedule

The objective of the Project is to reduce exposure of asbestos, lead-based paint, and soil and groundwater contamination at the Site while complying with all applicable environmental regulations and protecting human health and the environment. The end goal of the Project is to abate the asbestos and lead-based paint hazards and remediate the soil and groundwater contamination to allow for redevelop of the Site for residential and commercial use.

Asbestos contamination is present on all floors of the building and loose or deteriorated asbestos-containing material has been spread throughout the interior causing contamination of building debris and furnishings.

Lead-based paints are present on all floors of the building on walls, ceilings, columns, pillars, trim, doors, windows and railing. The lead-based paints are in poor condition with extensive flaking, peeling and chalking.

Metals have been detected in the soil and groundwater on the Site at concentrations exceeding state action levels. Mercury, arsenic, and lead were detected in soil collected from 1-2 feet below the ground surface, and lead was detected in the on-site groundwater. Measurements will be made to determine if cleanup activities have sufficiently removed contaminants to acceptable levels.

Schedule
The proposed project schedule is as follows, subject to changes:
- March 2018-QAPP submittal, April 2018 -EPA review and comments, January 2019 revised QAPP submittal

- March 2019 - QAPP approved and Cleanup Plans approved; initiate cleanup activities, including TCEQ Voluntary Cleanup Program (VCP) or Industrial and Hazardous Waste Corrective Action Program (CAP) application for soil and groundwater contamination
- April 2019 – Begin asbestos and lead-based paint removal (estimated 30 days for field activities). TDSHS notification required at least 10 working days before any activity that will disturb or remove ACM or asbestos contaminated material

Soil and Groundwater schedules will be updated and shared with the EPA project officer after the site is enrolled in the VCP or CAP.
Reports summarizing the field activities and data will be submitted within 30 days of the project completion.

A.7. Quality Objectives and Criteria for Measurement Data

Precision
Precision is a measure of the variability of a measurement system of the same property collected under similar conditions. Precision is typically estimated by means of duplicated and replicate measurements and is expressed in terms of relative percent difference (RPD). For field sampling, precision is increased by following SOPs and by collecting all samples using the same sampling procedures. Field QC samples that are collected to measure precision include field blind replicate samples from each media type. Field measurement precision is monitored by taking replicate measurements. Field measurement precision is increased through proper operation and maintenance of field equipment. For analytical procedures, precision may be specified as either intralaboratory (within the same lab) or interlaboratory (between different labs). Intralaboratory precision is more common and is the variability when a single lab uses the same method to make repeated measurements on the same sample. Interlaboratory precision is the variability when multiple labs use the same method to make measurements on the same or identical samples. When possible a sample should be subdivided (i.e., split) in the field and preserved separately, if necessary, to assess the variability of sample handling, preservation and storage along with the variability of the analysis process.

The precision of duplicates or replicates is assessed by calculating the RPD between the duplicated or replicated results. The goal for precision of field duplicate results is ± 50 percent RPD for soil/sediment samples and ± 35 percent RPD for water samples. The RPD between duplicate or replicate sample results is calculated by the following equation:

$$RPD\ (\%) = \left[\frac{S - D}{\left(\frac{S + D}{2}\right)}\right] \times 100$$

Where S is the concentration of the original sample and D is the concentration of the duplicate sample. Precision for laboratory analysis for the Project will be measured by LCS and LCSD samples.

Accuracy
Accuracy is a measure of closeness or agreement of an individual measurement or average of a number of measurements to the observed value or test response to the true or acceptable reference value or the test response from a reference method. It is influenced by both random error (precision) and systematic error (bias). The terms “bias” is the constant or systematic distortion of a measurement process which differs from random error which manifests itself as a persistent positive or negative deviation from the know or true value. This can result from improper data collection, poorly calibrated analytical or sampling equipment, or limitations or errors in analytical methods and techniques.
Accuracy is expressed as the percent recovery (%R) of a spiked sample. In the laboratory, a sample is spiked with a known concentration of a chemical(s) from a list of analytes detectable by the method being

evaluated. Accuracy of laboratory analyses will be assessed by LCS, MS, surrogate standards, and initial and continuation calibration of the instrument. The results provide information on matrix interference and method performance. The %R is calculated as follows:

$$\%R=100 \times \frac{X_S-X}{T} \frac{X_S-X}{T}$$

Where XS is the measured value of the spiked sample, X is the measured value of the unspiked sample, and T is the true value of the spike solution added. Accuracy for sampling will be increased by establishing a sound sampling strategy and following appropriate SOPs. QC measures used to monitor accuracy of field measurements include comparison of results to field notes and observations. Accuracy for laboratory analyses will be assessed per the laboratory QAM in Appendix D.

Representativeness

Representativeness refers to the extent that the sample data precisely and accurately represent the characteristics of a group of samples, parameter variations at a sampling point, or an environmental condition. Representativeness is a qualitative parameter that depends on the proper design of the sampling program and proper laboratory protocol.

Field duplicates provide a measure of assurance that the samples are representative of the sampling point. Since field duplicates will not be collected for the Project, method blanks will be used to determine if cross-contamination has taken place in the laboratory.

Representativeness will also be satisfied by seeing that this QAPP is followed, samples are collected in accordance with the appropriate SOPs, proper analytical procedures are followed, and holding times of the samples are not exceeded in the laboratory.

Comparability

Comparability is qualitative measure of confidence with which one data set, element or method can be compared with another. The sample data should be comparable to other measurement data for similar sampling conditions. This parameter is achieved through standard sample collection techniques, analyses, and reporting the analytical results in appropriate units.

Generally, comparability will be attained by achieving the QA objectives for sensitivity, accuracy, precision, completeness and representativeness given in this QAPP. Following field and laboratory procedures consistently for this Project will also achieve comparability of data. EPA-approved standard field procedures such as those discussed in Section 3.2 of this QAPP will be used to the extent possible. EPA-approved laboratory methods will be used to increase comparability of laboratory analytical data generated for this Project.

Completeness

Completeness is a measure of the amount of valid data obtained from a measurement system compared to the total number of measurements necessary to achieve a specified level of confidence in decision-making. The completeness goal for data is 90% useable. Samples collected using the methodology with this QAPP are expected to yield useable data.

Completeness of sample collection is the ratio of the samples collected to the number of samples planned to be collected. The completeness of sample collection is 50% of proposed samples collected. The number of samples necessary to confirm regulatory compliance will be determined during cleanup activities and will depend on the number of days on-site.

$$\%Completeness = 100 \times \frac{Number\ of\ Valid\ Results}{Number\ of\ Expected\ Results}$$

A.8. Special Training Requirements and Certifications

The Borrower's QA Manager will be responsible for working with Contractors to ensure all personnel on-site have the applicable training and certification requirements. The Borrower's QA Manager will retain this information on-site and will provided confirmation of completing this task to the Grantee QA Manager.

A.8.1 Field Sampling and Measurement Personnel

Asbestos must be abated by a licensed asbestos abatement contractor, and a National Emission Standards for Hazardous Air Pollutants (NESHAP) trained person must be onsite during the removal. Asbestos Hazard Emergency Response Act (AHERA) accreditation and a TDSHS license will be required for the asbestos inspection, removal, and confirmation testing personnel.

Lead-based paint sampling will be conducted by TDSHS-licensed Lead Inspectors, Lead Risk Assessors and Lead Project Designers.
40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) certification and up-to-date 8-hour refreshers, as applicable, in accordance with 40 CFR Part 311. Required for all field personnel collecting soil and groundwater samples.
Drilling contractors must possess a current water well driller's license in accordance with the Texas Occupations Code, Title 12, Chapter 1901.

A.8.2 Laboratory Personnel

The laboratory training is included in the laboratory's QAM, include in Appendix D.

A.9. Documents and Records

A.9.1 Field Documentation and Records

Field documentation will provide evidence of activities performed and observations made during the field activity. This is essential to documenting deviations and is critical in evaluating the usability of the data. Records will be recorded in permanent ink, legible, scanned to a project folder daily, and electronic records will be backed-up daily and protected from unauthorized access. Copies of all field records will be provided to the Grantee QA Manager and the QEP QA Manager electronically at least once per week (more often if requested by any stakeholder). Electronic documents will be stored for five years by Stanley Consultants in accordance with their project filing system (Bentley ProjectWise) which is backed up twice a day. The original field documents will be retained by the contractor generating the forms until the Project is complete and EPA has approved the final reporting.

Field documentation will be in accordance with SOPs in Appendix C and include the following, as generated per activity:

- Daily activity reports – Document the activities completed that day, personnel, hours of activities, weather, any significant findings or items of interest, and any deviations from the QAPP
- Field logbooks or forms – Include notes of sample collection including sampler name, Sample locations, descriptions, date and time of sample collection, sample type/media, and sampling equipment, and observations
- Chain-of-custody (COC) – Sample jars labeled with location, date, time, preservation; COC forms completed, include sample information, sampler's signature, and courier information; custody seals attached to shipping containers.
- Boring Logs, Monitor Well Installation Forms, and Monitor Well Sampling Forms
- Data validation/data quality assessment reports
- Field instrument documentation – equipment models, serial numbers, calibration logs
- Other relevant documentation including photographs, letters, memos, video and audio media
- Project audit and QA reports and deviations from the QAPP

All field forms should be signed and dated with any blanks crossed out. Error corrections shall be made by marking through the error with a single line and initialing and dating the correction, so that the original entry is readable.

A.9.2 Laboratory Documentation and Records

Laboratory reports may be generated by both on-site and off-site laboratories. Laboratory reports shall show traceability to the sample analyzed and will include the following information as applicable to sample type:

- Document the project identification; field sample number; laboratory sample number; sample matrix description; dates and times of sample collection, receipt at the laboratory, sample preparation and analysis; analytical method description and reference citation; individual parameter results with concentration units; quantitation limits achieved; dilution or concentration factors; data qualifier code and description; and analysts' and QA/QC reviewer's name.
- COC forms
- Deviations from the spec from the specified analytical method, explanation of data qualifiers applied to the data, and any other significant problems encountered during the analysis. A narrative that describes all QC nonconformance experienced during sample analysis, along with the corrective actions taken.
- Data summary forms and QC summary forms for sample results, surrogate results, blank results, field QC samples results, MS/MSD results, MS results, initial and continuing calibration results, confirmatory results, LCS/LCSD results and other QC sample results.
- MDLs and instrument detection limit results; laboratory control charts
- Raw data such as chromatograms, peak area, and retention times for gas chromatography (GC) and high performance liquid chromatography (HPLC) analyses, mass spectra for gas chromatography/mass spectrometry (GC/MS) analyses, and laboratory bench sheets (if requested).

The laboratory QA Manager is responsible for seeing that all laboratory data reporting requirements in the QAPP are met. Analytical records will be maintained by the laboratory for a period of five years. Samples will be retained by the laboratory until the final laboratory report is issued. The laboratory will dispose of samples in accordance with applicable regulations. An example Level 2 Laboratory Analytical Report is provided in Appendix D.

A.9.3 Technical Reviews and Evaluations

Technical reviews of the field activities and laboratory reports will be conducted throughout the project by the Borrower's QA Manager. The Borrower's QA Manager will observe selected sampling events to ensure that sample collection and field measurements are conducted according to the QAPP, Cleanup Plans, and Federal/State requirements. If necessary, Corrective Action Reports will be prepared after the field audit which should be conducted at least once per year. Field audits and Corrective Action Reports will be forwarded to the Grantee QA Manager for review.

The Borrower or his delegate will prepare reports of the cleanup activities after they are finished.

Quarterly and Annual reports as required by the RLF grant will be completed by the Grantee. Final reports of the cleanup activities will be stored in the information repository for this project at the City of Texarkana's Library.

All project documents will be filed following the procedures of the City of Texarkana's filing system. Reports and electronic documents will also be stored per Stanley Consultants' standardized project filing system. Documents will be maintained for at least five years.

B.1. Sampling Process Design & Site Figures

Site figures are included in Appendix A. Table B-1 in Appendix B includes details of the sampling design.

Asbestos

The asbestos removal process includes:

1. Remove and dispose all identified asbestos-containing materials.
2. Remove and dispose all asbestos-containing debris and furnishings.
3. Decontaminate all remaining interior surfaces from asbestos fibers.
4. Obtain final clearance air levels by PCM and/or TEM in accordance with these specifications.

The asbestos sampling design includes:

Pre-abatement Environmental Air Monitoring

Pre-abatement environmental air monitoring shall be established (baseline) prior to the masking and sealing operations for each regulated area to determine background concentrations before abatement work begins. As a minimum, pre-abatement air samples shall be collected using NIOSH Method 7400 (PCM) at these locations: outside the building; inside the building, but outside the regulated area perimeter; and inside each regulated work area. One sample shall be collected for every 2000 square feet of floor space. At least 2 samples shall be collected outside the building: at the exhaust of the high-efficiency particulate air (HEPA) units; and downwind from the abatement site. The PCM samples shall be analyzed within 24 hours; and if any result in fiber concentration greater than 0.01 f/cc, asbestos fiber concentration, confirmed using NIOSH Method 7402 TEM, may be requested by the Contractor, Grantee, Borrower, QEP, or EPA.

Environmental Air Monitoring During Abatement

Environmental air monitoring shall be conducted at locations and frequencies that will accurately characterize any evolving airborne asbestos fiber concentrations. The monitoring shall be at least once per shift at locations including, but not limited to, close to the work inside a regulated area; pre-abatement sampling locations; outside entrances to a regulated area; close to glovebag operations; representative locations outside of the perimeter of a regulated area; inside clean room; and at the exhaust discharge point of local exhaust system ducted to the outside of a containment. If the sampling outside regulated area shows airborne fiber levels have exceeded background or 0.01 f/cc, whichever is greater, work shall be stopped immediately, and the Borrower's Construction Manager, the Borrower's QA Manager and the QEP Project Manager notified. The condition causing the increase shall be corrected. Work shall not restart until authorized by the Borrower's Construction Manager, the Borrower's QA Manager.

Final Clearance Air Monitoring

The Borrower's QA Manager and/or Air Monitoring Technician (AMT) shall perform clearance testing for each enclosed area. Final air clearance will be conducted using aggressive air sampling techniques as defined in 40 CFR 763, Subpart E, Appendix A, for all indoor asbestos abatement projects. Clearance air monitoring is not required for outside work.

EPA TEM Method for EPA TEM sampling and analysis, using the EPA Method specified in 40 CFR 763 Appendix A, abatement inside the regulated area is considered complete when the arithmetic mean asbestos concentration of the 5 inside samples is less than or equal to 70 structures per square millimeter (70 S/mm). When the arithmetic mean is greater than 70 S/mm, the 3 blank samples shall be analyzed. If the 3 blank samples are greater than 70 S/mm, resampling shall be done. If less than 70 S/mm, the 5 outside samples shall be analyzed and a Z-test analysis performed. When the Z-test results are less than 1.65, the decontamination shall be considered complete.

If the Z-test results are more than 1.65, the abatement is incomplete and cleaning shall be repeated. Upon completion of any required recleaning, resampling with results to meet the above clearance criteria shall be done. For environmental and final clearance, air monitoring shall be conducted at a sufficient velocity and duration to establish the limit of detection of the method used at 0.005 f/cc.

Air Clearance Failure
Where clearance sampling results fail to meet the final clearance requirements, the contractor shall incur all costs associated with the required recleaning, resampling, and analysis, until final clearance requirements are met.

Exposure Assessment and Air Monitoring
Exposure assessment, air monitoring and analysis of airborne concentration of asbestos fibers shall be performed in accordance with 29 CFR 1926.1101, and the Contractor's air monitoring plan. Results of breathing zone samples shall be posted at the job site and made available to the Project Manager. Submit all
documentation regarding initial exposure assessments, negative exposure assessments, and air-monitoring results.

Worker Exposure.
1) The Contractor's Designated AMT shall collect personal samples representative of the exposure of each employee who is assigned to work within a regulated area. Breathing zone samples shall be taken for at least 25 percent of the workers in each shift, or a minimum of 2, whichever is greater. Air monitoring results at the 95 percent confidence level.
2) The Contractor will contract directly with an independent testing laboratory with qualified analysts and appropriate equipment to conduct sample analyses of air samples using the methods prescribed in 29 CFR 1926.1101, to include NIOSH Method 7400.
3) Workers shall not be exposed to an airborne fiber concentration in excess of 1.0 f/cc, as averaged over a sampling period of 30 minutes. Should a personal excursion concentration of 1.0 f/cc expressed as a 30-minute sample occur inside a regulated work area, stop work immediately, notify the Consultant's Project Manager, and implement additional engineering controls and work practice controls to reduce airborne fiber levels below prescribed limits in the work area. Do not restart work until authorized by the Project Manager.

Lead-based paint
The lead removal process includes:

1. Remove and dispose all lead contaminated debris and furnishings.
2. Remove and dispose all damaged and flaking lead-based paints.
3. Remove and dispose all lead painted components not scheduled for reuse. Components to include doors, door trim, trim work, molding, window components, wanes coating and other damaged components having lead-based paints.
4. Remove and dispense of non-structural ceiling and walls as lead contaminated where specified for removal in architectural demolition plans.
5. Obtain final HUD level clearance for lead dust from each room equivalent space.
6. Partial stripping of lead-based paints from remaining surfaces as needed to facilitate general building repairs and renovations.
7. Apply prime coat of paint to seal all remaining walls and ceilings where lead paints are not removed in their entirety.
8. Removal of all damaged structural components and damaged sub-structural components as needed to complete asbestos and lead hazard abatement.

The lead sampling design includes confirmation of the following:
Paint or other surface coatings will have the lead removed or stabilized by painting to achieve lead levels below 1 mg/cm^2 or less than 0.5% by weight.

Clearance monitoring will be performed with the following action limits:
Target housing and child occupied facilities:
Building Interior:
Floors - 40 micrograms/square foot.
Interior Window Sills - 250 micrograms/square foot
Window Troughs - 400 micrograms/square foot.
Building Exterior:
Bare soils in play areas used by children under the age of 6 - 400 mg/kg
Bare soils, all other areas - 1200 mg/kg

Soil and Groundwater
The soil and groundwater sampling will be dependent on the project is enrolled in the TCEQ's VCP or CAP. The process design may be encapsulating the site and/or limited soil removal. Confirmation soil and groundwater samples will be collected to evaluate if TCEQ cleanup levels have been met. The QAPP will be updated before soil and/or groundwater sampling activities begin.

B.2. Sampling & Analytical Method Requirements

Sampling methods and equipment will be selected to meet project objectives, and samples will be collected according to the ASTM and EPA field SOPs included in Appendix C. If an SOP is updated or revised, the updated or revised SOP will be used for the subsequent sampling event(s). Any revisions/updates to SOPs will be documented in an amendment to the QAPP. Affected media include groundwater, surface and subsurface soils, building materials, and air. Sampling methods are summarized on table in Appendix B.

Asbestos and lead samples will be collected and analyzed by one or more of the following SOPs or methods:
- Asbestos Abatement and Management in Buildings Model Guide Specifications, NIBS,1996
- Aggressive air sampling techniques defined in 40 CFR 763, Subpart E
- Appendix A ASTM E1728 (2016) "Collection of Settled Dust Samples Using Wipe Sampling Methods for Subsequent Lead Determination"
- ASTM E1792 (2003; R 2016) "Standard Specification for Wipe Sampling Materials for Lead in Surface Dust"
- NIOSH Method 7400 Phase-Contrast Microscopy (PCM)
- EPA Method 40 CFR 763 Appendix A for TEM
- OSWER Publication 9360.4-05, "Compendium of Environmental Response Team (ERT) Air Sampling Procedures," PB92-963406 (EPA 1992a)

Soil and groundwater samples will be collected and analyzed by one or more of the following methods:
- OSWER Publication 9355.0-14 "A Compendium of Superfund Field Operations Methods," PB88-181557, EPA 1987
- ERT SOP 2012 "Standard Operating Procedures Soil Sampling", February 18, 2012
- ERT, US EPA Publication 160014-891034 "Handbook of Suggested Practices for the Design and Installation of Ground-Water Monitoring Wells", March 1991
- EPA Region 1 SOP-GW4 "Low-Stress (log flow) Purging and Sampling Procedure for the Collection of Groundwater Samples from Monitoring Wells", September 2017.

B.3. Sample Handling and Custody Requirements

The transfer of sample custody will be limited between the field sampler, the express carrier (if applicable), and laboratory personnel. The primary objective of custody requirements for this project is simply to track that samples are handled by authorized personnel and to document that handling occurred within the parameters of the QAPP.

In general, the outline for sample handling and custody will be as follows.

- The field lead will brief sampling personnel on custody procedures.
- Samples will be in the custody of the field team at all times.
- The field team will maintain COC documentation from the time of sampling until the sample is delivered to the laboratory.
- Samples will be delivered to the on-site laboratory immediately after sample collection or to an off-site laboratory via an overnight courier on a daily basis when necessary to meet analytical holding times.
- The laboratory will implement tracking and custody documentation.
- Post-analysis samples will be disposed of properly.

Laboratory QA/QC requirements will be conducted in accordance with the laboratory QAM in Appendix D.
COC protocol will be adhered to during all phases of sample collection, storage, shipment, and analytical procedures. Example COC forms, custody seal, and soil/sediment jar label are included in Appendix E. Asbestos samples will be placed in sealed plastic bags and will not cooled for transport.

B.4. Analytical Methods and Requirements

Analytical services will be provided by TestAmerica and EMSL Laboratories with their QAMs provided in Appendix D. The samples will be analyzed and reported by the laboratory standard turnaround time, which is generally two to three weeks. Analytical methods and requirement are shown on Table B-1 in Appendix B and in the QAM in Appendix D,

If the analytical system fails, the laboratory will notify Project Coordinator and corrective action will be taken. In general, corrective actions will include stopping the analysis, examining instrument performance and sample preparation information, and determining whether instrument recalibration and re-preparation and re-analysis of samples are warranted. Parameters will be reported to the MDLs provided in the laboratory QAM in Appendix D.

B.5. Quality Control Requirements

Field sampling QC will consist of collecting field QC (blanks, replicates) samples as summarized on Table B-1 in Appendix B.

Blank samples (Field, Equipment) will be collected and analyzed to determine whether contamination has been introduced into a sample set either in the field while samples are being collected or during sample transportation to the laboratory. Field and equipment blanks will be collected at a frequency of 1 per day or 5% of the total number of primary field samples. If dedicated or disposable sampling equipment is used, the frequency of the equipment blanks will be at least one per sampling device.

Replicate samples will be collected from the same location by the same procedures as the primary field sample to demonstrate precision of sampling and laboratory proficiency in the execution of the collection and measurement process. The frequency of duplicate and replicate collection will be at a rate on one per analytical method, per medium, per day.

The Project acceptance criteria for field duplicates and replicates will be a measurable concentration within a range of 20% above or below the averaged concentration of original samples represented by replicates. Duplicates and replicate soil samples will be collected by homogenizing the soil in a clean, stainless steel bowl before placing in laboratory-provided containers. Duplicate and replicate groundwater samples will be collected by pouring water into sampling containers at equal small intervals until the bottles are filled.

Field split samples may be collected at the discretion of the Grantee QA Manager or EPA QA Officer. A primary field sample will be divided into two equal representative parts and submitted to two difference laboratories for the same analyses by the same methods. The purpose of the split sample analyses is to demonstrate precision of sampling procedures and proficiency of the laboratory's analytical methods. The precision goal for split samples will be 50% RPD.

Laboratory QA/QC requirements will be conducted in accordance with the laboratory QAM in Appendix D, and may include bottle blanks, laboratory instrument blanks, method blanks, LCS, MS/MSD analysis, and laboratory reagent blanks. The purpose of the bottle and instrument blanks is to demo that the analytical equipment is free of contamination prior to analyses. The purpose of method and reagent blanks are to demonstrate the analytical procedures do not result in the introduction of laboratory contaminants into the primary sample. Typical laboratory contaminants include: acetone, 2-butanone (aka., methyl ethyl ketone (MEK)), methylene chloride, and phthalate esters. Laboratory blanks should be at a rate of one for every 20 field samples or at least one per day whichever is more frequent. The purpose of LCS is to demonstrate accuracy of an analytical method while MS/MSD is to demonstrate precision. The rate at which LCS and MS/MSD should be analyzed is at least one per day or one every 20 field samples whichever is more frequent.

Corrective actions will be taken at the discretion of the EPA Project Officer or QA Manager if there appears to be problems that could adversely affect data quality and/or resulting decisions affecting future response actions pertaining to the site.

B.6. Instrument/Equipment Testing, Inspection, and Maintenance

Testing, inspection, and maintenance methods and frequency will be based on the type of instruments; its stability characteristics; the required accuracy, sensitivity, and precision; its intended use, considering the DQOs; manufacturer's recommendations; and other conditions affecting measurement or operational control.
The purpose of which is to verify that all equipment and instrumentation is capable of operating at acceptable levels of accuracy. Inspection, maintenance, and testing procedures may include reference materials, QC (ex. calibration) standards, and/or a certification program. The accuracy of calibration standards is critical as all data collected will be measured in reference to the standard used and should be in accordance with the manufacturer's or EPAs SOPs and prior to the standard's expiration date.

Some field instruments require using a calibration apparatus rather than a standard and will receive scheduled bench calibration to check instrument response to manufacture's accepted check measurements. Calibration methods and results will be documented on calibration logs and placed in the project file.
Any field or laboratory instrument that is in disrepair or is out of calibration will be segregated, clearly marked, and not used until it is repaired and recalibrated. It is the responsibility of the contractor's Field Team Leader to notify the QA Manager of the status of all field equipment and instrumentation. The QA Manager will make sure the field crews have the necessary equipment and instrumentation to complete the required tasks.

Field Instruments
Field instruments may include PID, groundwater pumps, water quality meters, and water level meters. The field technicians are responsible for thoroughly checking and calibrating each instrument before taking it to the field and including instructions for field calibration, testing and maintenance of each instrument used in the field. Once in the field, the field person will perform the required field testing, calibration and maintenance of the equipment.

Field equipment and instruments will be inspected for damage prior to mobilization and after arrival in the field. Damaged equipment will be immediately replaced or repaired. Battery-operated equipment is checked to assure full operating capacity; if needed, batteries are recharged or replaced. Backup instruments, equipment, and additional spare parts will be available on site or within a 1-day shipping period to avoid delays in the field schedule. Following use, field equipment will be properly decontaminated prior to being returned to its source. When the equipment is returned, copies of any field notes regarding equipment problems will be included so that problems are not overlooked, and any necessary equipment repairs will be carried out.

Laboratory Instruments
ESC and EMSL Laboratories have a preventative maintenance programs covering testing, inspection, and maintenance procedures and schedules for each measurement system and required support activity. The programs are documented in the laboratory's QAM in Appendix D.

Instruments will be calibrated per manufacturer's specifications. Field instruments will be calibrated prior to each sampling event and at the end of the day or as instructed by the manufacturer. Field instruments include a low flow pump, water level indicator, and water quality meter for groundwater sampling and a photoionization detector (PID) for soil sampling. Calibration of field equipment will be documented on the Calibration Log included in Appendix E.

B.7. Instrument/Equipment Calibration and Frequency

Instruments that fail to calibrate or operator in accordance with manufacturer's specifications will be replaced via overnight delivery service and documented in the Project field book. The contractor's Field Team Leader to notify the QA Manager of the status of all field equipment and instrumentation and the need for repairs and replacement.

Field instrument measurements that may be collected for this Project are:
PID readings (ppm) – Calibration requirement: 1 pre-and post-field calibration (after each 8 hours of use)
Water quality readings - Calibration requirement: 1 pre-and post-field calibration (after each 8 hours of use)
Pumps and water level indicators typically don't require calibration.

The laboratory equipment will be calibrated in accordance with the laboratory QAM in Appendix D. Calibration records (including the dates and times of calibration and the names of the personnel performing the calibration) will be filed at the laboratory. The laboratory QA Manager is responsible for confirming that laboratory instruments are calibrating in accordance with this QAPP.

B.8. Inspection and Acceptance of Supplies and Consumables

The Borrower's QA Manager and contractors have primary responsibility for identifying the types and quantities of supplies and consumables needed for this Project. They are also responsible for determining the acceptance criteria for these items.

Supplies and consumables will be received at contractors' offices. When supplies are received, the contractors will inspect the condition of the supplies before they are accepted for use on the Project. If the supplies do not meet the acceptance criteria, the supplies will be returned to the vendor for replacement or repair.

Supplies and consumables to be used on the project include tools and equipment, glovebags, disposable containers, sheet plastic, solvents and cleaning agents, ventilation and vacuum equipment, filters, respiratory protection, disposable nitrile gloves. Acceptable criteria for the personal protection equipment (PPE) is that it is in new or good, clean condition with no visible holes or tears. Where applicable, disposable PPE (ex., Tyvek, gloves, boots) should be used so to reduce the potential for cross contamination. Similarly, certified contaminant-free disposable sampling equipment (ex, bailers, filters) should be used where possible. Laboratory containers shall have a Level II Certification from the manufacturer as meeting pre-cleaning criteria.

Additional information on supplies and consumables is included in the specifications in Appendix F.

B.9. Data Acquisition Requirements (Non-direct measurements)

Previously acquired sampling data and non-direct measurement data may be used for this Project when making comparisons, drawing conclusions, or decision making. The calculation of site-specific standards and cleanup goals may be based on external data sources and research. Several types of data and information may be obtained from non-measurement sources for use in projects conducted under this QAPP. This information may include existing sampling and analytical data from previous studies; historical maps, aerial, and site photographs; information from published literature, and background data from the facility or regulatory agency. Non-direct measurement data will be documented and referenced in any document for which they are used.

The QEP Project Manager will be responsible for verifying the accuracy of existing data that is used for Project decisions. The data will first be reviewed to verify the data is from a reliable source or accepted publication; The data is current and relevant to the Project area; the data is accessible for other parties to review if requested, and; we have permission to use the data. The data will then be reviewed to determine if the data is consistent with expected results, and any QA/QC information associated with the data will be reviewed. If the data are insufficient, limitations will be placed on the use of the data in supporting project decisions.

B.10. Data Management

Data for this Project will be obtained from a combination of sources, including field observations, fixed-site laboratory analyses, literature, and previously completed surveys and reports. The process of data gathering is a coordination effort and will be conducted by project staff in conjunction with potential data producers. The analytical data will be obtained from laboratories in the form of an electronic data deliverable. The data will be included in the final report for the Project. The QEP QA Manager will compare the analytical reports with the final report to ensure the accuracy of reported data.

A Data Management Plan will be maintained that supports project activities by creating and retaining records that document project activities in an accurate and transparent manner that will allow for reviews and data usability assessments. Sampling and training records will be maintained in the Data Management Plan and may potentially include specialized training certificates, sampling procedures, the names of the persons conducting the activity, sample number, sample collection points, maps, diagrams and/or photographs, equipment/method used, climatic conditions, and unusual observations. Bound field notebooks, pre-printed forms, or computerized notebooks can serve as the recording media.

The various data and information generated from this Project will be stored and maintained in the Grantee's office and electronically with the QEP Project Manager. Electronic copies of field logs, COC forms, original preliminary and final lab reports, and electronic media reports will be sent to the Grantee QA Manager and QEP QA Manager. The Borrower's Construction Manager or field crew will retain original field logs. The raw field data generated and stored on data loggers and portable laptop computers will be transmitted to the QEP Project Manager and converted to a standard database format. After data entry or data transfer procedures are completed for each sample event, data will be inspected for data transcription errors, and corrected as appropriate. At the end of the Project, the QEP Project Manager will archive all Project files which will be retained for 5 years. If the Project files need to be accessed following archiving, the QEP Project Manager will instruct the IT (information Technology) Department to reopen the Project.

C.1 Assessment/Oversight and Response Actions

The Borrower's QA Manager will evaluate the process and quality of performance for the Project. Measured parameters will be observed to ensure that the data meets the QA/QC requirements in the QAPP. At the Grantee QA Manger's or EPA QA Officer's discretion, performance and system audits of both field and laboratory activities may be conducted by the QEP QA Manager, EPA, or other regulatory agency to verify that sampling and analysis are performed in accordance with procedures and requirements established in this QAPP. Non-conforming items identified during an audit will be addressed by corrective action.

Auditors must be independent of the activities being audited. The Grantee QA Manager has the lead role in directing internal audit activities for the Project. The Grantee QA Manager will select the appropriate personnel to conduct each internal audit and will assign them responsibilities and deadlines for completing their audits.

Readiness Reviews

The Borrower's QA Manager will conduct a readiness review of the field team prior to starting field efforts, to confirm that the sampling personnel are properly trained by qualified personnel before any sampling begins. The Borrower's QA Manager will be on-site to observe supplies and equipment to ensure that they are appropriate and have been adequately cleaned and/or tested. The QEP Project Manager or designated personnel will check for proper paperwork, field forms, health & safety manuals/equipment. Any problems that are noted will be corrected before the sampling team is permitted to begin work.
Field activity audits

Unannounced Field activity audits will be performed weekly by the Grantee QA Manager or designated personnel to assess the field procedures, sample collection methodologies, and record keeping of the field team. Any deviations from the QAPP or Cleanup Plan will be corrected immediately, reported to the Grantee QA Manager and the QEP Project Manager, and documented in the Project file. Laboratory audits are conducted per the laboratory QAM in Appendix D.

Audit Reports

Audit reports will be prepared for performance and system audits of field and laboratory activities and laboratory performance evaluation studies that are conducted for the Project. Audit reports will identify audit participants, describe the activity audited, summarize audit findings, and detail any deficiencies or deviations from protocol that were discovered during the audits, as well as any corrective actions that are proposed. Any field or laboratory data that is generated during the analysis of blind performance evaluation samples must be validated. The validated data will be included with the audit report.

Audit reports are distributed to the Grantee Project manager and the QEP Project Manager. They will also be distributed to the QEP QA Manager, Borrower QA Manager, or the laboratory's QA Manager, as appropriate. The lead auditor has primary responsibility for seeing that audits are conducted thoroughly and properly. The QEP and the laboratory QA Manager are responsible for implementing corrective actions that result from an audit. The QEP QA Manager is responsible for verifying that recommended corrective actions have been implemented.

C.2 Reports to Management

The reports described and submitted to parties will be made part of the permanent data quality record. Additional routine reports describing the project activities, status, results of audits, corrective actions, needs for resolution among participating parties, and schedule changes will be distributed electronically and in writing. Any QA problems encountered will be included in these reports.

Project Reports

Document	Frequency	Prepared by	Submitted to	Distributed to
Daily Job Reports	Daily	Field crew	Borrower's QA Manager	Grantee QA Manager, QEP Project Manager
Laboratory Reports	As tasks are completed	Laboratory	Borrower's QA Manager	Grantee QA Manager, QEP Project Manager, QEP QA Manager
Environmental Data Reports	As tasks are completed	Contractors	Borrower	Grantee Program Manager, QEP Project Manager, QEP QA Manager
Status Reports	Monthly	Grantee Program Manager and QA Manager, QEP Project Manager	EPA Project Officer	Borrower
Final Report	Once	Grantee Program Manager and QA Manager, QEP Project Manager	EPA Project Officer	Borrower, Information Repository

D.1 Data Review, Verification, and Usability

The data evaluation process consists of three steps:
1. review,
2. verification,
3. usability assessment.

The purpose of which is to ensure that project data is of adequate quality (i.e., usability) to meet the DQO intended purpose. The data review and verification process will consist of a completeness check to confirm that all data requested from the field crew and laboratory has been received and complies with the specific DQO requirements. Samples are collected in the field based on the SOPs in Appendix C. and result in two data flows created from the sampling activities. 1) Field data is sent to the Borrower's QA Manager, and 2) Field samples under standard COCs are sent to a laboratory for analyses.

Laboratory data review and verification will be performed by a qualified laboratory analyst as described in the laboratory QAM included in Appendix D. The QEP QA Manager or designated personnel will be responsible for the validation and final approval of the data (including field notes) in accordance with the stated project purpose and use of the data. Any anomalies will be documented with corrective actions described and included in the final report to EPA.

Data reduction and review are essential functions of preparing data that can be effectively used to support project decisions and DQOs. These functions must be performed accurately and per EPA-approved procedures and techniques and region-specific guidelines. Data reduction includes computations and data manipulations that produce final results used for reporting. Data review includes procedures conducted by field or laboratory personnel to ensure that measurement results are correct and acceptable relative to QA objectives in the QAPP.

Field personnel will record raw data from field measurements in a field logbook or on field forms, data loggers, lap top computers or tablets. The Borrower's QA Manager has primary responsibility for verifying that field measurements were made correctly, confirming that sample collection and handling procedures specified in the QAPP and SOPs were followed, and verifying field data reduction and review procedures and requirements are followed. The QEP QA Manager will review the results from the Borrower's QA Manager. When field data are used in a project report, data reduction methods will be fully documented in the report.

The laboratory will complete data reduction for chemical and physical laboratory measurements and will complete in-house review of analytical results. The laboratory QA Manager is responsible for seeing that laboratory data reduction and review procedures and requirements in this QAPP are followed. The laboratory QA Manager is also responsible for assessing data quality and for advising the Borrower's QA Manager of possible QA/QC problems with laboratory data.

D.2 Data Verification and Validation Methods

Field sampling and measurement data
The Borrower's QA Manager will inspect all the data prior to submitting to the QEP QA Manger to provide final review and approval to ensure that the data meets the sampling requirements. At a minimum, the following items will be reviewed by the Borrower's QA Manager and submitted to the QEP QA Manager:

Field data
- Field forms completed as required in this QAPP
- Transcriptions from field notes to report

- Unusual, anomalous, or inconsistent items between the field notes, photographs, and analytical data

Laboratory data
Method analytical service requests;
- Holding times;
- Initial and continuing calibration acceptance criteria;
- Surrogate recovery;
- MS/MSD;
- Compound identification and quantitation; and
- Overall assessment of data in accordance with Project objectives.

Third party data validation is not proposed at this time. If review of the data suggests issues, the Grantee QA Manager or QEP QA Manager will propose additional data validation with a QAPP addendum or letter to EPA.

D.3 Reconciliation with User Requirements

If the project objectives from Section A.7 are met, the user requirements have been met. The QEP Project Manager will evaluate the data for completeness needed to achieve the Project's goal. If the data quality indicators do not meet the project requirements outlined in this QAPP the data may be discarded and re-sampling may occur. In case of a failure, the project team will evaluate the cause. If the failure is due to laboratory procedures or equipment, necessary corrective measures will be taken by the laboratory. If failure is associated with sampling, field procedures will be re-evaluated with any changes documented by the QEP Project Manager and included Project deliverables.

Once environmental data have been collected, reviewed, and validated, the data must be further evaluated to determine whether the DQOs identified in this QAPP have been met. The QEP Project Manager will follow EPA's data quality assessment (DQA) process to verify that the type, quality, and quantity of data collected are appropriate for their intended use. The DQA process involves first verifying that the assumptions under which the data collection design and DQOs were developed have been met. The DQA process then evaluates how well the data collected support the decision that must be made so that scientifically valid and meaningful conclusions can be drawn from the data. To the extent possible, the QEP will follow DQA methods and procedures outlined in EPA documents:

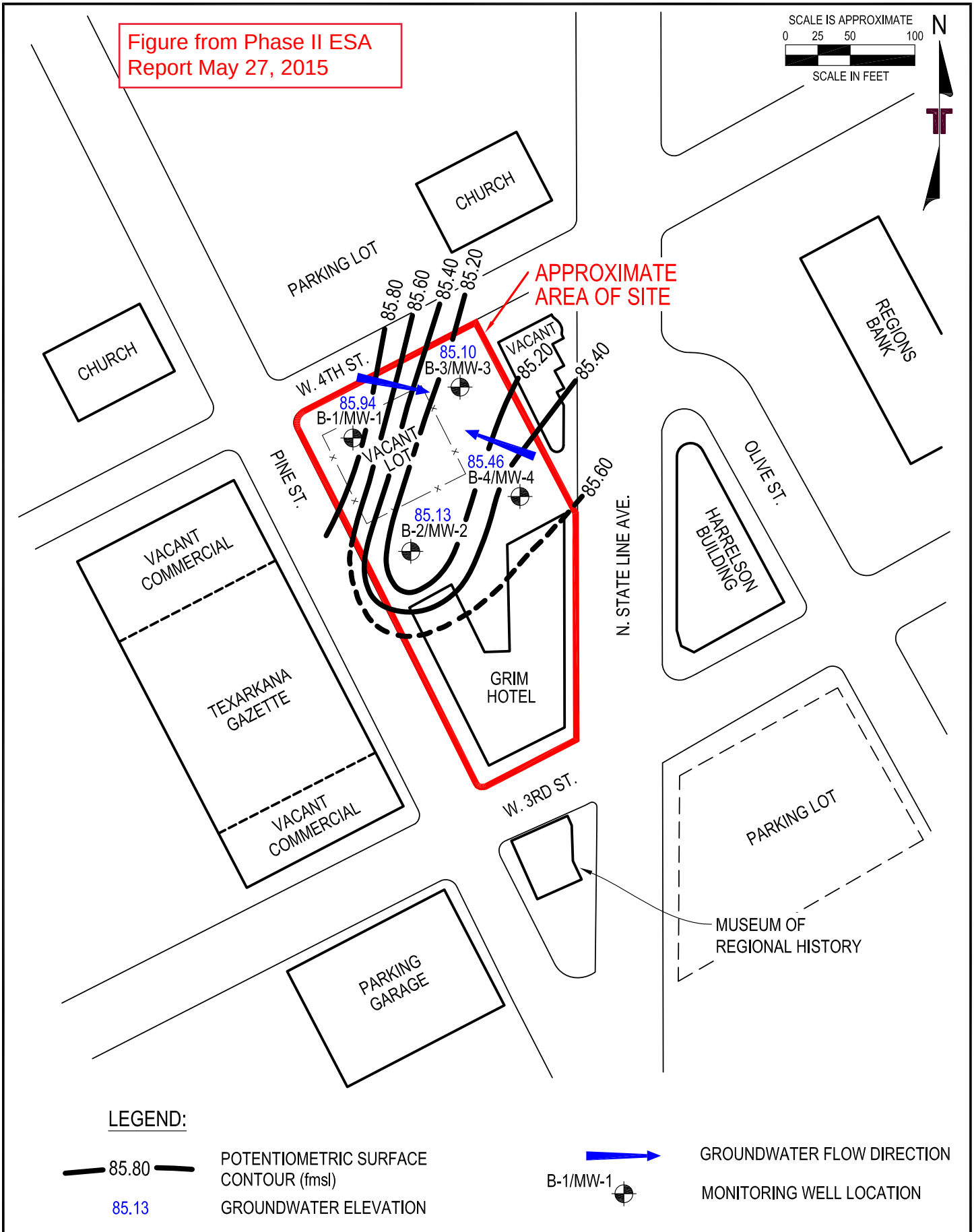
- Data Quality Assessment: A Reviewer's Guide, QA/G-9R (EPA, 2006b), and
- Data Quality Assessment: Statistical Tools for Practitioners, QA/G-9S (EPA, 2006c).

If data quality indicators do not meet the Project's requirements as outlined in this QAPP, the data may be discarded, and re-sampling and/or re-analysis may be required. In which case, the QEP Project Manager will notify the Grantee Program Manager and QA Manager.

Appendix A

Figures

Figure from Phase II ESA Report May 27, 2015



LEGEND:

85.80 — POTENTIOMETRIC SURFACE CONTOUR (fmsl)

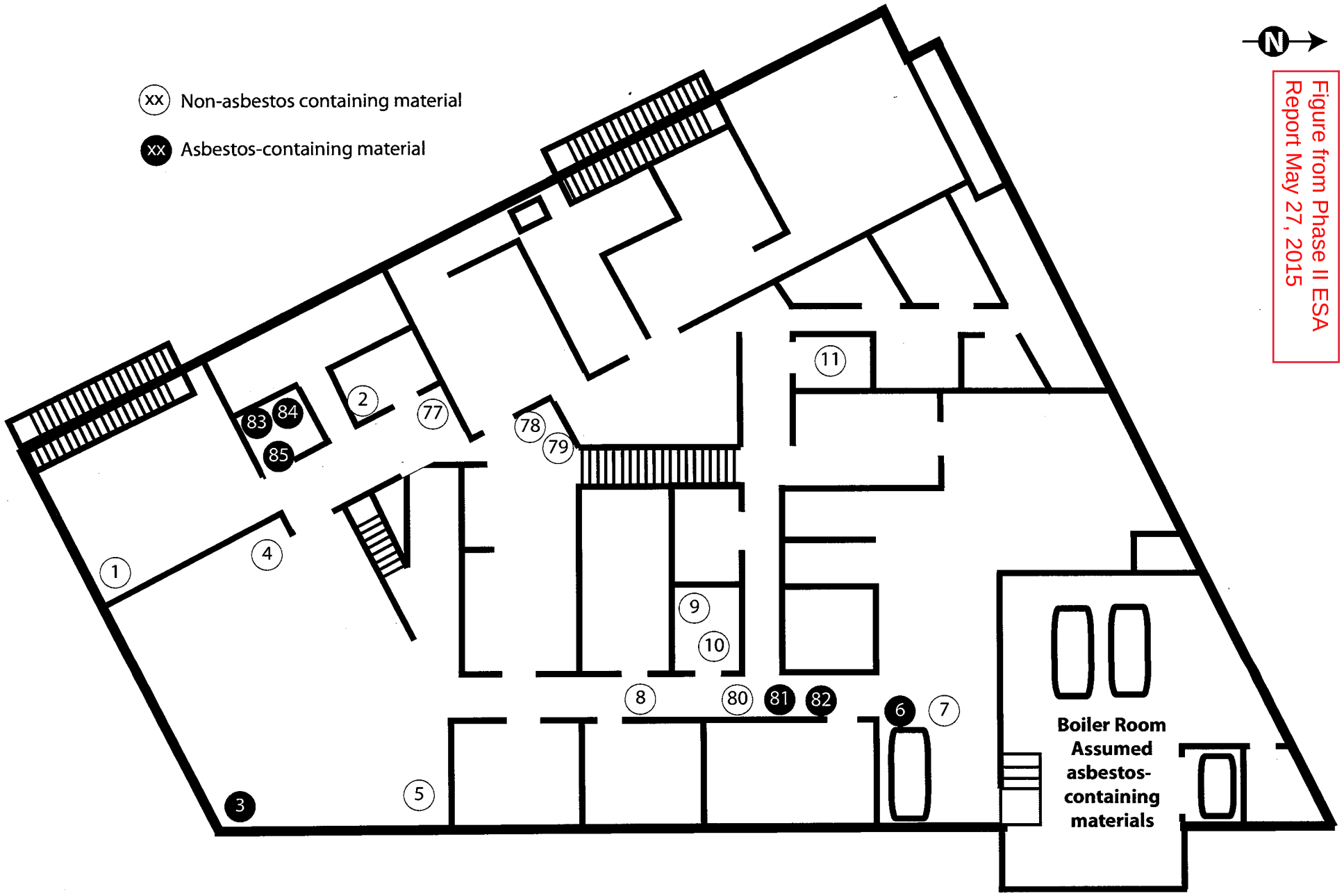
85.13 — GROUNDWATER ELEVATION

GROUNDWATER FLOW DIRECTION

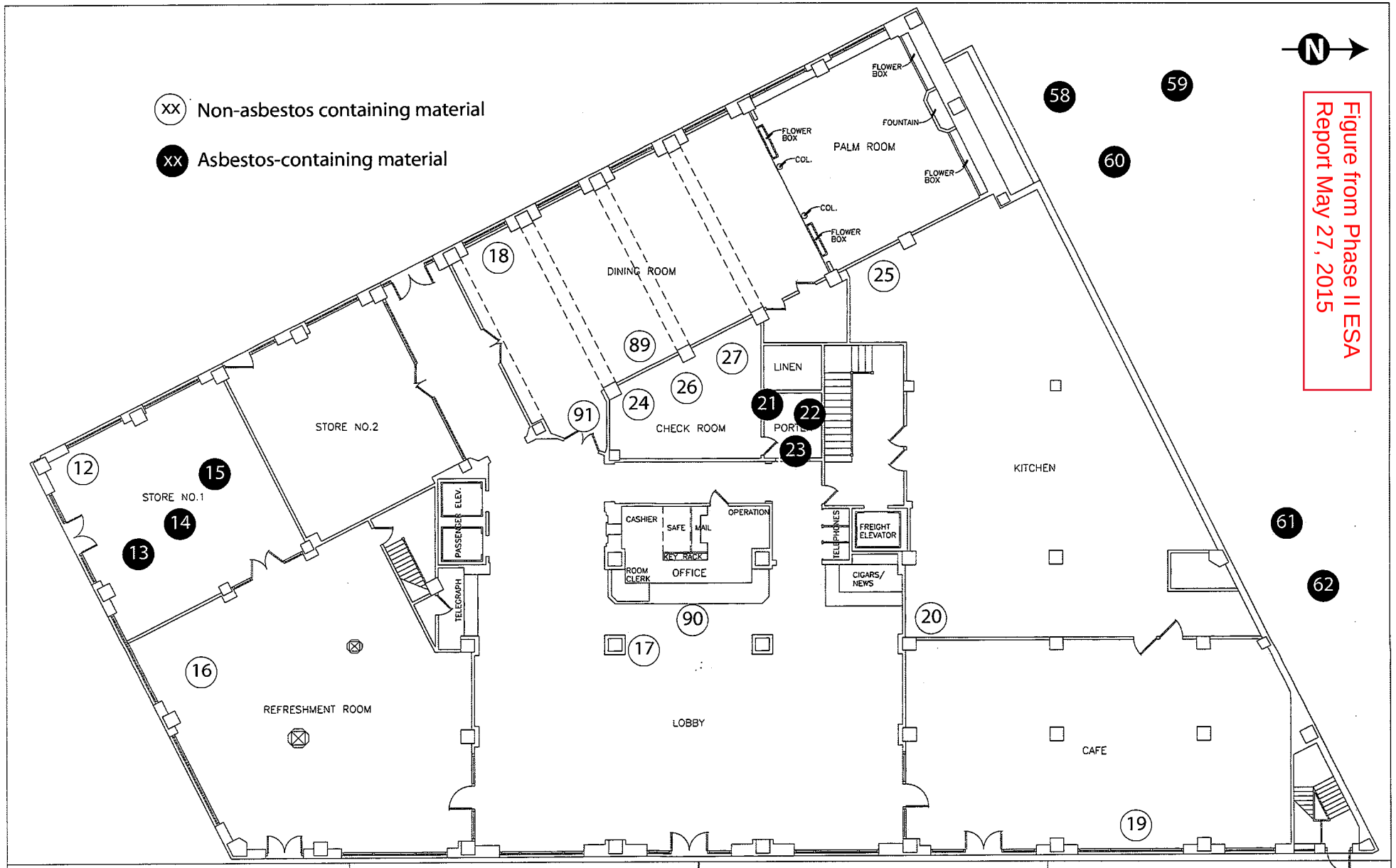
B-1/MW-1 — MONITORING WELL LOCATION

Project Mngr: LMN	Project No. 232-012-35107140	Terracon Consulting Engineers and Scientists	MONITORING WELL LOCATIONS
Drawn By: PTG	Scale: AS SHOWN	25809 I-30 SOUTH BRYANT, AR 72022	PHASE II ESA - GRIM HOTEL
Checked By: LMN	File No. 012 T4-16	PH. (501) 847-9292 FAX. (501) 847-9210	CITY OF TEXARKANA, TEXAS
Approved By: MR	Date: 4/27/2015		311 NORTH STATE LINE AVENUE
			TEXARKANA TEXAS

EXHIBIT 3



HOTEL GRIM 301 North State Line Avenue Texarkana, Texas 75501	**Asbestos Sample Location** **Basement Floor**	HEC Project # T15147 March 30, 2015	HEC Environmental Group, Inc. 409 Hazel Texarkana, AR 71854 870-772-4700



HOTEL GRIM 301 North State Line Avenue Texarkana, Texas 75501	**Asbestos Sample Location** **First Floor**	HEC Project # T15147 March 30, 2015	HEC Environmental Group, Inc. 409 Hazel Texarkana, AR 71854 870-772-4700

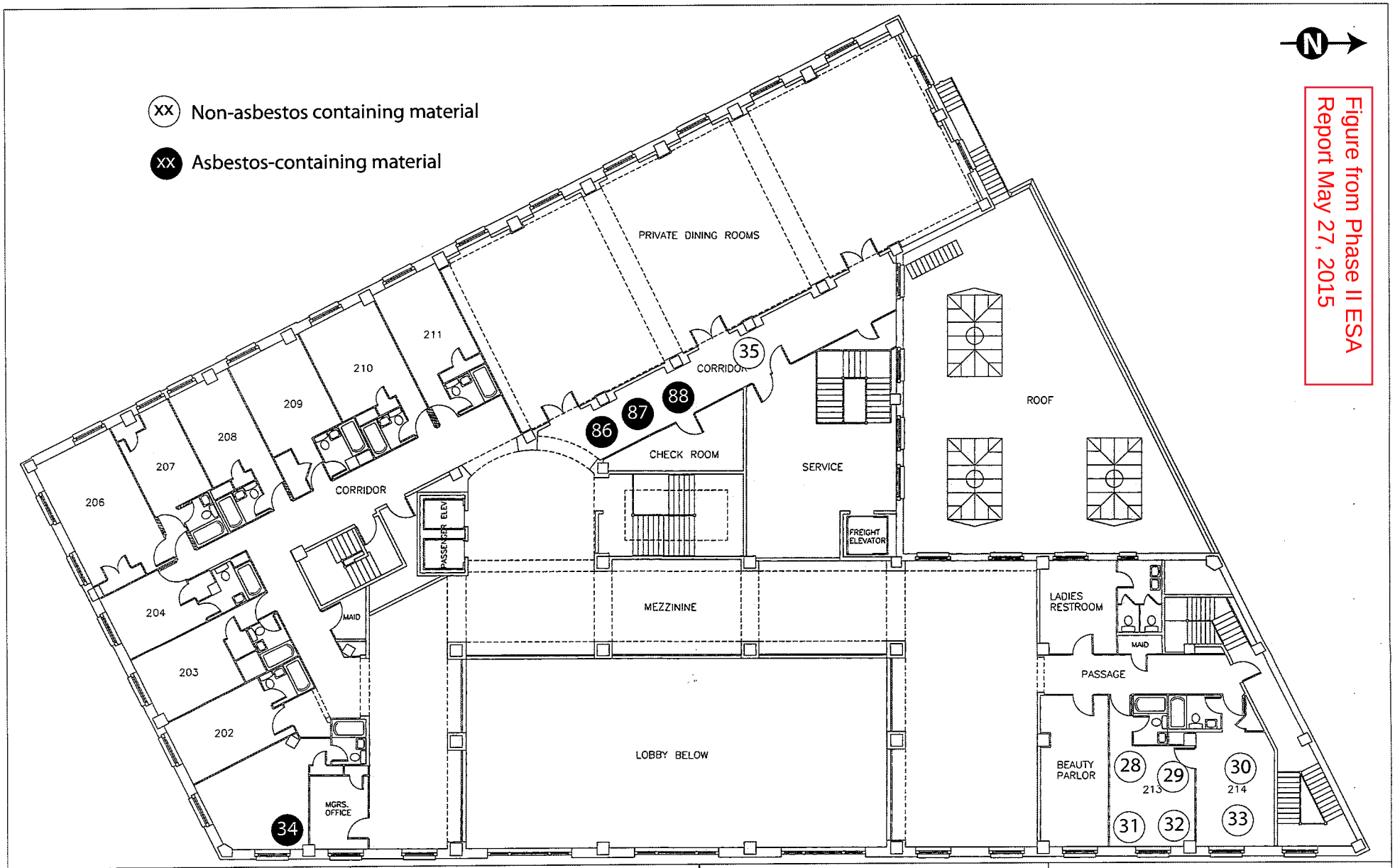


Figure from Phase II ESA Report May 27, 2015

HOTEL GRIM 301 North State Line Avenue Texarkana, Texas 75501	**Asbestos Sample Location** **Second Floor**	HEC Project # T15147 March 30, 2015	HEC Environmental Group, Inc. 409 Hazel Texarkana, AR 71854 870-772-4700

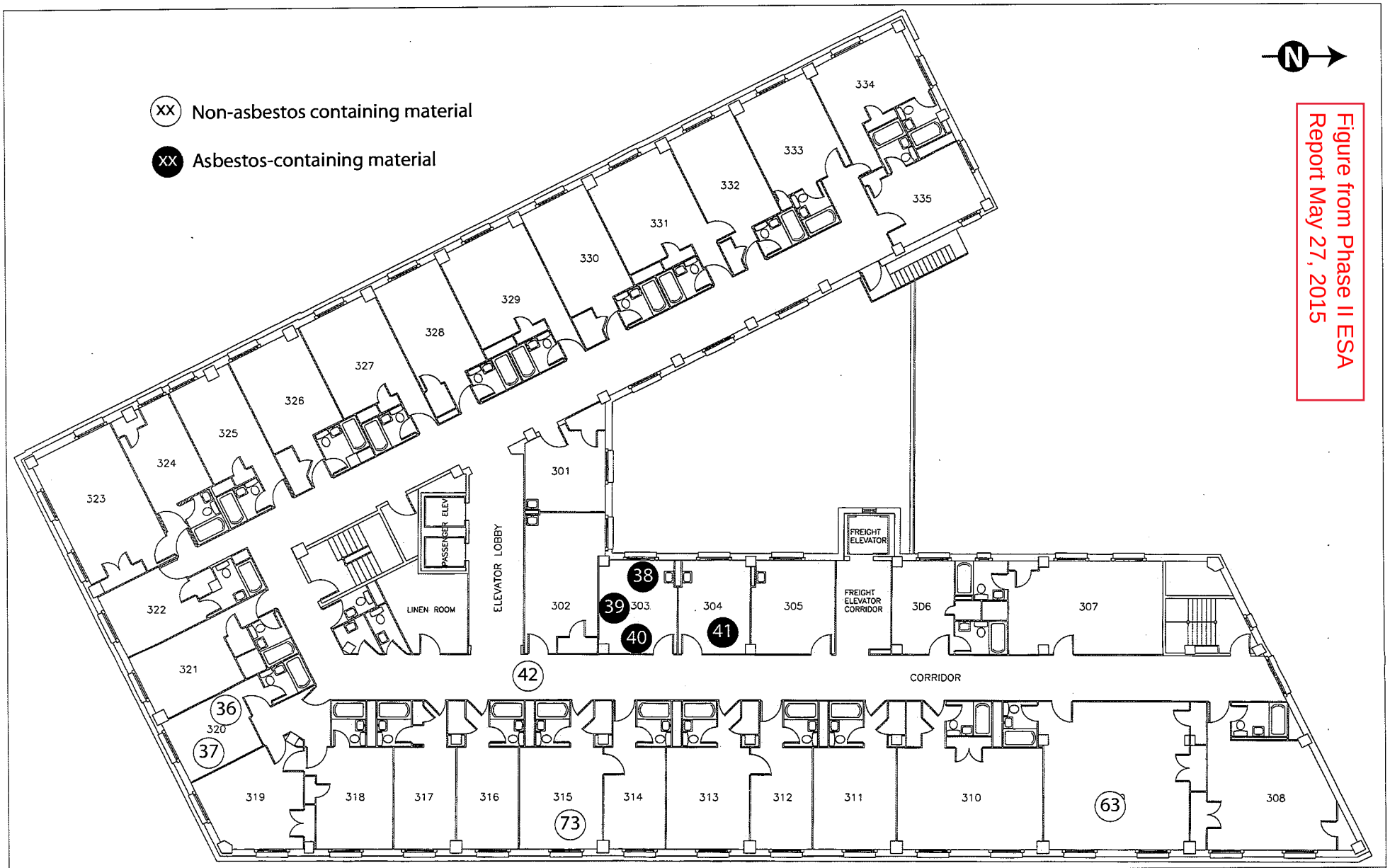


Figure from Phase II ESA Report May 27, 2015

HOTEL GRIM 301 North State Line Avenue Texarkana, Texas 75501	**Asbestos Sample Location** **Third Floor**	HEC Project # T15147 March 30, 2015	HEC Environmental Group, Inc. 409 Hazel Texarkana, AR 71854 870-772-4700

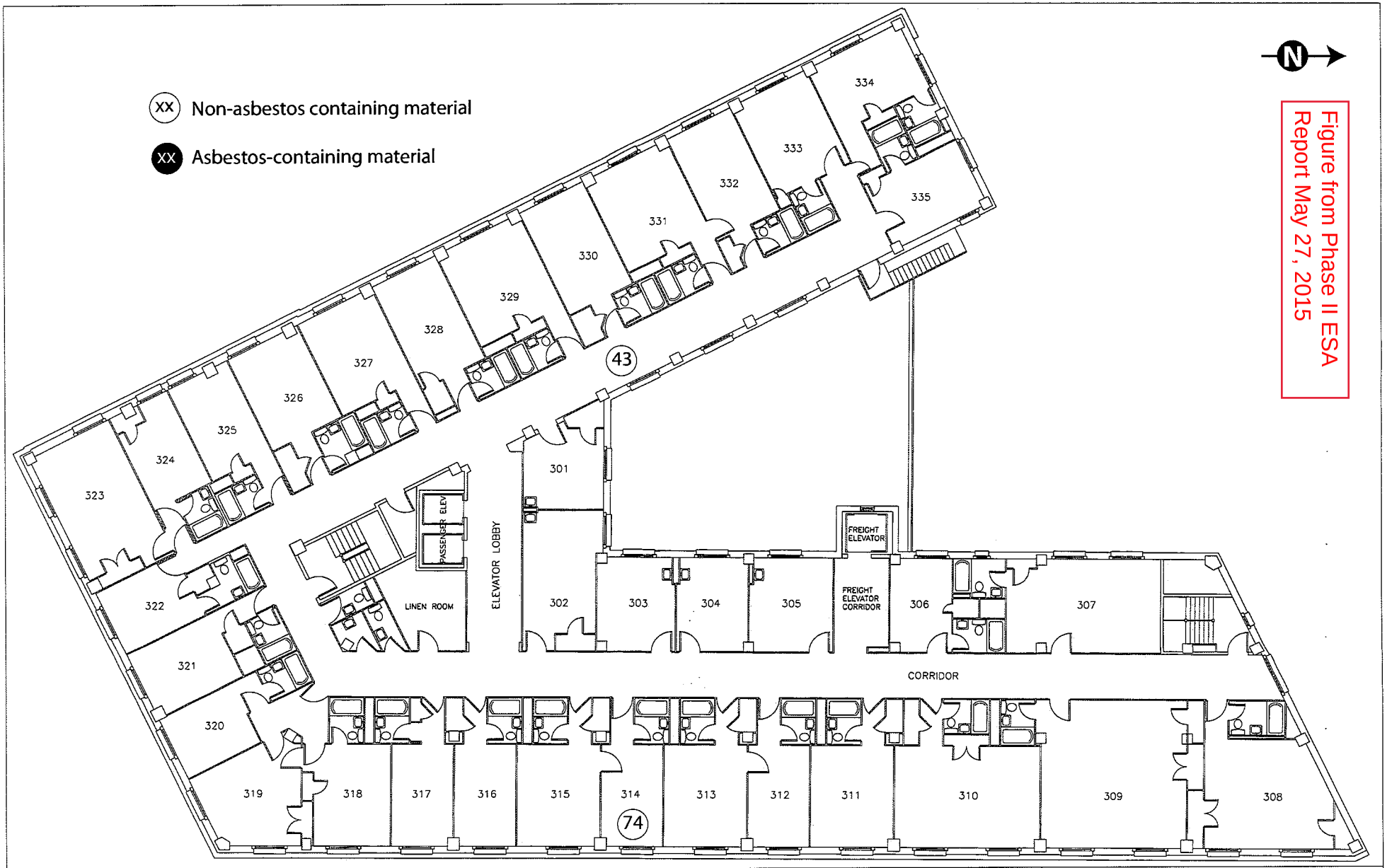
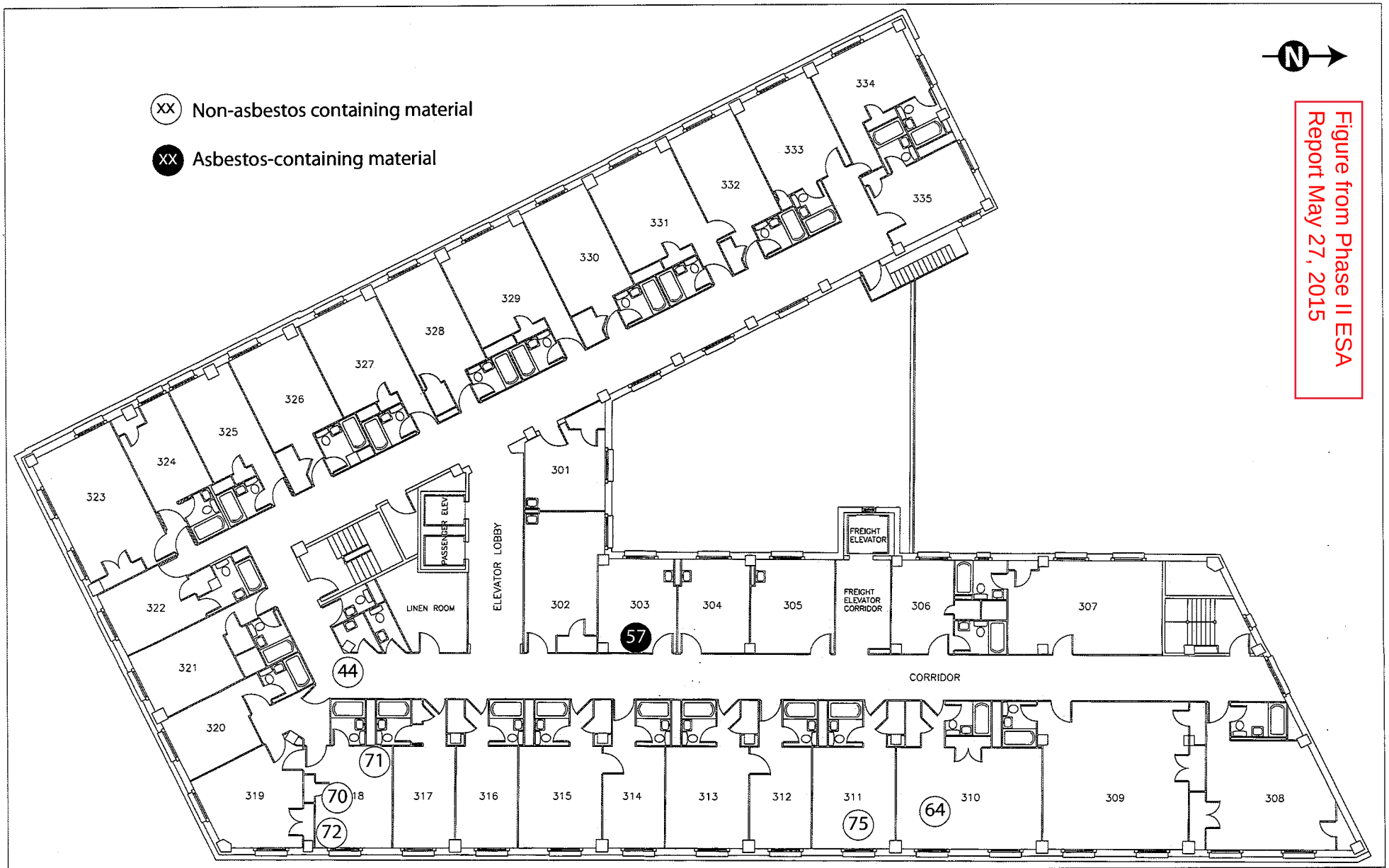


Figure from Phase II ESA
Report May 27, 2015

HOTEL GRIM 301 North State Line Avenue Texarkana, Texas 75501	**Asbestos Sample Location** **Fourth Floor**	HEC Project # T15147 March 30, 2015	HEC Environmental Group, Inc. 409 Hazel Texarkana, AR 71854 870-772-4700



HOTEL GRIM 301 North State Line Avenue Texarkana, Texas 75501	**Asbestos Sample Location** **Fifth Floor**	HEC Project # T15147 March 30, 2015	HEC Environmental Group, Inc. 409 Hazel Texarkana, AR 71854 870-772-4700

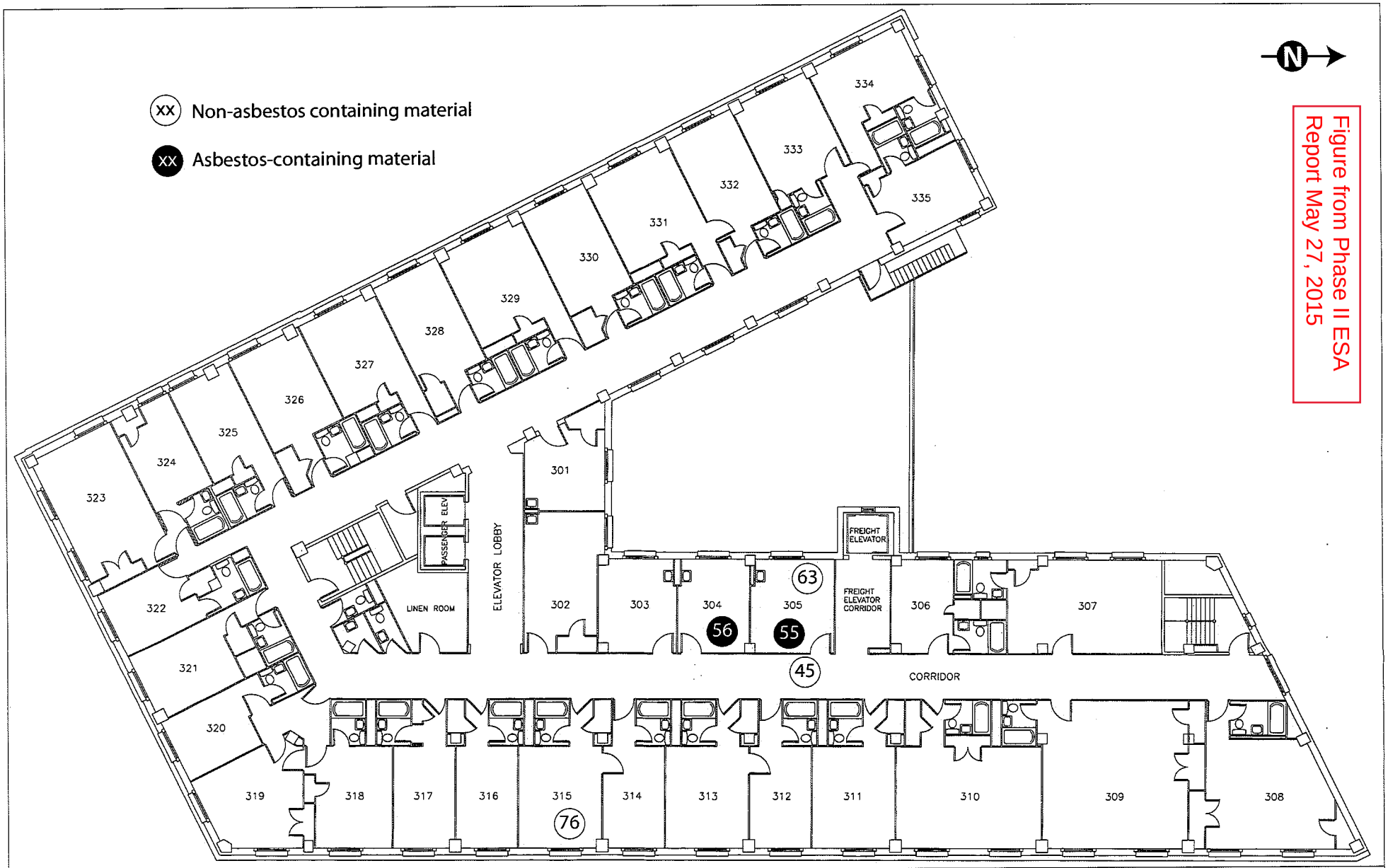
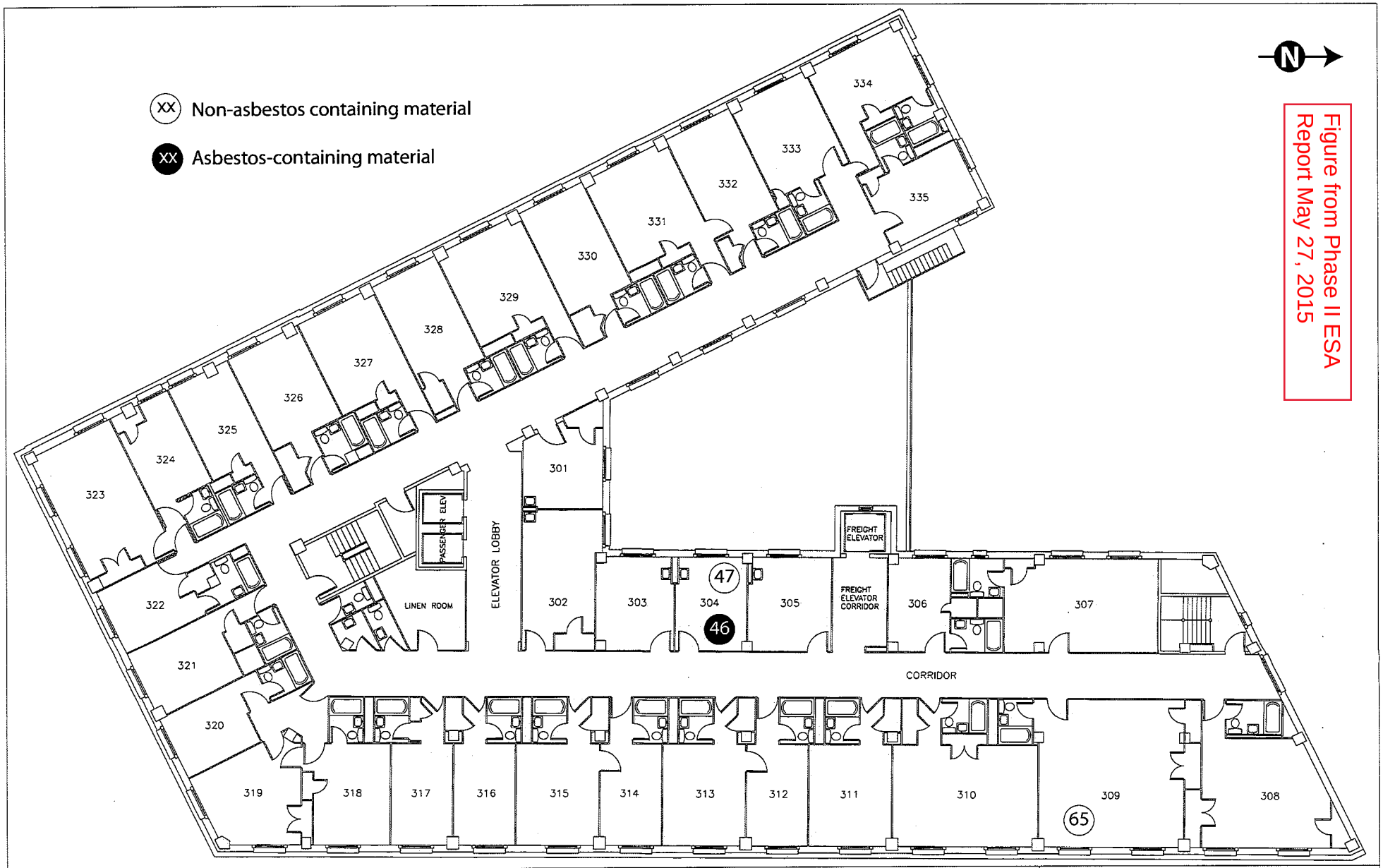


Figure from Phase II ESA Report May 27, 2015

HOTEL GRIM 301 North State Line Avenue Texarkana, Texas 75501	**Asbestos Sample Location Sixth Floor**	HEC Project # T15147 March 30, 2015	HEC Environmental Group, Inc. 409 Hazel Texarkana, AR 71854 870-772-4700

Figure from Phase II ESA
Report May 27, 2015



HOTEL GRIM 301 North State Line Avenue Texarkana, Texas 75501	**Asbestos Sample Location** **Seventh Floor**	HEC Project # T15147 March 30, 2015	HEC Environmental Group, Inc. 409 Hazel Texarkana, AR 71854 870-772-4700

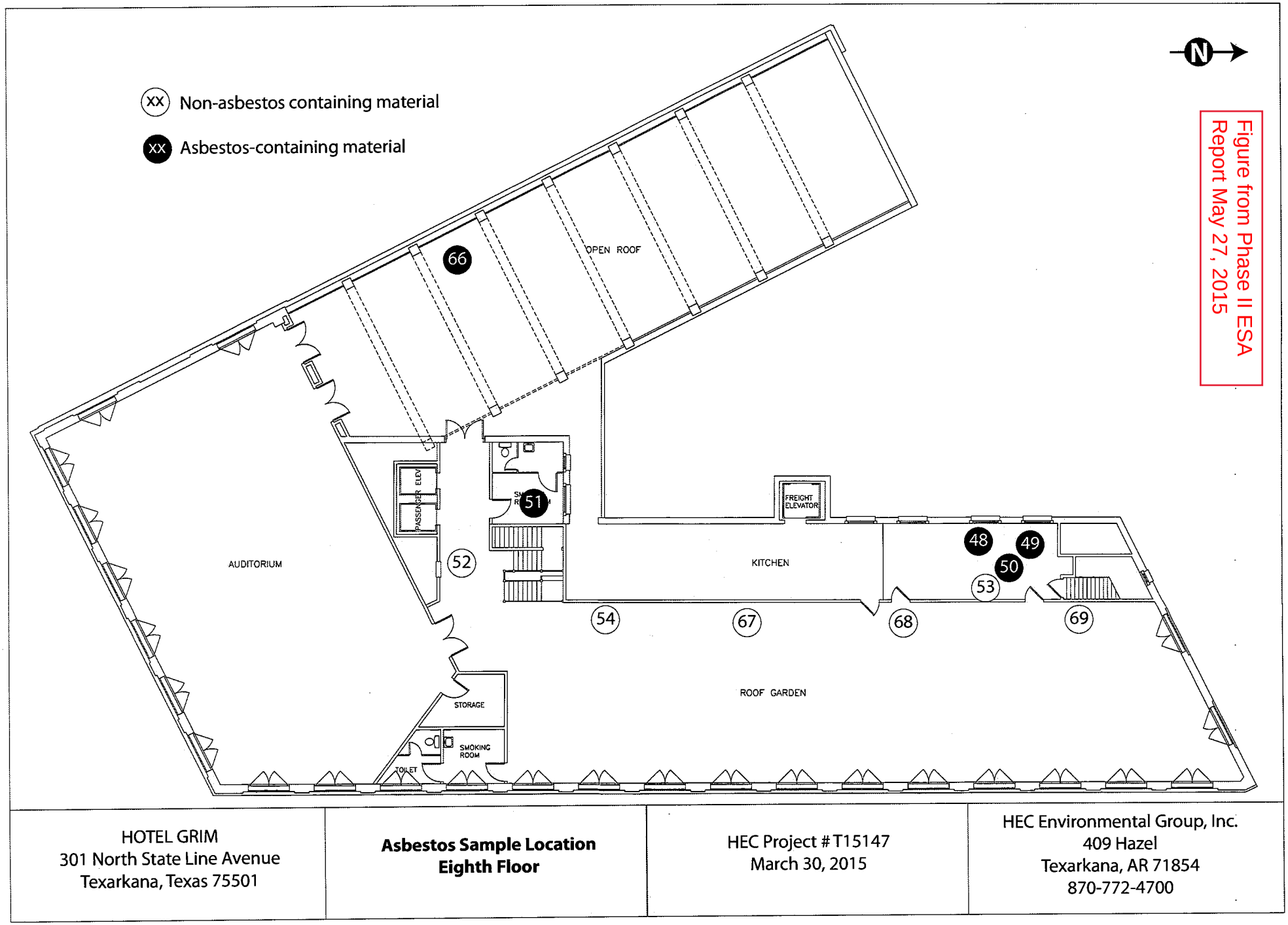


Figure from Phase II ESA Report May 27, 2015

HOTEL GRIM 301 North State Line Avenue Texarkana, Texas 75501	**Asbestos Sample Location Eighth Floor**	HEC Project # T15147 March 30, 2015	HEC Environmental Group, Inc. 409 Hazel Texarkana, AR 71854 870-772-4700

Appendix B

Tables

Table B-1–Sample and Analytical Methods Requirements								
Site Name: Grim Hotel				**Date:** November, 2018				
Addenda: Addendum 1		**Cooperative Agreement:** BF-00F62501		**City:** Texarkana, Texas				**Quality Control Samples**
Sample Summary Location	**Matrix**	**# of Samples**	**Parameter/Methods**	**Sample Container/ preservative**	**Sample Volume**	**Holding Time**	**Reporting limit (action limit)**	**Note**
Airborne asbestos – throughout building interior	air	300	ACM/ Phase Contrast Microscopy (PCM)/ 29 CFR 1926.1101 NIOSH Method 7400	25 mm cassette	Minimum rate: 1,500 liters; 1-12 liters per minute	NA	0.01 f/cc (0.01 f/cc)	Lab blank – one per each 20 samples collected, analyzed for ACM. Do not open cassette Field blank – one per each 20 samples collected, analyzed for ACM. Open cassette for 30 seconds.
Airborne asbestos – throughout building interior and exterior	air	300	ACM/ Transmission Electron Microscopy (TEM)/ 40 CFR 763, Subpart E, Appendix E	25 mm cassette	Minimum rate: 1,500 liters; 1-12 liters per minute	NA	70 S/mm (mean of 5 samples less than 70 S/mm)	Lab blank – one per each 20 samples collected, analyzed for ACM. Do not open cassette Field blank – one per each 20 samples collected, analyzed for ACM. Open cassette for 30 seconds.
Airborne asbestos – throughout building interior	air	300	ACM/ NIOSH NMAM Method 7400 PCM and NIOSH NMAM Method 7402 (TEM) confirmation of asbestos content of PCM results) from the same filter.	25 mm cassette	Minimum rate: 1,500 liters; 1-12 liters per minute	NA	0.01 f/cc (0.01 f/cc) and 70 S/mm (mean of 5 samples less than 70 S/mm)	Lab blank – one per each 20 samples collected, analyzed for ACM. Do not open cassette Field blank – one per each 20 samples collected, analyzed for ACM. Open cassette for 30 seconds.
Asbestos material – throughout building interior	ACM bulk sample	25	ACM/ PLM Polarized Light Microscopy (PLM)- EPA Method 600/R-93-116,	Clean quart sealable bag	NA	NA	1% (non-detect)	None
Lead-based paint– throughout building interior	Paint bulk	2	Lead/ SW846-7000B	Clean quart sealable bag	1 square inch	NA	0.01% (0.5%)	None
Lead-based paint– throughout building interior	dust wipe	150	Lead/ ASTM SW-846-7000B	Wipe / clean jar	Wipe of square foot	NA	10 g/wipe (40 g/ft2)	None
Lead-based paint– throughout building interior	air	20	NIOSH 7082	37-mm cassette filter	Flow rate of 1 to 4 L/min up to 8 hrs.; total sample size 200 to 1500L	NA	4 g/filter (30 g/m3))	Lab blank – one per each 20 samples collected, analyzed for lead. Do not open cassette Field blank – one per each 20 samples collected, analyzed for ACM. Open cassette for 30 seconds.
Lead waste	Paint bulk	5	TCLP	clear glass jar/non-preserved (cool 4°C)	4oz Cool 4°C	6 months	(5 mg/kg)	1 duplicate for each 5 samples collected. Analyzed for the same parameters.
B-2 (1-2'), B-4 (1-2'), exterior	Soil	10	Arsenic (B-4), Lead (B-2 and B-4), Mercury (B-4)/ EPA 6020B,6010B, 7471B	clear glass jar/non-preserved (cool 4°C)	4oz Cool 4°C	28 days	0.0159, 1, 0.078 mg/kg (5.9, 15, 0.04) mg/kg	1 replicate for each 20 samples collected. Analyzed for the same parameters. Field split (discretionary) EPA/TCEQ
MW-4	Groundwater	1	Lead/ EPA 6020B	plastic container/ HNO3/, cool 4°C	250 mL	6 months	0.008 mg/L (0.015 mg/L)	1 replicate for each 20 samples collected. Analyzed for the same parameters. Field split (discretionary) EPA/TCEQ 1 equipment rinsate blank per mobilization

Appendix C

SOPs

Field SOPs will be provided electronically
Asbestos Abatement and Management in Buildings Model Guide Specifications, NIBS,
Aggressive air sampling techniques defined in 40 CFR 763, Subpart E
ASTM E1728 (2016) “Collection of Settled Dust Samples Using Wipe Sampling Methods for Subsequent Lead Determination”
ASTM E1792 (2003; R 2016) “Standard Specification for Wipe Sampling Materials for Lead in Surface Dust”
NIOSH Method 7400 Phase-Contrast Microscopy (PCM)
EPA Method 40 CFR 763 Appendix A for TEM
OSWER Publication 9360.4-05, “Compendium of Environmental Response Team (ERT) Air Sampling Procedures,” PB92-963406 (EPA 1992a)
OSWER Publication 9355.0-14 “A Compendium of Superfund Field Operations Methods,” PB88-181557, EPA 1987
ERT SOP 2012 “Standard Operating Procedures Soil Sampling”, February 18, 2012
ERT, US EPA Publication 160014-891034 “Handbook of Suggested Practices for the Design and Installation of Ground-Water Monitoring Wells”, March 1991
EPA Region 1 SOP-GW4 “Low-Stress (log flow) Purging and Sampling Procedure for the Collection of Groundwater Samples from Monitoring Wells”, September, 2017
Laboratory SOPs
References included in Appendix D; electronic copies provided as requested.

Appendix D

Laboratory Certifications
Laboratory Quality Manuals

TEXAS DEPARTMENT OF STATE HEALTH SERVICES

EMSL ANALYTICAL INC

is certified to perform as a

Asbestos Laboratory
PCM, PLM, TEM

in the State of Texas within the purview of Texas Occupations Code, chapter 1954, so long as this license is not suspended or revoked and is renewed according to the rules adopted by the Texas Board of Health.

JOHN HELLERSTEDT, M.D.
COMMISSIONER OF HEALTH

License Number: 300159

Expiration Date: 7/11/2019

Control Number: 96212

(Void After Expiration Date)

VOID IF ALTERED NON-TRANSFERABLE

United States Department of Commerce
National Institute of Standards and Technology

Certificate of Accreditation to ISO/IEC 17025:2005

NVLAP LAB CODE: 600111-0

EMSL Analytical, Inc.

Farmers Branch, TX

is accredited by the National Voluntary Laboratory Accreditation Program for specific services, listed on the Scope of Accreditation, for:

Asbestos Fiber Analysis

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communique dated January 2009).

2018-04-01 through 2019-03-31

Effective Dates

DEPARTMENT OF COMMERCE * UNITED STATES OF AMERICA *

For the National Voluntary Laboratory Accreditation Program

NVLAP® National Voluntary Laboratory Accreditation Program

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005

EMSL Analytical, Inc.
2307 Springlake Road, Suite 510
Farmers Branch, TX 75234
Cindy Nguyen
Phone: 972-892-9928
Email: cnguyen@emsl.com
http://www.emsl.com

ASBESTOS FIBER ANALYSIS — NVLAP LAB CODE 600111-0

Bulk Asbestos Analysis

Code	*Description*
18/A01	EPA -- 40 CFR Appendix E to Subpart E of Part 763, Interim Method of the Determination of Asbestos in Bulk Insulation Samples
18/A03	EPA 600/R-93/116: Method for the Determination of Asbestos in Bulk Building Materials

Airborne Asbestos Analysis

Code	*Description*
18/A02	U.S. EPA's "Interim Transmission Electron Microscopy Analytical Methods-Mandatory and Nonmandatory-and Mandatory Section to Determine Completion of Response Actions" as found in 40 CFR, Part 763, Subpart E, Appendix A.

For the National Voluntary Laboratory Accreditation Program

Effective 2018-04-01 through 2019-03-31

TEXAS DEPARTMENT OF STATE HEALTH SERVICES

EMSL ANALYTICAL INC

is certified to perform as a

Asbestos Laboratory
PCM, PLM

in the State of Texas within the purview of Texas Occupations Code, chapter 1954, so long as this license is not suspended or revoked and is renewed according to the rules adopted by the Texas Board of Health.

John Hellerstedt, M.D.
Commissioner of Health

License Number: 300456

Expiration Date: 4/5/2020

Control Number: 96282

(Void After Expiration Date)

VOID IF ALTERED NON-TRANSFERABLE

Texas Commission on Environmental Quality

NELAP-Recognized Laboratory Accreditation is hereby awarded to

EMSL Analytical, Inc.

200 Route 130 North
Cinnaminson, NJ 08077-2892

in accordance with Texas Water Code Chapter 5, Subchapter R, Title 30 Texas Administrative Code Chapter 25, and the National Environmental Laboratory Accreditation Program.

The laboratory's scope of accreditation includes the fields of accreditation that accompany this certificate. Continued accreditation depends upon successful ongoing participation in the program. The Texas Commission on Environmental Quality urges customers to verify the laboratory's current location(s) and accreditation status for particular methods and analyses (www.tceq.texas.gov/goto/lab). Accreditation does not imply that a product, process, system or person is approved by the Texas Commission on Environmental Quality.

Certificate Number: T104704177-17-13
Effective Date: 9/1/2017
Expiration Date: 8/31/2018

Executive Director Texas Commission on Environmental Quality

Texas Commission on Environmental Quality

NELAP - Recognized Laboratory Fields of Accreditation

Certificate:	T104704177-17-13
Expiration Date:	8/31/2018
Issue Date:	9/1/2017

EMSL Analytical, Inc.

200 Route 130 North
Cinnaminson, NJ 08077-2892

These fields of accreditation supercede all previous fields. The Texas Commission on Environmental Quality urges customers to verify the laboratory's current accreditation status for particular methods and analyses.

Matrix: ***Drinking Water***

Method EPA 100.1

Analyte	AB	Analyte ID	Method ID
Asbestos	NJ	1520	10004203

Method EPA 100.2

Analyte	AB	Analyte ID	Method ID
Asbestos	NJ	1520	10004407

Method EPA 200.7

Analyte	AB	Analyte ID	Method ID
Barium	NJ	1015	10013806
Beryllium	NJ	1020	10013806
Cadmium	NJ	1030	10013806
Chromium	NJ	1040	10013806
Copper	NJ	1055	10013806
Magnesium	NJ	1085	10013806
Manganese	NJ	1090	10013806
Nickel	NJ	1105	10013806
Silver	NJ	1150	10013806
Sodium	NJ	1155	10013806
Zinc	NJ	1190	10013806

Method EPA 200.8

Analyte	AB	Analyte ID	Method ID
Lead	NJ	1075	10014605

Method EPA 200.9

Analyte	AB	Analyte ID	Method ID
Lead	NJ	1075	10015404

Method EPA 245.1

Analyte	AB	Analyte ID	Method ID
Mercury	NJ	1095	10036609

Method EPA 300.0

Analyte	AB	Analyte ID	Method ID
Bromide	NJ	1540	10053200

Texas Commission on Environmental Quality

NELAP - Recognized Laboratory Fields of Accreditation

Certificate: T104704177-17-13
Expiration Date: 8/31/2018
Issue Date: 9/1/2017

EMSL Analytical, Inc.

200 Route 130 North
Cinnaminson, NJ 08077-2892

These fields of accreditation supercede all previous fields. The Texas Commission on Environmental Quality urges customers to verify the laboratory's current accreditation status for particular methods and analyses.

Matrix: ***Drinking Water***

Chloride	NJ	1575	10053200
Fluoride	NJ	1730	10053200
Nitrate as N	NJ	1810	10053200
Nitrite as N	NJ	1840	10053200
Orthophosphate as P	NJ	1870	10053200
Sulfate	NJ	2000	10053200

Method EPA 524.2

Analyte	**AB**	**Analyte ID**	**Method ID**
1,1,1-Trichloroethane	NJ	5160	10088809
1,1,2-Trichloroethane	NJ	5165	10088809
1,1-Dichloroethylene	NJ	4640	10088809
1,2,4-Trichlorobenzene	NJ	5155	10088809
1,2-Dichlorobenzene	NJ	4610	10088809
1,2-Dichloroethane (Ethylene dichloride)	NJ	4635	10088809
1,2-Dichloropropane	NJ	4655	10088809
1,4-Dichlorobenzene	NJ	4620	10088809
Benzene	NJ	4375	10088809
Carbon tetrachloride	NJ	4455	10088809
Chlorobenzene	NJ	4475	10088809
cis-1,2-Dichloroethylene	NJ	4645	10088809
Ethylbenzene	NJ	4765	10088809
Methylene chloride (Dichloromethane)	NJ	4975	10088809
Styrene	NJ	5100	10088809
Tetrachloroethylene (Perchloroethylene)	NJ	5115	10088809
Toluene	NJ	5140	10088809
Total trihalomethanes	NJ	5205	10088809
trans-1,2-Dichloroethylene	NJ	4700	10088809
Trichloroethene (Trichloroethylene)	NJ	5170	10088809
Vinyl chloride	NJ	5235	10088809
Xylene (total)	NJ	5260	10088809

Texas Commission on Environmental Quality

NELAP - Recognized Laboratory Fields of Accreditation

Certificate:	T104704177-17-13
Expiration Date:	8/31/2018
Issue Date:	9/1/2017

EMSL Analytical, Inc.

200 Route 130 North
Cinnaminson, NJ 08077-2892

These fields of accreditation supercede all previous fields. The Texas Commission on Environmental Quality urges customers to verify the laboratory's current accreditation status for particular methods and analyses.

Matrix: ***Drinking Water***

Method	Analyte	AB	Analyte ID	Method ID
SM 4500-CN^- C,E	Total cyanide	NJ	1645	20092404
SM 4500-CN^- C,G	Amenable cyanide	NJ	1510	20093203
SM 9223-IDEXX Laboratories Colilert® Quanti-Tray Test	Escherichia coli (enumeration)	NJ	2525	20211603

Texas Commission on Environmental Quality

NELAP - Recognized Laboratory Fields of Accreditation

Certificate:	T104704177-17-13
Expiration Date:	8/31/2018
Issue Date:	9/1/2017

EMSL Analytical, Inc.

200 Route 130 North
Cinnaminson, NJ 08077-2892

These fields of accreditation supercede all previous fields. The Texas Commission on Environmental Quality urges customers to verify the laboratory's current accreditation status for particular methods and analyses.

Matrix: ***Non-Potable Water***

Method	Analyte	AB	Analyte ID	Method ID
EPA 180.1	Turbidity	NJ	2055	10011606
EPA 7420	Lead	NJ	1075	10164406
SM 2130 B	Turbidity	NJ	2055	20042200

Texas Commission on Environmental Quality

NELAP - Recognized Laboratory Fields of Accreditation

Certificate:	T104704177-17-13
Expiration Date:	8/31/2018
Issue Date:	9/1/2017

EMSL Analytical, Inc.

200 Route 130 North
Cinnaminson, NJ 08077-2892

These fields of accreditation supercede all previous fields. The Texas Commission on Environmental Quality urges customers to verify the laboratory's current accreditation status for particular methods and analyses.

Matrix: ***Solid & Chemical Materials***

Method	Analyte	AB	Analyte ID	Method ID
EPA 1311	TCLP	NJ	849	10118806
EPA 7420	Lead	NJ	1075	10164406

EMSL Analytical, Inc. Management

EMSL Analytical, Inc.

Quality Management Program Summary

Based on Rev. 19 of the Quality Management System (QMS) Manual

The quality program at EMSL is built on a commitment to quality and continued improvement. This program is a primary part of our every day work; developed, utilized, and maintained by all the dedicated staff at EMSL.

Introduction

This program outline presents an overview of the quality assurance program. It provides the reader with a summary of EMSL laboratory policies and procedures as they relate to the technical elements of the corporate quality objectives.

This program follows quality guidelines as documented by ISO/IEC 17025:2005, the American Industrial Hygiene Association Laboratory Accreditation Program (AIHA-LAP, LLC), the EPA's National Voluntary Laboratory Approval Program (NVLAP), The NELAC Institute (TNI), A2LA, Canadian Association for Laboratory Accreditation (CALA, Inc.) and other applicable state and federal regulatory agencies.

This QA program is designed to ensure the highest level of quality professional services and technical excellence is provided to our customers. This is accomplished by the implementation of program policies including:

- Development of company standard quality control programs
- Standardization of reporting formats
- The monitoring of laboratory QC performance
- Providing technical training for all staff levels
- Achieving traceability of data
- Performance of internal quality audits
- Participation in applicable accreditation programs
- Participation in third party proficiency testing programs

The objectives of these program policies ensure the quality, accuracy and integrity of our analytical data.

The quality assurance objectives, policies and procedures are formally documented in the EMSL Quality Assurance Manual and program-specific Modules. A summary of this manual is presented on the following pages.

Topics covered are:

EMSL Quality Policy Statement

EMSL is committed to providing a high standard of service and to producing dependable, accurate and technically defensible test results, in order to best serve our customers. EMSL will avoid involvement in any activities that would diminish confidence in its competence, impartiality, judgment, or operational integrity. Our experienced and qualified technical personnel are committed to providing data of the highest quality achievable.

The senior management of EMSL Analytical, Inc. is committed to adopting the quality standards utilized by the various accrediting authorities (e.g. NVLAP, AIHA-LAP LLC, A2LA, CALA and other State and Federal authorities) and those requirements documented in the ISO/IEC 17025 and TNI standards. The major goal of the laboratory and its personnel will be toward constant improvement in the quality management system, which has been designed with the purpose of ensuring consistent operations leading to quality data.

The senior management staff of EMSL acknowledges and accepts the responsibility for the overall quality of the data produced by the laboratory, and makes a commitment toward continual improvement of the final product and the management system. In doing so, management provides the laboratory manager and the Quality Assurance Department with full authority to accomplish this end. Management is committed to providing all of the resources necessary to provide high quality analytical data.

All personnel concerned with testing within the laboratory must familiarize themselves with the quality documentation, and must implement the policies and procedures addressed in the EMSL Quality Management System Manual.

Commitment to ISO Standard

- Starting with corporate management, and extending to regional and local laboratory management, EMSL is committed to ensuring the standards documented in ISO/IEC 17025:2005 (or the most recent revision of the 17025 standard) are upheld in all aspects of company affairs.

By way of authority, it is corporate management who implements, maintains and monitors compliance.

This statement is issued under the authority of company President, Peter Frasca, Ph.D.

1. Organization Structure

The corporate headquarters of EMSL Analytical, Inc. operates out of the Cinnaminson, NJ location. The corporate management oversees the laboratory operations located there, as well as the branch laboratory locations. Corporate headquarters are responsible for the management of all company activities.

EMSL's approximately 40 branch laboratories (as well as the laboratory located in Cinnaminson, NJ) perform the company's analytical services. They report to the corporate headquarters on quality control, productivity, staffing and market issues. Each branch laboratory holds specific

accreditations relevant to market requirements and the scope of their analytical work. A copy of each branch lab's qualifications is available on the EMSL Analytical website.

The Quality Program for EMSL Analytical, Inc. is established and maintained by the corporate Quality Assurance Department, and implemented at the lab level by local branch lab managers and quality control personnel. All changes to corporately issued procedures, processes and policies must be approved by the QA Department and/or executive management of EMSL Analytical, Inc. Changes are controlled to ensure affected personnel are notified and the changes do not impact EMSL's compliance with quality standards, regulations and accreditation requirements.

Due to this multi-laboratory structure, the EMSL Quality Program is in a constant state of review by outside assessors from multiple agencies. With outside assessments of the quality program occurring on average at least once per month, the program has been thoroughly vetted, and is always in a state of continual improvement.

2. Document Control

In order to prepare and distribute documents in an organized fashion, and ensure the most up-to-date documents are available to the end user, procedures for initiation, preparation, review, approval and distribution of controlled copies have been established. EMSL's document control program is a coordinated effort involving both technical review and custodial control. Laboratories are to use only approved, controlled and current documents for calibrations, analyses, final reports, and other activities performed in our laboratories. Most documents are controlled at the corporate level and may not be altered by branch laboratories without permission of corporate management. This ensures consistent operations across all EMSL branch laboratories and minimizes the risk for local inconsistencies. The document control system that has been established has proven to be effective, efficient and sustainable.

3. Purchasing

Quality results begin with supplies and services that meet necessary quality specifications. Vendors utilized by EMSL are selected based on the establishment of their own quality programs, their reputation in the industry, as well as historic performance as an EMSL service/supply provider. Supplies and services are ordered from approved vendors, and any non-conforming product received from these vendors is isolated and reported to both laboratory management and the purchasing department. Vendors are evaluated on a regular basis to ensure products and services provided continue to meet EMSL expectations, and vendors are contacted for corrective action if products are found to be unacceptable.

4. Use of Customer Feedback

Customer feedback, both positive and negative, provides consistent input to the evaluation of the effectiveness of EMSL's quality program. Customer feedback is solicited through the use of customer surveys, as well as during routine communications with our customers. This data feeds directly into our continual improvement processes, such as corrective and preventive actions and management reviews. Feedback is considered a crucial aspect of improving our quality program.

5. Corrective and Preventive Actions

The heart of EMSL's continual improvement process is the use of corrective and preventive actions to identify areas for improvement. Inputs to the corrective and preventive action programs come from all other quality systems implemented in the lab including, but not limited to: audit findings (internal and external), complaints, QC results, and customer and employee suggestions. The corrective action process includes an evaluation of a problem, a root cause analysis, and then the selection of corrective actions necessary to prevent recurrence. Preventive actions are improvements based on prospective problems that may arise in order to ensure they never occur. In both cases, follow-up actions ensure the actions taken have proven effective. EMSL also reviews corrective actions for trends which may indicate the need for further root cause analysis to improve systems across the entire EMSL enterprise. Corrective and preventive action records are reviewed by management during annual management reviews.

6. Control of Records

EMSL recognizes the importance of maintaining accurate records in a manner that prevents degradation, allows for timely retrieval, and protects customer confidentiality. Policies and procedures for controlling records have been established for implementation at both the lab and corporate level. These policies include general requirements for how changes to records must be handled, confidentiality of records, and how records are to be stored. Each branch laboratory is responsible for how these policies are implemented in their laboratory based on the size, scope and volume of records generated. Electronic records are backed up according to established procedures to ensure they are retrievable in case of a computer error, and where offsite storage of archived records is necessary, storage is contracted with established record management services. Tape backups of many crucial electronic records are also stored offsite to prevent loss in case of an unexpected disaster at the corporate headquarters. EMSL has also established a standard 5-year record retention schedule; although some types of analyses require longer retention times as a function of accreditation requirements or through customer agreement.

It is understood confidentiality and proprietary rights must be respected throughout the performance of services for any customer, or for those that may include national security concerns. Information will not be given to those for whom it is not intended, and the proprietary rights of our customer will be protected. Data reports and/or other related information will not be given out to any person or agency other than the customer unless we have received prior approval from the customer.

7. Internal and External Audits

EMSL's quality processes and procedures are continually being audited. One of the benefits of having multiple labs is each is accredited independently, and therefore, each lab audit contains a review of the quality system. Between all branch labs, the EMSL Quality System is being assessed by a 3rd party approximately once per month. Non-conformities noted in these audits are evaluated, and where necessary, quality system improvements are implemented for the company as a whole. As a result, the program is continually being improved, and over time has become more efficient and effective. External audit findings are directed to the corporate

Quality Assurance Department and, therefore, systematic defects are more easily identified and corrected.

In addition to external assessments of the quality program, EMSL also has established policies and procedures for conducting internal audits of each laboratory. Internal audits use checklists similar to those used by outside agencies, but with additional information on how to audit EMSL specific systems. Findings from internal audits go through the same corrective action process as external findings. Internal audit findings and responses are forwarded to the corporate QA department, and are reviewed by corporate management as part of the annual management review process.

8. Management Reviews

The management team conducts annual management reviews for each branch laboratory for the previous year. Input to the management reviews include information from monthly and quarterly quality reports, results from internal and external audits, corrective and preventive actions, results from lab participation in proficiency testing programs and inter-lab round robin exchanges, summaries of customer feedback, and input on resources and staff training. From this input, a management review report is generated which documents management's findings on the suitability of policies and procedures currently in place, and makes recommendations on actions that need to be completed by the branch laboratory or corporate management. Follow-up is conducted on these recommendations for improvement to ensure they have been carried out.

9. Personnel and Training

The EMSL Quality Program has established minimum requirements for the technical personnel hired by the laboratory. In addition, analysts must complete an EMSL training program in order to perform analysis independently. EMSL provides in-house training pertinent to areas of analysis. Laboratory managers are responsible for ensuring appropriate training is provided to every analyst, and they are completely qualified to perform analysis, including demonstrating competency with the methods used.

In addition to initial training for lab personnel, ongoing evaluations of competency are conducted at least annually (some areas require 6 month evaluations) for each analyst. Where it is determined additional training may be beneficial, this will be conducted immediately. These evaluations will include review of routine QC, trends in analyst performance, performance in proficiency testing and/or blind sample rounds, and other data. This ongoing evaluation process ensures the performance of EMSL analysts meets expectations at all times.

10. Lab Conditions/Environmental Monitoring

EMSL has established processes and procedures for ensuring lab spaces are free from contamination which could jeopardize the health of its employees, customers, or affect the quality of results. In addition to general good housekeeping routines, quarterly monitoring is performed in the lab areas to ensure there is no contamination above acceptable levels. In addition, blank samples are run alongside most analyses which may be affected by cross-contamination. Whenever contamination is detected or suspected, corrective actions will be implemented and documented before re-evaluating to ensure the corrections were effective.

In addition to contamination, lab areas will be monitored for temperature, humidity, etc., where such conditions may have an affect on method performance or stability of samples. Refrigerators, freezers and incubators are monitored according to defined criteria to ensure they are performing as expected. These checks are maintained in laboratory logs and referenced in lab records, as appropriate.

In some more specialized areas, additional precautionary design features may be in place such as UV lighting, additional access controls, and continual monitoring systems.

11. Equipment Calibration

EMSL has established calibration programs for instrumentation which may affect the quality of results. These calibration programs define the frequency, parameters and acceptance criteria for equipment calibrations and calibration verifications. Standards used in in-house calibrations and routine calibration verifications are all traceable to NIST, and come from approved providers. Where external calibrations are performed, these are performed by approved calibration services accredited to ISO 17025:2005 when available, and calibration reports must comply with the requirements of that standard. Equipment found to fail performance criteria must be either repaired and re-calibrated, or taken out of service.

12. Measurement Traceability

EMSL processes and procedures are established to ensure measurement traceability to recognized standards whenever such standards are available. NIST traceable standards are mandatory for EMSL laboratories whenever available. Where no NIST-traceable standard exists, alternative standards may be considered, but shall come from sources reviewed and approved by EMSL management (e.g., non-NIST sources such as ATCC, or where no external source is available, consensus standards such as graded proficiency testing samples). Calibrations shall be performed using traceable standards so equipment performance is traceable to NIST or other approved source. Instruments shall be identified in lab records for the analysis, along with standards used in calibration to ensure final measurement results are traceable to the original standards.

13. Sample Handling

Chain of Custody

In order to ensure the integrity of any sample, records of its custody must be maintained throughout the sample collection in the field, acknowledgement of receipt, acceptance by the laboratory, and through analysis.

In general, EMSL does not perform sampling for customers, nor is it present at the time of sampling, and as a result, cannot be responsible for issuing a chain of custody at the time of sampling. However, the laboratory can advise customers regarding sampling requirements (sampling materials, recommended sampling volumes, packaging, instructions for shipping, etc.) and chain-of-custody, and recommends customers use available EMSL chain-of-custody forms whenever possible.

Once the sample is accepted for analysis by the laboratory, the EMSL “Internal Chain of Custody” is used to document the handling of the samples throughout the analytical process.

Sample Acceptance Criteria

In addition to acknowledgement of the receipt of samples, samples must also be accepted for analysis. Prior to accepting samples, the person preparing the samples for analysis inspects them to determine if they conform to laboratory acceptance criteria. If they do not, or if this person has any question as to the validity of the sample, the laboratory manager or an analyst trained to analyze such samples will determine whether the questionable circumstance is sufficient to cause rejection. Rejections of samples are to be followed up by immediate notification to the customer with an explanation. The sample will be returned upon request.

Log-In

Information is entered for samples received into the Laboratory Information Management system (LIMS). LIMS is a computer laboratory information management system which serves to track samples from receipt through the analysis, reporting, and billing processes. Samples are tagged with a project number label at this time to ensure they cannot be separated from others in the project.

Archival and Disposal of Samples

Once the analysis is complete and the analysis worksheet is signed, the analyst stores the sample in the appropriate storage area as defined in relevant SOPs. All storage containers are to be stored in a safe manner for the period indicated for that category of waste, and in accordance with regulatory requirements for sample retention.

Samples which are not completely consumed in analysis are retained as detailed in the EMSL QMS Manual.

14. Data Control Programs

The ultimate purpose of the EMSL Quality Program is to ensure that "Final Test Reports," which are EMSL's final product, are reliable and defensible within the confines of the scope of work. Data is checked through a number of interrelated programs throughout the process, from receipt to final approval.

Checks on lab and analyst proficiency are conducted using the following tools:

- External proficiency testing programs
- Round Robin programs
- Blind sample re-analysis
- Routine QC samples for evaluating accuracy and precision against established control and acceptance limits
- Analysis of data over time using control charts

Any out-of-specification result in a graded proficiency test or round robin will be evaluated, and corrective action performed, as appropriate.

Specific quality control requirements are established in the QMS Manual and SOPs. These requirements are established by corporate management and the QA department and are implemented by lab managers. In addition to quality samples such as blanks and verifications

analyzed to ensure accuracy of a particular run, inter- and intra-analyst reanalysis is performed, where appropriate, to verify accuracy and precision of each analyst. QC data is charted over time against established warning and acceptance limits in order to identify potentially significant trends which may lead to non-conformities. Whenever QC results are out-of-specification, this shall be evaluated by the analyst and lab management. Corrective action is taken where necessary.

In addition, for each project there is a continuous data review process culminating in a review of the final report, usually by a second independent individual. At each stage, the information on the chain of custody and internal chain of custody is reviewed for errors, and any errors are corrected. The final report review includes a thorough review of both completeness and accuracy. A check on any QC analysis performed in association with the samples may be completed to ensure QC passed, or the final report is adequately notated. If any errors or suspected errors are identified, this will be discussed with the analyst prior to release of the final report.

15. Ethics

One of the objectives of the quality assurance program is to ensure the staff of EMSL is provided information regarding ethics as they pertain to corporate policy. The goals of the EMSL ethics policy and ongoing training program are:

- For each staff member to understand the responsibility to provide true and accurate information
- To understand the consequences of unethical conduct
- Provide direction to employees regarding prevention of unethical conduct
- Define right and wrong (as it is job related)
- To ensure all employees are free of undue pressures

16. Customer Communication

Clear, continuous and open communication between the laboratory and the customer is one of the keys to maintaining a successful, quality operation. Communication is established prior to the start of any work. Information must be clearly understood between laboratory management and the customer. EMSL provides quality assurance information and technical support to the customer to ensure continued quality service. The support and information provided in relation to the work performed includes:

- Field sampling guides
- Availability of pertinent QC records
- Access to the Quality Assurance Department for technical assistance
- Security of data (confidentiality)
- Reasonable access to the relevant areas of the laboratory for the witnessing of analysis

If a major deficiency in policy or procedure is identified which directly affects customer results, the customer will be notified immediately of the problem.

17. Notice of Performance

The laboratory manager shall provide the customer with information as it relates to the performance of the analysis and turnaround time, where necessary. The laboratory shall notify the customer if:

- Analysis cannot be performed on time
- Integrity of the sample has been jeopardized (either by the laboratory or the customer)
- A discrepancy in the analysis has been found during QC analysis

18. Estimate of Analytical Uncertainty

When requested by the customer or required by regulatory agency, an estimate of analytical uncertainty can be provided with customer results. Generally, the uncertainty will be reported at a confidence interval of 95%. It should be noted this is only analytical uncertainty, and does not cover those contributors to uncertainty that may arise from sample collection activities.

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TestAmerica Laboratories, Inc. - Houston

Expiration Date: 10/31/2019

6310 Rothway Street
Houston, TX 77040-5056

Issue Date: 11/1/2018

These fields of accreditation supercede all previous fields. The Texas Commission on Environmental Quality urges customers to verify the laboratory's current accreditation status for particular methods and analyses.

Matrix: ***Non-Potable Water***

Method EPA 1010

Analyte	AB	Analyte ID	Method ID
Ignitability	TX	1780	10116606

Method EPA 1311

Analyte	AB	Analyte ID	Method ID
TCLP	TX	849	10118806

Method EPA 1312

Analyte	AB	Analyte ID	Method ID
SPLP	TX	850	10119003

Method EPA 1664

Analyte	AB	Analyte ID	Method ID
n-Hexane Extractable Material (HEM) (O&G)	TX	1803	10127807
Silica Gel Treated n-Hexane Extractable Material (SGT-HEM)	TX	10220	10127807

Method EPA 180.1

Analyte	AB	Analyte ID	Method ID
Turbidity	TX	2055	10011606

Method EPA 200.7

Analyte	AB	Analyte ID	Method ID
Aluminum	TX	1000	10013806
Antimony	TX	1005	10013806
Arsenic	TX	1010	10013806
Barium	TX	1015	10013806
Beryllium	TX	1020	10013806
Boron	TX	1025	10013806
Cadmium	TX	1030	10013806
Calcium	TX	1035	10013806
Chromium	TX	1040	10013806
Cobalt	TX	1050	10013806
Copper	TX	1055	10013806
Iron	TX	1070	10013806
Lead	TX	1075	10013806

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Matrix: ***Non-Potable Water***

Lithium	TX	1080	10013806
Magnesium	TX	1085	10013806
Manganese	TX	1090	10013806
Molybdenum	TX	1100	10013806
Nickel	TX	1105	10013806
Potassium	TX	1125	10013806
Selenium	TX	1140	10013806
Silica as SiO2	TX	1990	10013806
Silver	TX	1150	10013806
Sodium	TX	1155	10013806
Strontium	TX	1160	10013806
Thallium	TX	1165	10013806
Tin	TX	1175	10013806
Titanium	TX	1180	10013806
Vanadium	TX	1185	10013806
Zinc	TX	1190	10013806

Method EPA 200.8

Analyte	**AB**	**Analyte ID**	**Method ID**
Aluminum	TX	1000	10014605
Antimony	TX	1005	10014605
Arsenic	TX	1010	10014605
Barium	TX	1015	10014605
Beryllium	TX	1020	10014605
Boron	TX	1025	10014605
Cadmium	TX	1030	10014605
Chromium	TX	1040	10014605
Cobalt	TX	1050	10014605
Copper	TX	1055	10014605
Iron	TX	1070	10014605
Lead	TX	1075	10014605

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Matrix: ***Non-Potable Water***

Manganese	TX	1090	10014605
Molybdenum	TX	1100	10014605
Nickel	TX	1105	10014605
Potassium	TX	1125	10014605
Selenium	TX	1140	10014605
Silver	TX	1150	10014605
Sodium	TX	1155	10014605
Strontium	TX	1160	10014605
Thallium	TX	1165	10014605
Tin	TX	1175	10014605
Titanium	TX	1180	10014605
Vanadium	TX	1185	10014605
Zinc	TX	1190	10014605

Method EPA 245.1

Analyte	**AB**	**Analyte ID**	**Method ID**
Mercury	TX	1095	10036609

Method EPA 300.0

Analyte	**AB**	**Analyte ID**	**Method ID**
Bromide	TX	1540	10053200
Chloride	TX	1575	10053200
Fluoride	TX	1730	10053200
Nitrate as N	TX	1810	10053200
Nitrate-nitrite	TX	1820	10053200
Nitrite as N	TX	1840	10053200
Sulfate	TX	2000	10053200

Method EPA 335.1

Analyte	**AB**	**Analyte ID**	**Method ID**
Amenable cyanide	TX	1510	10060001

Method EPA 335.4

Analyte	**AB**	**Analyte ID**	**Method ID**
Total cyanide	TX	1645	10061402

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Matrix: ***Non-Potable Water***

Method EPA 350.1

Analyte	AB	Analyte ID	Method ID
Ammonia as N	TX	1515	10063408

Method EPA 351.2

Analyte	AB	Analyte ID	Method ID
Kjeldahl Nitrogen (Total Kjeldahl Nitrogen-TKN)	TX	1790	10065404

Method EPA 353.2

Analyte	AB	Analyte ID	Method ID
Nitrate-nitrite	TX	1820	10067400

Method EPA 420.4

Analyte	AB	Analyte ID	Method ID
Total phenolics	TX	1905	10080203

Method EPA 6010

Analyte	AB	Analyte ID	Method ID
Aluminum	TX	1000	10155609
Antimony	TX	1005	10155609
Arsenic	TX	1010	10155609
Barium	TX	1015	10155609
Beryllium	TX	1020	10155609
Boron	TX	1025	10155609
Cadmium	TX	1030	10155609
Calcium	TX	1035	10155609
Chromium	TX	1040	10155609
Cobalt	TX	1050	10155609
Copper	TX	1055	10155609
Iron	TX	1070	10155609
Lead	TX	1075	10155609
Lithium	TX	1080	10155609
Magnesium	TX	1085	10155609
Manganese	TX	1090	10155609
Molybdenum	TX	1100	10155609

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Matrix: ***Non-Potable Water***

Nickel	TX	1105	10155609
Potassium	TX	1125	10155609
Selenium	TX	1140	10155609
Silica as SiO2	TX	1990	10155609
Silver	TX	1150	10155609
Sodium	TX	1155	10155609
Strontium	TX	1160	10155609
Thallium	TX	1165	10155609
Tin	TX	1175	10155609
Titanium	TX	1180	10155609
Vanadium	TX	1185	10155609
Zinc	TX	1190	10155609

Method EPA 6020

Analyte	AB	Analyte ID	Method ID
Aluminum	TX	1000	10156419
Antimony	TX	1005	10156419
Arsenic	TX	1010	10156419
Barium	TX	1015	10156419
Beryllium	TX	1020	10156419
Boron	TX	1025	10156419
Cadmium	TX	1030	10156419
Chromium	TX	1040	10156419
Cobalt	TX	1050	10156419
Copper	TX	1055	10156419
Iron	TX	1070	10156419
Lead	TX	1075	10156419
Manganese	TX	1090	10156419
Molybdenum	TX	1100	10156419
Nickel	TX	1105	10156419
Potassium	TX	1125	10156419

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Matrix: ***Non-Potable Water***

Selenium	TX	1140	10156419
Silver	TX	1150	10156419
Sodium	TX	1155	10156419
Strontium	TX	1160	10156419
Thallium	TX	1165	10156419
Tin	TX	1175	10156419
Titanium	TX	1180	10156419
Vanadium	TX	1185	10156419
Zinc	TX	1190	10156419

Method EPA 608

Analyte	AB	Analyte ID	Method ID
4,4'-DDD	TX	7355	10103603
4,4'-DDE	TX	7360	10103603
4,4'-DDT	TX	7365	10103603
Aldrin	TX	7025	10103603
alpha-BHC (alpha-Hexachlorocyclohexane)	TX	7110	10103603
alpha-Chlordane	TX	7240	10103603
Aroclor-1016 (PCB-1016)	TX	8880	10103603
Aroclor-1221 (PCB-1221)	TX	8885	10103603
Aroclor-1232 (PCB-1232)	TX	8890	10103603
Aroclor-1242 (PCB-1242)	TX	8895	10103603
Aroclor-1248 (PCB-1248)	TX	8900	10103603
Aroclor-1254 (PCB-1254)	TX	8905	10103603
Aroclor-1260 (PCB-1260)	TX	8910	10103603
beta-BHC (beta-Hexachlorocyclohexane)	TX	7115	10103603
Chlordane (tech.)	TX	7250	10103603
delta-BHC (delta-Hexachlorocyclohexane)	TX	7105	10103603
Dieldrin	TX	7470	10103603
Endosulfan I	TX	7510	10103603
Endosulfan II	TX	7515	10103603

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Endosulfan sulfate	TX	7520	10103603
Endrin	TX	7540	10103603
Endrin aldehyde	TX	7530	10103603
Endrin ketone	TX	7535	10103603
gamma-BHC (Lindane, gamma-Hexachlorocyclohexane)	TX	7120	10103603
gamma-Chlordane	TX	7245	10103603
Heptachlor	TX	7685	10103603
Heptachlor epoxide	TX	7690	10103603
Methoxychlor	TX	7810	10103603
Toxaphene (Chlorinated camphene)	TX	8250	10103603

Method EPA 615

Analyte	**AB**	**Analyte ID**	**Method ID**
2,4,5-T	TX	8655	10298201
2,4-D	TX	8545	10298201
2,4-DB	TX	8560	10298201
Dalapon	TX	8555	10298201
Dicamba	TX	8595	10298201
Dichloroprop (Dichlorprop, Weedone)	TX	8605	10298201
Dinoseb (2-sec-butyl-4,6-dinitrophenol, DNBP)	TX	8620	10298201
MCPA	TX	7775	10298201
MCPP	TX	7780	10298201
Silvex (2,4,5-TP)	TX	8650	10298201

Method EPA 624

Analyte	**AB**	**Analyte ID**	**Method ID**
1,1,1-Trichloroethane	TX	5160	10107207
1,1,2,2-Tetrachloroethane	TX	5110	10107207
1,1,2-Trichloroethane	TX	5165	10107207
1,1-Dichloroethane	TX	4630	10107207
1,1-Dichloroethylene	TX	4640	10107207
1,2-Dibromoethane (EDB, Ethylene dibromide)	TX	4585	10107207
1,2-Dichlorobenzene	TX	4610	10107207

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Matrix: ***Non-Potable Water***

1,2-Dichloroethane (Ethylene dichloride)	TX	4635	10107207
1,2-Dichloropropane	TX	4655	10107207
1,3-Dichlorobenzene	TX	4615	10107207
1,4-Dichlorobenzene	TX	4620	10107207
2-Butanone (Methyl ethyl ketone, MEK)	TX	4410	10107207
2-Chloroethyl vinyl ether	TX	4500	10107207
Acetone (2-Propanone)	TX	4315	10107207
Acrolein (Propenal)	TX	4325	10107207
Acrylonitrile	TX	4340	10107207
Benzene	TX	4375	10107207
Bromodichloromethane	TX	4395	10107207
Bromoform	TX	4400	10107207
Carbon tetrachloride	TX	4455	10107207
Chlorobenzene	TX	4475	10107207
Chlorodibromomethane	TX	4575	10107207
Chloroethane (Ethyl chloride)	TX	4485	10107207
Chloroform	TX	4505	10107207
cis-1,2-Dichloroethylene	TX	4645	10107207
cis-1,3-Dichloropropene	TX	4680	10107207
Ethylbenzene	TX	4765	10107207
m+p-xylene	TX	5240	10107207
Methyl bromide (Bromomethane)	TX	4950	10107207
Methyl chloride (Chloromethane)	TX	4960	10107207
Methyl tert-butyl ether (MTBE)	TX	5000	10107207
Methylene chloride (Dichloromethane)	TX	4975	10107207
Naphthalene	TX	5005	10107207
o-Xylene	TX	5250	10107207
Tetrachloroethylene (Perchloroethylene)	TX	5115	10107207
Toluene	TX	5140	10107207
Total trihalomethanes	TX	5205	10107207

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trans-1,2-Dichloroethylene	TX	4700	10107207
trans-1,3-Dichloropropylene	TX	4685	10107207
Trichloroethene (Trichloroethylene)	TX	5170	10107207
Trichlorofluoromethane (Fluorotrichloromethane, Freon 11)	TX	5175	10107207
Vinyl chloride	TX	5235	10107207
Xylene (total)	TX	5260	10107207

Method EPA 625

Analyte	**AB**	**Analyte ID**	**Method ID**
1,2,4,5-Tetrachlorobenzene	TX	6715	10107401
1,2,4-Trichlorobenzene	TX	5155	10107401
1,2-Dichlorobenzene	TX	4610	10107401
1,2-Diphenylhydrazine	TX	6220	10107401
1,3-Dichlorobenzene	TX	4615	10107401
1,4-Dichlorobenzene	TX	4620	10107401
2,2'-Oxybis(1-chloropropane) (bis(2-Chloro-1-methylethyl)ether)	TX	4659	10107401
2,3,4,6-Tetrachlorophenol	TX	6735	10107401
2,4,5-Trichlorophenol	TX	6835	10107401
2,4,6-Trichlorophenol	TX	6840	10107401
2,4-Dichlorophenol	TX	6000	10107401
2,4-Dimethylphenol	TX	6130	10107401
2,4-Dinitrophenol	TX	6175	10107401
2,4-Dinitrotoluene (2,4-DNT)	TX	6185	10107401
2,6-Dinitrotoluene (2,6-DNT)	TX	6190	10107401
2-Chloronaphthalene	TX	5795	10107401
2-Chlorophenol	TX	5800	10107401
2-Methyl-4,6-dinitrophenol (4,6-Dinitro-2-methylphenol)	TX	6360	10107401
2-Methylphenol (o-Cresol)	TX	6400	10107401
2-Nitrophenol	TX	6490	10107401
3,3'-Dichlorobenzidine	TX	5945	10107401
4-Bromophenyl phenyl ether (BDE-3)	TX	5660	10107401

Texas Commission on Environmental Quality

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Expiration Date: 10/31/2019

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Houston, TX 77040-5056
Issue Date: 11/1/2018

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Matrix: ***Non-Potable Water***

4-Chloro-3-methylphenol	TX	5700	10107401
4-Chlorophenyl phenylether	TX	5825	10107401
4-Methylphenol (p-Cresol)	TX	6410	10107401
4-Nitrophenol	TX	6500	10107401
Acenaphthene	TX	5500	10107401
Acenaphthylene	TX	5505	10107401
Anthracene	TX	5555	10107401
Benzidine	TX	5595	10107401
Benzo(a)anthracene	TX	5575	10107401
Benzo(a)pyrene	TX	5580	10107401
Benzo(b)fluoranthene	TX	5585	10107401
Benzo(g,h,i)perylene	TX	5590	10107401
Benzo(k)fluoranthene	TX	5600	10107401
bis(2-Chloroethoxy)methane	TX	5760	10107401
bis(2-Chloroethyl) ether	TX	5765	10107401
bis(2-Ethylhexyl) phthalate (Di(2-Ethylhexyl) phthalate, DEHP)	TX	6065	10107401
Butyl benzyl phthalate	TX	5670	10107401
Chrysene	TX	5855	10107401
Dibenz(a,h) anthracene	TX	5895	10107401
Diethyl phthalate	TX	6070	10107401
Dimethyl phthalate	TX	6135	10107401
Di-n-butyl phthalate	TX	5925	10107401
Di-n-octyl phthalate	TX	6200	10107401
Fluoranthene	TX	6265	10107401
Fluorene	TX	6270	10107401
Hexachlorobenzene	TX	6275	10107401
Hexachlorobutadiene	TX	4835	10107401
Hexachlorocyclopentadiene	TX	6285	10107401
Hexachloroethane	TX	4840	10107401
Indeno(1,2,3-cd) pyrene	TX	6315	10107401

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Matrix: ***Non-Potable Water***

Isophorone	TX	6320	10107401
Naphthalene	TX	5005	10107401
Nitrobenzene	TX	5015	10107401
n-Nitrosodiethylamine	TX	6525	10107401
n-Nitrosodimethylamine	TX	6530	10107401
n-Nitrosodi-n-butylamine	TX	5025	10107401
n-Nitrosodi-n-propylamine	TX	6545	10107401
n-Nitrosodiphenylamine	TX	6535	10107401
Pentachlorobenzene	TX	6590	10107401
Pentachlorophenol	TX	6605	10107401
Phenanthrene	TX	6615	10107401
Phenol	TX	6625	10107401
Pyrene	TX	6665	10107401
Pyridine	TX	5095	10107401

Method EPA 7196

Analyte	**AB**	**Analyte ID**	**Method ID**
Chromium (VI)	TX	1045	10162400

Method EPA 7470

Analyte	**AB**	**Analyte ID**	**Method ID**
Mercury	TX	1095	10165807

Method EPA 8015

Analyte	**AB**	**Analyte ID**	**Method ID**
Allyl alcohol	TX	4350	10173601
Crotonaldehyde	TX	4545	10173601
Diesel range organics (DRO)	TX	9369	10173601
Ethanol	TX	4750	10173601
Ethylene glycol	TX	4785	10173601
Isobutyl alcohol (2-Methyl-1-propanol)	TX	4875	10173601
Isopropyl alcohol (2-Propanol, Isopropanol)	TX	4895	10173601
Methanol	TX	4930	10173601
n-Butyl alcohol (1-Butanol, n-Butanol)	TX	4425	10173601

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Matrix: ***Non-Potable Water***

n-Propanol (1-Propanol)	TX	5055	10173601

Method EPA 8081

Analyte	AB	Analyte ID	Method ID
4,4'-DDD	TX	7355	10178606
4,4'-DDE	TX	7360	10178606
4,4'-DDT	TX	7365	10178606
Aldrin	TX	7025	10178606
alpha-BHC (alpha-Hexachlorocyclohexane)	TX	7110	10178606
alpha-Chlordane	TX	7240	10178606
beta-BHC (beta-Hexachlorocyclohexane)	TX	7115	10178606
Chlordane (tech.)	TX	7250	10178606
delta-BHC (delta-Hexachlorocyclohexane)	TX	7105	10178606
Dieldrin	TX	7470	10178606
Endosulfan I	TX	7510	10178606
Endosulfan II	TX	7515	10178606
Endosulfan sulfate	TX	7520	10178606
Endrin	TX	7540	10178606
Endrin aldehyde	TX	7530	10178606
Endrin ketone	TX	7535	10178606
gamma-BHC (Lindane, gamma-Hexachlorocyclohexane)	TX	7120	10178606
gamma-Chlordane	TX	7245	10178606
Heptachlor	TX	7685	10178606
Heptachlor epoxide	TX	7690	10178606
Methoxychlor	TX	7810	10178606
Toxaphene (Chlorinated camphene)	TX	8250	10178606

Method EPA 8082

Analyte	AB	Analyte ID	Method ID
Aroclor-1016 (PCB-1016)	TX	8880	10179007
Aroclor-1221 (PCB-1221)	TX	8885	10179007
Aroclor-1232 (PCB-1232)	TX	8890	10179007
Aroclor-1242 (PCB-1242)	TX	8895	10179007

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Matrix: ***Non-Potable Water***

Aroclor-1248 (PCB-1248)	TX	8900	10179007
Aroclor-1254 (PCB-1254)	TX	8905	10179007
Aroclor-1260 (PCB-1260)	TX	8910	10179007
PCBs (total)	TX	8870	10179007

Method EPA 8151

Analyte	**AB**	**Analyte ID**	**Method ID**
2,4,5-T	TX	8655	10183207
2,4-D	TX	8545	10183207
2,4-DB	TX	8560	10183207
Dalapon	TX	8555	10183207
Dicamba	TX	8595	10183207
Dichloroprop (Dichlorprop, Weedone)	TX	8605	10183207
Dinoseb (2-sec-butyl-4,6-dinitrophenol, DNBP)	TX	8620	10183207
MCPA	TX	7775	10183207
MCPP	TX	7780	10183207
Silvex (2,4,5-TP)	TX	8650	10183207

Method EPA 8260

Analyte	**AB**	**Analyte ID**	**Method ID**
1,1,1,2-Tetrachloroethane	TX	5105	10184802
1,1,1-Trichloroethane	TX	5160	10184802
1,1,2,2-Tetrachloroethane	TX	5110	10184802
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	TX	5195	10184802
1,1,2-Trichloroethane	TX	5165	10184802
1,1-Dichloroethane	TX	4630	10184802
1,1-Dichloroethylene	TX	4640	10184802
1,1-Dichloropropene	TX	4670	10184802
1,2,3-Trichlorobenzene	TX	5150	10184802
1,2,3-Trichloropropane	TX	5180	10184802
1,2,4-Trichlorobenzene	TX	5155	10184802
1,2,4-Trimethylbenzene	TX	5210	10184802
1,2-Dibromo-3-chloropropane (DBCP)	TX	4570	10184802

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Matrix: ***Non-Potable Water***

1,2-Dibromoethane (EDB, Ethylene dibromide)	TX	4585	10184802
1,2-Dichlorobenzene	TX	4610	10184802
1,2-Dichloroethane (Ethylene dichloride)	TX	4635	10184802
1,2-Dichloropropane	TX	4655	10184802
1,3,5-Trimethylbenzene	TX	5215	10184802
1,3-Dichlorobenzene	TX	4615	10184802
1,3-Dichloropropane	TX	4660	10184802
1,4-Dichlorobenzene	TX	4620	10184802
1,4-Dioxane (1,4-Diethyleneoxide)	TX	4735	10184802
1-Chlorohexane	TX	4510	10184802
2,2-Dichloropropane	TX	4665	10184802
2-Butanone (Methyl ethyl ketone, MEK)	TX	4410	10184802
2-Chloroethyl vinyl ether	TX	4500	10184802
2-Chlorotoluene	TX	4535	10184802
2-Hexanone (MBK)	TX	4860	10184802
2-Nitropropane	TX	5020	10184802
4-Chlorotoluene	TX	4540	10184802
4-Isopropyltoluene (p-Cymene)	TX	4915	10184802
4-Methyl-2-pentanone (MIBK)	TX	4995	10184802
Acetone (2-Propanone)	TX	4315	10184802
Acetonitrile	TX	4320	10184802
Acrolein (Propenal)	TX	4325	10184802
Acrylonitrile	TX	4340	10184802
Allyl chloride (3-Chloropropene)	TX	4355	10184802
Benzene	TX	4375	10184802
Benzyl chloride	TX	5635	10184802
Bromobenzene	TX	4385	10184802
Bromochloromethane	TX	4390	10184802
Bromodichloromethane	TX	4395	10184802
Bromoform	TX	4400	10184802

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Matrix: ***Non-Potable Water***

Carbon disulfide	TX	4450	10184802
Carbon tetrachloride	TX	4455	10184802
Chlorobenzene	TX	4475	10184802
Chlorodibromomethane	TX	4575	10184802
Chloroethane (Ethyl chloride)	TX	4485	10184802
Chloroform	TX	4505	10184802
Chloroprene (2-Chloro-1,3-butadiene)	TX	4525	10184802
cis-1,2-Dichloroethylene	TX	4645	10184802
cis-1,3-Dichloropropene	TX	4680	10184802
Dibromofluoromethane	TX	4590	10184802
Dibromomethane (Methylene bromide)	TX	4595	10184802
Dichlorodifluoromethane (Freon-12)	TX	4625	10184802
Diethyl ether	TX	4725	10184802
Di-isopropylether (DIPE)	TX	9375	10184802
Ethyl acetate	TX	4755	10184802
Ethyl methacrylate	TX	4810	10184802
Ethylbenzene	TX	4765	10184802
Ethylene oxide	TX	4795	10184802
Ethyl-t-butylether (ETBE) (2-Ethoxy-2-methylpropane)	TX	4770	10184802
Hexachlorobutadiene	TX	4835	10184802
Iodomethane (Methyl iodide)	TX	4870	10184802
Isobutyl alcohol (2-Methyl-1-propanol)	TX	4875	10184802
Isopropyl alcohol (2-Propanol, Isopropanol)	TX	4895	10184802
Isopropylbenzene (Cumene)	TX	4900	10184802
m+p-xylene	TX	5240	10184802
Methacrylonitrile	TX	4925	10184802
Methyl acetate	TX	4940	10184802
Methyl acrylate	TX	4945	10184802
Methyl bromide (Bromomethane)	TX	4950	10184802
Methyl chloride (Chloromethane)	TX	4960	10184802

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Matrix: ***Non-Potable Water***

Methyl methacrylate	TX	4990	10184802
Methyl tert-butyl ether (MTBE)	TX	5000	10184802
Methylcyclohexane	TX	4965	10184802
Methylene chloride (Dichloromethane)	TX	4975	10184802
Naphthalene	TX	5005	10184802
n-Butyl alcohol (1-Butanol, n-Butanol)	TX	4425	10184802
n-Butylbenzene	TX	4435	10184802
n-Propylbenzene	TX	5090	10184802
o-Xylene	TX	5250	10184802
Propionitrile (Ethyl cyanide)	TX	5080	10184802
sec-Butylbenzene	TX	4440	10184802
Styrene	TX	5100	10184802
T-amylmethylether (TAME)	TX	4370	10184802
tert-Butyl alcohol	TX	4420	10184802
tert-Butylbenzene	TX	4445	10184802
Tetrachloroethylene (Perchloroethylene)	TX	5115	10184802
Toluene	TX	5140	10184802
Total trihalomethanes	TX	5205	10184802
trans-1,2-Dichloroethylene	TX	4700	10184802
trans-1,3-Dichloropropylene	TX	4685	10184802
trans-1,4-Dichloro-2-butene	TX	4605	10184802
Trichloroethene (Trichloroethylene)	TX	5170	10184802
Trichlorofluoromethane (Fluorotrichloromethane, Freon 11)	TX	5175	10184802
Vinyl acetate	TX	5225	10184802
Vinyl chloride	TX	5235	10184802
Xylene (total)	TX	5260	10184802

Method EPA 8270

Analyte	**AB**	**Analyte ID**	**Method ID**
1,2,4,5-Tetrachlorobenzene	TX	6715	10185805
1,2,4-Trichlorobenzene	TX	5155	10185805

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Matrix: ***Non-Potable Water***

1,2-Dichlorobenzene	TX	4610	10185805
1,2-Dinitrobenzene	TX	6155	10185805
1,2-Diphenylhydrazine	TX	6220	10185805
1,3,5-Trinitrobenzene (1,3,5-TNB)	TX	6885	10185805
1,3-Dichlorobenzene	TX	4615	10185805
1,3-Dinitrobenzene (1,3-DNB)	TX	6160	10185805
1,4-Dichlorobenzene	TX	4620	10185805
1,4-Dinitrobenzene	TX	6165	10185805
1,4-Naphthoquinone	TX	6420	10185805
1,4-Phenylenediamine	TX	6630	10185805
1-Chloronaphthalene	TX	5790	10185805
1-Naphthylamine	TX	6425	10185805
2,2'-Oxybis(1-chloropropane) (bis(2-Chloro-1-methylethyl)ether)	TX	4659	10185805
2,3,4,6-Tetrachlorophenol	TX	6735	10185805
2,4,5-Trichlorophenol	TX	6835	10185805
2,4,5-Trimethylaniline	TX	6880	10185805
2,4,6-Trichlorophenol	TX	6840	10185805
2,4-Diaminotoluene	TX	5880	10185805
2,4-Dichlorophenol	TX	6000	10185805
2,4-Dimethylphenol	TX	6130	10185805
2,4-Dinitrophenol	TX	6175	10185805
2,4-Dinitrotoluene (2,4-DNT)	TX	6185	10185805
2,4-Toluene diisocyanate	TX	9636	10185805
2,6-Dichlorophenol	TX	6005	10185805
2,6-Dinitrotoluene (2,6-DNT)	TX	6190	10185805
2-Acetylaminofluorene	TX	5515	10185805
2-Chloronaphthalene	TX	5795	10185805
2-Chlorophenol	TX	5800	10185805
2-Methyl-4,6-dinitrophenol (4,6-Dinitro-2-methylphenol)	TX	6360	10185805
2-Methylaniline (o-Toluidine)	TX	5145	10185805

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Matrix: ***Non-Potable Water***

2-Methylnaphthalene	TX	6385	10185805
2-Methylphenol (o-Cresol)	TX	6400	10185805
2-Naphthylamine	TX	6430	10185805
2-Nitroaniline	TX	6460	10185805
2-Nitrophenol	TX	6490	10185805
2-Picoline (2-Methylpyridine)	TX	5050	10185805
3,3'-Dichlorobenzidine	TX	5945	10185805
3,3'-Dimethoxybenzidine	TX	6100	10185805
3,3'-Dimethylbenzidine	TX	6120	10185805
3-Methylcholanthrene	TX	6355	10185805
3-Methylphenol (m-Cresol)	TX	6405	10185805
3-Nitroaniline	TX	6465	10185805
4-Aminobiphenyl	TX	5540	10185805
4-Bromophenyl phenyl ether (BDE-3)	TX	5660	10185805
4-Chloroaniline	TX	5745	10185805
4-Chlorophenyl phenylether	TX	5825	10185805
4-Dimethyl aminoazobenzene	TX	6105	10185805
4-Methylphenol (p-Cresol)	TX	6410	10185805
4-Nitroaniline	TX	6470	10185805
4-Nitrophenol	TX	6500	10185805
4-Nitroquinoline-1-oxide	TX	6510	10185805
5-Nitro-o-toluidine	TX	6570	10185805
7,12-Dimethylbenz(a) anthracene	TX	6115	10185805
a-a-Dimethylphenethylamine	TX	6125	10185805
Acenaphthene	TX	5500	10185805
Acenaphthylene	TX	5505	10185805
Acetophenone	TX	5510	10185805
Aniline	TX	5545	10185805
Anthracene	TX	5555	10185805
Azobenzene	TX	5562	10185805

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Matrix: ***Non-Potable Water***

Benzidine	TX	5595	10185805
Benzo(a)anthracene	TX	5575	10185805
Benzo(a)pyrene	TX	5580	10185805
Benzo(b)fluoranthene	TX	5585	10185805
Benzo(g,h,i)perylene	TX	5590	10185805
Benzo(k)fluoranthene	TX	5600	10185805
Benzoic acid	TX	5610	10185805
Benzyl alcohol	TX	5630	10185805
Biphenyl	TX	5640	10185805
bis(2-Chloroethoxy)methane	TX	5760	10185805
bis(2-Chloroethyl) ether	TX	5765	10185805
bis(2-Ethylhexyl) phthalate (Di(2-Ethylhexyl) phthalate, DEHP)	TX	6065	10185805
Butyl benzyl phthalate	TX	5670	10185805
Caprolactam	TX	7180	10185805
Carbazole	TX	5680	10185805
Chrysene	TX	5855	10185805
Diallate	TX	7405	10185805
Dibenz(a,h) anthracene	TX	5895	10185805
Dibenz(a,j) acridine	TX	5900	10185805
Dibenzo(a,e) pyrene	TX	5890	10185805
Dibenzofuran	TX	5905	10185805
Diethyl phthalate	TX	6070	10185805
Dimethoate	TX	7475	10185805
Dimethyl phthalate	TX	6135	10185805
Di-n-butyl phthalate	TX	5925	10185805
Di-n-octyl phthalate	TX	6200	10185805
Diphenylamine	TX	6205	10185805
Disulfoton	TX	8625	10185805
Ethyl methanesulfonate	TX	6260	10185805
Fluoranthene	TX	6265	10185805

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Matrix: ***Non-Potable Water***

Fluorene	TX	6270	10185805
Hexachlorobenzene	TX	6275	10185805
Hexachlorobutadiene	TX	4835	10185805
Hexachlorocyclopentadiene	TX	6285	10185805
Hexachloroethane	TX	4840	10185805
Hexachloropropene	TX	6295	10185805
Indeno(1,2,3-cd) pyrene	TX	6315	10185805
Isodrin	TX	7725	10185805
Isophorone	TX	6320	10185805
Isosafrole	TX	6325	10185805
Methyl methanesulfonate	TX	6375	10185805
Methyl parathion (Parathion, methyl)	TX	7825	10185805
Naphthalene	TX	5005	10185805
Nitrobenzene	TX	5015	10185805
n-Nitrosodiethylamine	TX	6525	10185805
n-Nitrosodimethylamine	TX	6530	10185805
n-Nitrosodi-n-butylamine	TX	5025	10185805
n-Nitrosodi-n-propylamine	TX	6545	10185805
n-Nitrosodiphenylamine	TX	6535	10185805
n-Nitrosomethylethylamine	TX	6550	10185805
n-Nitrosomorpholine	TX	6555	10185805
n-Nitrosopiperidine	TX	6560	10185805
n-Nitrosopyrrolidine	TX	6565	10185805
o,o,o-Triethyl phosphorothioate	TX	8290	10185805
Parathion, ethyl	TX	7955	10185805
Pentachlorobenzene	TX	6590	10185805
Pentachloronitrobenzene (PCNB)	TX	6600	10185805
Pentachlorophenol	TX	6605	10185805
Phenacetin	TX	6610	10185805
Phenanthrene	TX	6615	10185805

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Matrix: ***Non-Potable Water***

Phenol	TX	6625	10185805
Phorate	TX	7985	10185805
Pyrene	TX	6665	10185805
Pyridine	TX	5095	10185805
Quinoline	TX	6670	10185805
Safrole	TX	6685	10185805
Thionazin (Zinophos)	TX	8235	10185805

Method EPA 9012

Analyte	**AB**	**Analyte ID**	**Method ID**
Amenable cyanide	TX	1510	10193405
Total cyanide	TX	1645	10193405

Method EPA 9034

Analyte	**AB**	**Analyte ID**	**Method ID**
Sulfide	TX	2005	10196006

Method EPA 9040

Analyte	**AB**	**Analyte ID**	**Method ID**
pH	TX	1900	10197203

Method EPA 9050

Analyte	**AB**	**Analyte ID**	**Method ID**
Conductivity	TX	1610	10198808

Method EPA 9056

Analyte	**AB**	**Analyte ID**	**Method ID**
Bromide	TX	1540	10199209
Chloride	TX	1575	10199209
Fluoride	TX	1730	10199209
Nitrate as N	TX	1810	10199209
Nitrate-nitrite	TX	1820	10199209
Nitrite as N	TX	1840	10199209
Sulfate	TX	2000	10199209

Method EPA 9060

Analyte	**AB**	**Analyte ID**	**Method ID**

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Matrix: ***Non-Potable Water***

Total Organic Carbon (TOC)	TX	2040	10200201

Method EPA 9066

Analyte	**AB**	**Analyte ID**	**Method ID**
Total phenolics	TX	1905	10200609

Method EPA RSK 175

Analyte	**AB**	**Analyte ID**	**Method ID**
Ethane	TX	4747	10212905
Ethene	TX	4752	10212905
Methane	TX	4926	10212905

Method HACH 8000

Analyte	**AB**	**Analyte ID**	**Method ID**
Chemical oxygen demand (COD)	TX	1565	60003001

Method HACH 8507

Analyte	**AB**	**Analyte ID**	**Method ID**
Nitrite as N	TX	1840	60004208

Method SM 2120 B

Analyte	**AB**	**Analyte ID**	**Method ID**
Color	TX	1605	20223807

Method SM 2130 B

Analyte	**AB**	**Analyte ID**	**Method ID**
Turbidity	TX	2055	20042200

Method SM 2310 B (4a)

Analyte	**AB**	**Analyte ID**	**Method ID**
Acidity, as CaCO3	TX	1500	20002806

Method SM 2320 B

Analyte	**AB**	**Analyte ID**	**Method ID**
Alkalinity as CaCO3	TX	1505	20045005

Method SM 2340 B

Analyte	**AB**	**Analyte ID**	**Method ID**
Total hardness as CaCO3	TX	1755	20046008

Method SM 2510 B

Analyte	**AB**	**Analyte ID**	**Method ID**

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Matrix: ***Non-Potable Water***

Conductivity	TX	1610	20048004

Method SM 2540 B

Analyte	AB	Analyte ID	Method ID
Residue-total (total solids)	TX	1950	20004608

Method SM 2540 C

Analyte	AB	Analyte ID	Method ID
Residue-filterable (TDS)	TX	1955	20049803

Method SM 2540 D

Analyte	AB	Analyte ID	Method ID
Residue-nonfilterable (TSS)	TX	1960	20004802

Method SM 3500-Cr B

Analyte	AB	Analyte ID	Method ID
Chromium (VI)	TX	1045	20065809

Method SM 3500-Cr D

Analyte	AB	Analyte ID	Method ID
Chromium (VI)	TX	1045	20009001

Method SM 4500-Cl F

Analyte	AB	Analyte ID	Method ID
Total residual chlorine	TX	1940	20080482

Method SM 4500-CN^- G

Analyte	AB	Analyte ID	Method ID
Amenable cyanide	TX	1510	20021607

Method SM 4500-H+ B

Analyte	AB	Analyte ID	Method ID
pH	TX	1900	20104603

Method SM 4500-NH3 B

Analyte	AB	Analyte ID	Method ID
Ammonia as N	TX	1515	20022804

Method SM 4500-NH3 G

Analyte	AB	Analyte ID	Method ID
Ammonia as N	TX	1515	20023205

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Matrix: ***Non-Potable Water***

Method SM 4500-NO3 F

Analyte	AB	Analyte ID	Method ID
Nitrate-nitrite	TX	1820	20024402

Method SM 4500-O C

Analyte	AB	Analyte ID	Method ID
Oxygen, dissolved	TX	1880	20025201

Method SM 4500-P E

Analyte	AB	Analyte ID	Method ID
Orthophosphate as P	TX	1870	20025803
Phosphorus	TX	1910	20025803

Method SM 4500-$S2^{-}$ D

Analyte	AB	Analyte ID	Method ID
Sulfide	TX	2005	20125400

Method SM 4500-$S2^{-}$ E

Analyte	AB	Analyte ID	Method ID
Sulfide	TX	2005	20026408

Method SM 4500-$SO3^{-}$ B

Analyte	AB	Analyte ID	Method ID
Sulfite	TX	2015	20026806

Method SM 5210 B

Analyte	AB	Analyte ID	Method ID
Biochemical oxygen demand (BOD)	TX	1530	20027401
Carbonaceous BOD, CBOD	TX	1555	20027401

Method SM 5310 D

Analyte	AB	Analyte ID	Method ID
Total Organic Carbon (TOC)	TX	2040	20139202

Method SM 5540 C

Analyte	AB	Analyte ID	Method ID
Surfactants - MBAS	TX	2025	20144405

Method TCEQ 1005

Analyte	AB	Analyte ID	Method ID
Total Petroleum Hydrocarbons (TPH)	TX	2050	90019208

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Matrix: ***Solid & Chemical Materials***

Method EPA 1010

Analyte	AB	Analyte ID	Method ID
Ignitability	TX	1780	10116606

Method EPA 1311

Analyte	AB	Analyte ID	Method ID
TCLP	TX	849	10118806

Method EPA 1312

Analyte	AB	Analyte ID	Method ID
SPLP	TX	850	10119003

Method EPA 300.0

Analyte	AB	Analyte ID	Method ID
Bromide	TX	1540	10053200
Chloride	TX	1575	10053200
Fluoride	TX	1730	10053200
Nitrate as N	TX	1810	10053200
Nitrate-nitrite	TX	1820	10053200
Nitrite as N	TX	1840	10053200
Sulfate	TX	2000	10053200

Method EPA 353.2

Analyte	AB	Analyte ID	Method ID
Nitrate-nitrite	TX	1820	10067604

Method EPA 6010

Analyte	AB	Analyte ID	Method ID
Aluminum	TX	1000	10155609
Antimony	TX	1005	10155609
Arsenic	TX	1010	10155609
Barium	TX	1015	10155609
Beryllium	TX	1020	10155609
Boron	TX	1025	10155609
Cadmium	TX	1030	10155609
Calcium	TX	1035	10155609

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Matrix: ***Solid & Chemical Materials***

Chromium	TX	1040	10155609
Cobalt	TX	1050	10155609
Copper	TX	1055	10155609
Iron	TX	1070	10155609
Lead	TX	1075	10155609
Magnesium	TX	1085	10155609
Manganese	TX	1090	10155609
Molybdenum	TX	1100	10155609
Nickel	TX	1105	10155609
Potassium	TX	1125	10155609
Selenium	TX	1140	10155609
Silica as SiO2	TX	1990	10155609
Silver	TX	1150	10155609
Sodium	TX	1155	10155609
Strontium	TX	1160	10155609
Thallium	TX	1165	10155609
Tin	TX	1175	10155609
Titanium	TX	1180	10155609
Vanadium	TX	1185	10155609
Zinc	TX	1190	10155609

Method EPA 7471

Analyte	**AB**	**Analyte ID**	**Method ID**
Mercury	TX	1095	10166208

Method EPA 8015

Analyte	**AB**	**Analyte ID**	**Method ID**
Allyl alcohol	TX	4350	10173601
Diesel range organics (DRO)	TX	9369	10173601
Ethanol	TX	4750	10173601
Ethylene glycol	TX	4785	10173601
Isobutyl alcohol (2-Methyl-1-propanol)	TX	4875	10173601
Isopropyl alcohol (2-Propanol, Isopropanol)	TX	4895	10173601

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Matrix: ***Solid & Chemical Materials***

Methanol	TX	4930	10173601
n-Butyl alcohol (1-Butanol, n-Butanol)	TX	4425	10173601
n-Propanol (1-Propanol)	TX	5055	10173601

Method EPA 8081

Analyte	AB	Analyte ID	Method ID
4,4'-DDD	TX	7355	10178606
4,4'-DDE	TX	7360	10178606
4,4'-DDT	TX	7365	10178606
Aldrin	TX	7025	10178606
alpha-BHC (alpha-Hexachlorocyclohexane)	TX	7110	10178606
alpha-Chlordane	TX	7240	10178606
beta-BHC (beta-Hexachlorocyclohexane)	TX	7115	10178606
Chlordane (tech.)	TX	7250	10178606
delta-BHC (delta-Hexachlorocyclohexane)	TX	7105	10178606
Dieldrin	TX	7470	10178606
Endosulfan I	TX	7510	10178606
Endosulfan II	TX	7515	10178606
Endosulfan sulfate	TX	7520	10178606
Endrin	TX	7540	10178606
Endrin aldehyde	TX	7530	10178606
Endrin ketone	TX	7535	10178606
gamma-BHC (Lindane, gamma-Hexachlorocyclohexane)	TX	7120	10178606
gamma-Chlordane	TX	7245	10178606
Heptachlor	TX	7685	10178606
Heptachlor epoxide	TX	7690	10178606
Methoxychlor	TX	7810	10178606
Toxaphene (Chlorinated camphene)	TX	8250	10178606

Method EPA 8082

Analyte	AB	Analyte ID	Method ID
Aroclor-1016 (PCB-1016)	TX	8880	10179007
Aroclor-1221 (PCB-1221)	TX	8885	10179007

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Matrix: ***Solid & Chemical Materials***

Aroclor-1232 (PCB-1232)	TX	8890	10179007
Aroclor-1242 (PCB-1242)	TX	8895	10179007
Aroclor-1248 (PCB-1248)	TX	8900	10179007
Aroclor-1254 (PCB-1254)	TX	8905	10179007
Aroclor-1260 (PCB-1260)	TX	8910	10179007
PCBs (total)	TX	8870	10179007

Method EPA 8151

Analyte	AB	Analyte ID	Method ID
2,4,5-T	TX	8655	10183207
2,4-D	TX	8545	10183207
2,4-DB	TX	8560	10183207
Dalapon	TX	8555	10183207
Dicamba	TX	8595	10183207
Dichloroprop (Dichlorprop, Weedone)	TX	8605	10183207
Dinoseb (2-sec-butyl-4,6-dinitrophenol, DNBP)	TX	8620	10183207
MCPA	TX	7775	10183207
MCPP	TX	7780	10183207
Silvex (2,4,5-TP)	TX	8650	10183207

Method EPA 8260

Analyte	AB	Analyte ID	Method ID
1,1,1,2-Tetrachloroethane	TX	5105	10184802
1,1,1-Trichloroethane	TX	5160	10184802
1,1,2,2-Tetrachloroethane	TX	5110	10184802
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	TX	5195	10184802
1,1,2-Trichloroethane	TX	5165	10184802
1,1-Dichloroethane	TX	4630	10184802
1,1-Dichloroethylene	TX	4640	10184802
1,1-Dichloropropene	TX	4670	10184802
1,2,3-Trichlorobenzene	TX	5150	10184802
1,2,3-Trichloropropane	TX	5180	10184802
1,2,4-Trichlorobenzene	TX	5155	10184802

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Matrix: ***Solid & Chemical Materials***

1,2,4-Trimethylbenzene	TX	5210	10184802
1,2-Dibromo-3-chloropropane (DBCP)	TX	4570	10184802
1,2-Dibromoethane (EDB, Ethylene dibromide)	TX	4585	10184802
1,2-Dichlorobenzene	TX	4610	10184802
1,2-Dichloroethane (Ethylene dichloride)	TX	4635	10184802
1,2-Dichloropropane	TX	4655	10184802
1,3,5-Trimethylbenzene	TX	5215	10184802
1,3-Dichlorobenzene	TX	4615	10184802
1,3-Dichloropropane	TX	4660	10184802
1,4-Dichlorobenzene	TX	4620	10184802
1,4-Dioxane (1,4-Diethyleneoxide)	TX	4735	10184802
2,2-Dichloropropane	TX	4665	10184802
2-Butanone (Methyl ethyl ketone, MEK)	TX	4410	10184802
2-Chloroethyl vinyl ether	TX	4500	10184802
2-Chlorotoluene	TX	4535	10184802
2-Hexanone (MBK)	TX	4860	10184802
2-Nitropropane	TX	5020	10184802
4-Chlorotoluene	TX	4540	10184802
4-Isopropyltoluene (p-Cymene)	TX	4915	10184802
4-Methyl-2-pentanone (MIBK)	TX	4995	10184802
Acetone (2-Propanone)	TX	4315	10184802
Acetonitrile	TX	4320	10184802
Acrolein (Propenal)	TX	4325	10184802
Acrylonitrile	TX	4340	10184802
Allyl chloride (3-Chloropropene)	TX	4355	10184802
Benzene	TX	4375	10184802
Benzyl chloride	TX	5635	10184802
Bromobenzene	TX	4385	10184802
Bromochloromethane	TX	4390	10184802
Bromodichloromethane	TX	4395	10184802

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Matrix: ***Solid & Chemical Materials***

Bromoform	TX	4400	10184802
Carbon disulfide	TX	4450	10184802
Carbon tetrachloride	TX	4455	10184802
Chlorobenzene	TX	4475	10184802
Chlorodibromomethane	TX	4575	10184802
Chloroethane (Ethyl chloride)	TX	4485	10184802
Chloroform	TX	4505	10184802
Chloroprene (2-Chloro-1,3-butadiene)	TX	4525	10184802
cis-1,2-Dichloroethylene	TX	4645	10184802
cis-1,3-Dichloropropene	TX	4680	10184802
Dibromofluoromethane	TX	4590	10184802
Dibromomethane (Methylene bromide)	TX	4595	10184802
Dichlorodifluoromethane (Freon-12)	TX	4625	10184802
Ethyl acetate	TX	4755	10184802
Ethyl methacrylate	TX	4810	10184802
Ethylbenzene	TX	4765	10184802
Ethylene oxide	TX	4795	10184802
Hexachlorobutadiene	TX	4835	10184802
Iodomethane (Methyl iodide)	TX	4870	10184802
Isobutyl alcohol (2-Methyl-1-propanol)	TX	4875	10184802
Isopropyl alcohol (2-Propanol, Isopropanol)	TX	4895	10184802
Isopropylbenzene (Cumene)	TX	4900	10184802
m+p-xylene	TX	5240	10184802
Methacrylonitrile	TX	4925	10184802
Methyl acrylate	TX	4945	10184802
Methyl bromide (Bromomethane)	TX	4950	10184802
Methyl chloride (Chloromethane)	TX	4960	10184802
Methyl methacrylate	TX	4990	10184802
Methyl tert-butyl ether (MTBE)	TX	5000	10184802
Methylcyclohexane	TX	4965	10184802

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Matrix: ***Solid & Chemical Materials***

Methylene chloride (Dichloromethane)	TX	4975	10184802
Naphthalene	TX	5005	10184802
n-Butyl alcohol (1-Butanol, n-Butanol)	TX	4425	10184802
n-Butylbenzene	TX	4435	10184802
n-Propylbenzene	TX	5090	10184802
o-Xylene	TX	5250	10184802
Propionitrile (Ethyl cyanide)	TX	5080	10184802
sec-Butylbenzene	TX	4440	10184802
Styrene	TX	5100	10184802
tert-Butyl alcohol	TX	4420	10184802
tert-Butylbenzene	TX	4445	10184802
Tetrachloroethylene (Perchloroethylene)	TX	5115	10184802
Toluene	TX	5140	10184802
trans-1,2-Dichloroethylene	TX	4700	10184802
trans-1,3-Dichloropropylene	TX	4685	10184802
trans-1,4-Dichloro-2-butene	TX	4605	10184802
Trichloroethene (Trichloroethylene)	TX	5170	10184802
Trichlorofluoromethane (Fluorotrichloromethane, Freon 11)	TX	5175	10184802
Vinyl acetate	TX	5225	10184802
Vinyl chloride	TX	5235	10184802
Xylene (total)	TX	5260	10184802

Method EPA 8270

Analyte	**AB**	**Analyte ID**	**Method ID**
1,2,4,5-Tetrachlorobenzene	TX	6715	10185805
1,2,4-Trichlorobenzene	TX	5155	10185805
1,2-Dichlorobenzene	TX	4610	10185805
1,2-Dinitrobenzene	TX	6155	10185805
1,2-Diphenylhydrazine	TX	6220	10185805
1,3,5-Trinitrobenzene (1,3,5-TNB)	TX	6885	10185805
1,3-Dichlorobenzene	TX	4615	10185805

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Matrix: ***Solid & Chemical Materials***

1,3-Dinitrobenzene (1,3-DNB)	TX	6160	10185805
1,4-Dichlorobenzene	TX	4620	10185805
1,4-Dinitrobenzene	TX	6165	10185805
1,4-Naphthoquinone	TX	6420	10185805
1,4-Phenylenediamine	TX	6630	10185805
1-Chloronaphthalene	TX	5790	10185805
1-Naphthylamine	TX	6425	10185805
2,2'-Oxybis(1-chloropropane) (bis(2-Chloro-1-methylethyl)ether)	TX	4659	10185805
2,3,4,6-Tetrachlorophenol	TX	6735	10185805
2,4,5-Trichlorophenol	TX	6835	10185805
2,4,6-Trichlorophenol	TX	6840	10185805
2,4-Diaminotoluene	TX	5880	10185805
2,4-Dichlorophenol	TX	6000	10185805
2,4-Dimethylphenol	TX	6130	10185805
2,4-Dinitrophenol	TX	6175	10185805
2,4-Dinitrotoluene (2,4-DNT)	TX	6185	10185805
2,4-Toluene diisocyanate	TX	9636	10185805
2,6-Dichlorophenol	TX	6005	10185805
2,6-Dinitrotoluene (2,6-DNT)	TX	6190	10185805
2-Acetylaminofluorene	TX	5515	10185805
2-Chloronaphthalene	TX	5795	10185805
2-Chlorophenol	TX	5800	10185805
2-Methyl-4,6-dinitrophenol (4,6-Dinitro-2-methylphenol)	TX	6360	10185805
2-Methylaniline (o-Toluidine)	TX	5145	10185805
2-Methylnaphthalene	TX	6385	10185805
2-Methylphenol (o-Cresol)	TX	6400	10185805
2-Naphthylamine	TX	6430	10185805
2-Nitroaniline	TX	6460	10185805
2-Nitrophenol	TX	6490	10185805
2-Picoline (2-Methylpyridine)	TX	5050	10185805

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Matrix: ***Solid & Chemical Materials***

3,3'-Dichlorobenzidine	TX	5945	10185805
3,3'-Dimethoxybenzidine	TX	6100	10185805
3,3'-Dimethylbenzidine	TX	6120	10185805
3-Methylcholanthrene	TX	6355	10185805
3-Methylphenol (m-Cresol)	TX	6405	10185805
3-Nitroaniline	TX	6465	10185805
4-Aminobiphenyl	TX	5540	10185805
4-Bromophenyl phenyl ether (BDE-3)	TX	5660	10185805
4-Chloro-3-methylphenol	TX	5700	10185805
4-Chloroaniline	TX	5745	10185805
4-Chlorophenyl phenylether	TX	5825	10185805
4-Methylphenol (p-Cresol)	TX	6410	10185805
4-Nitroaniline	TX	6470	10185805
4-Nitrobiphenyl	TX	6480	10185805
4-Nitrophenol	TX	6500	10185805
4-Nitroquinoline-1-oxide	TX	6510	10185805
5-Nitro-o-toluidine	TX	6570	10185805
7,12-Dimethylbenz(a) anthracene	TX	6115	10185805
Acenaphthene	TX	5500	10185805
Acenaphthylene	TX	5505	10185805
Acetophenone	TX	5510	10185805
Aniline	TX	5545	10185805
Anthracene	TX	5555	10185805
Azobenzene	TX	5562	10185805
Benzenethiol (Thiophenol)	TX	6750	10185805
Benzidine	TX	5595	10185805
Benzo(a)anthracene	TX	5575	10185805
Benzo(a)pyrene	TX	5580	10185805
Benzo(b)fluoranthene	TX	5585	10185805
Benzo(g,h,i)perylene	TX	5590	10185805

Texas Commission on Environmental Quality

NELAP - Recognized Laboratory Fields of Accreditation

Certificate: T104704223-18-23

TestAmerica Laboratories, Inc. - Houston
Expiration Date: 10/31/2019

6310 Rothway Street
Houston, TX 77040-5056
Issue Date: 11/1/2018

These fields of accreditation supercede all previous fields. The Texas Commission on Environmental Quality urges customers to verify the laboratory's current accreditation status for particular methods and analyses.

Matrix: ***Solid & Chemical Materials***

Benzo(k)fluoranthene	TX	5600	10185805
Benzoic acid	TX	5610	10185805
Benzyl alcohol	TX	5630	10185805
Biphenyl	TX	5640	10185805
bis(2-Chloroethoxy)methane	TX	5760	10185805
bis(2-Chloroethyl) ether	TX	5765	10185805
bis(2-Ethylhexyl) phthalate (Di(2-Ethylhexyl) phthalate, DEHP)	TX	6065	10185805
Butyl benzyl phthalate	TX	5670	10185805
Caprolactam	TX	7180	10185805
Carbazole	TX	5680	10185805
Chlorobenzilate	TX	7260	10185805
Chrysene	TX	5855	10185805
Diallate	TX	7405	10185805
Dibenz(a,h) anthracene	TX	5895	10185805
Dibenzofuran	TX	5905	10185805
Diethyl phthalate	TX	6070	10185805
Dimethoate	TX	7475	10185805
Dimethyl phthalate	TX	6135	10185805
Di-n-butyl phthalate	TX	5925	10185805
Di-n-octyl phthalate	TX	6200	10185805
Diphenylamine	TX	6205	10185805
Disulfoton	TX	8625	10185805
Ethyl methanesulfonate	TX	6260	10185805
Fluoranthene	TX	6265	10185805
Fluorene	TX	6270	10185805
Hexachlorobenzene	TX	6275	10185805
Hexachlorobutadiene	TX	4835	10185805
Hexachlorocyclopentadiene	TX	6285	10185805
Hexachloroethane	TX	4840	10185805
Hexachlorophene	TX	6290	10185805

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Matrix: ***Solid & Chemical Materials***

Hexachloropropene	TX	6295	10185805
Indeno(1,2,3-cd) pyrene	TX	6315	10185805
Isodrin	TX	7725	10185805
Isophorone	TX	6320	10185805
Isosafrole	TX	6325	10185805
Methyl methanesulfonate	TX	6375	10185805
Methyl parathion (Parathion, methyl)	TX	7825	10185805
Methylphenols, total	TX	10313	10185805
Naphthalene	TX	5005	10185805
Nitrobenzene	TX	5015	10185805
n-Nitrosodiethylamine	TX	6525	10185805
n-Nitrosodimethylamine	TX	6530	10185805
n-Nitrosodi-n-butylamine	TX	5025	10185805
n-Nitrosodi-n-propylamine	TX	6545	10185805
n-Nitrosodiphenylamine	TX	6535	10185805
n-Nitrosomethylethylamine	TX	6550	10185805
n-Nitrosomorpholine	TX	6555	10185805
n-Nitrosopiperidine	TX	6560	10185805
n-Nitrosopyrrolidine	TX	6565	10185805
o,o,o-Triethyl phosphorothioate	TX	8290	10185805
Parathion, ethyl	TX	7955	10185805
Pentachlorobenzene	TX	6590	10185805
Pentachloronitrobenzene (PCNB)	TX	6600	10185805
Pentachlorophenol	TX	6605	10185805
Phenacetin	TX	6610	10185805
Phenanthrene	TX	6615	10185805
Phenol	TX	6625	10185805
Phorate	TX	7985	10185805
Pronamide (Kerb)	TX	6650	10185805
Pyrene	TX	6665	10185805

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Matrix: ***Solid & Chemical Materials***

Pyridine	TX	5095	10185805
Quinoline	TX	6670	10185805
Safrole	TX	6685	10185805
Thionazin (Zinophos)	TX	8235	10185805

Method EPA 9012

Analyte	**AB**	**Analyte ID**	**Method ID**
Amenable cyanide	TX	1510	10193405
Total cyanide	TX	1645	10193405

Method EPA 9034

Analyte	**AB**	**Analyte ID**	**Method ID**
Sulfide	TX	2005	10196006

Method EPA 9045

Analyte	**AB**	**Analyte ID**	**Method ID**
Corrosivity	TX	1615	10198400
pH	TX	1900	10198400

Method EPA 9050

Analyte	**AB**	**Analyte ID**	**Method ID**
Conductivity	TX	1610	10198808

Method EPA 9056

Analyte	**AB**	**Analyte ID**	**Method ID**
Bromide	TX	1540	10199209
Chloride	TX	1575	10199209
Fluoride	TX	1730	10199209
Nitrate as N	TX	1810	10199209
Nitrate-nitrite	TX	1820	10199209
Nitrite as N	TX	1840	10199209
Sulfate	TX	2000	10199209

Method EPA 9066

Analyte	**AB**	**Analyte ID**	**Method ID**
Total phenolics	TX	1905	10200609

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Matrix: ***Solid & Chemical Materials***

Method EPA 9071

Analyte	AB	Analyte ID	Method ID
n-Hexane Extractable Material (HEM) (O&G)	TX	1803	10201806
Silica Gel Treated n-Hexane Extractable Material (SGT-HEM)	TX	10220	10201806

Method EPA 9095

Analyte	AB	Analyte ID	Method ID
Paint Filter Liquids Test	TX	10312	10204203

Method SM 2320 B

Analyte	AB	Analyte ID	Method ID
Alkalinity as CaCO3	TX	1505	20045005

Method SM 2510 B

Analyte	AB	Analyte ID	Method ID
Conductivity	TX	1610	20048004

Method SSA/ASA Part 3:34

Analyte	AB	Analyte ID	Method ID
Carbon, organic (Walkley-Black)	TX	10340	SSA/ASA Pt 3:34

Method TCEQ 1005

Analyte	AB	Analyte ID	Method ID
Total Petroleum Hydrocarbons (TPH)	TX	2050	90019208

Quality Assurance Manual

TestAmerica Houston
6310 Rothway Street
Houston, TX 77040
713.690.4444
713.690.5646

www.testamericainc.com

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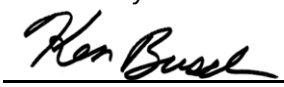
Quality Assurance Manual
Approval Signatures

03/02/2018

Laboratory Director – James Rorie — Date

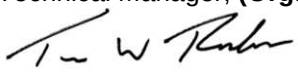


03/02/2018

Quality Manager - Ken Busch — Date

03/13/2018

Technical Manager, **(Organics)** – Jane Baxter — Date

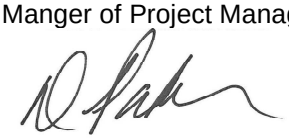


02/22/2018

Technical Manager, **(Metals)** – Travis W. Richter — Date

02/13/2018

Manger of Project Management – John Cady — Date



02/21/2018

Sample Admin/Field Supervisor – Dana Parker — Date

SECTION 2. TABLE OF CONTENTS

LIST OF TABLES

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LIST OF APPENDICES

REFERENCED CORPORATE SOPs AND POLICIES

SOP / Policy Reference	Title
CA-I-P-002	Electronic Reporting and Signature Policy
CA-L-P-002	Contract Compliance Policy
CW-L-S-004	Subcontracting
CA-Q-M-002	Corporate Quality Management Plan
CA-Q-S-001	Solvent and Acid Lot Testing and Approval
CA-Q-S-002	Acceptable Manual Integration Practices
CA-Q-S-006	Detection Limits
CA-Q-S-009	Root Cause Analysis
CA-T-P-001	Qualified Products List
CW-E-M-001	Corporate Environmental Health & Safety Manual
CW-F-P-002	Company-Wide Authorization Matrix
CW-F-P-004	Procurement and Contracts Policy
CW-F-S-007	Capital Expenditure, Controlled Purchase Requests and Fixed Asset Capitalization
CW-L-P-004	Ethics Policy
CW-L-S-002	Internal Investigation
CW-Q-S-001	Corporate Document Control and Archiving
CW-Q-S-002	Writing a Standard Operating Procedure (SOPs)
CW-Q-S-003	Internal Auditing
CW-Q-S-004	Management Systems Review
CW-Q-S-005	Data Recall Process
CA-C-S-001	Work Share Process

REFERENCED LABORATORY SOPs

SOP Reference	Title
HS-QA-004	Document Control & Updating (Sec. 3.4.1)
HS-QA-024	Complaint Resolution (Sec .10.1)
HS-QA-023	MOC (Sec. 13.2)
HS-QA-001	Lab Training (Sec. 17.3)
HS-QA-037	MDLs (Sec. 19.7)
HS-QA-017	Subsampling (22.5)
HS-SA-001	Sample Receipt / Login (Sec. 23.2.1.3)

SECTION 3. INTRODUCTION, SCOPE AND APPLICABILITY

3.1 Introduction and Compliance References

TestAmerica Houston's Quality Assurance Manual (QAM) is a document prepared to define the overall policies, organization objectives and functional responsibilities for achieving TestAmerica's data quality goals. The laboratory maintains a local perspective in its scope of services and client relations and maintains a national perspective in terms of quality.

The QAM has been prepared to assure compliance with The NELAC Institute (TNI) Standard, dated 2009, Volume 1 Modules 2 and 4, and ISO/IEC Guide 17025:2005(E). In addition, the policies and procedures outlined in this manual are compliant with TestAmerica's Corporate Quality Management Plan (CQMP) and the various accreditation and certification programs listed in Appendix 3. The CQMP provides a summary of TestAmerica's quality and data integrity system. It contains requirements and general guidelines under which all TestAmerica facilities shall conduct their operations. ***[Please note that the 2009 TNI Standard is based on the 2005 version of 17025.]***

The QAM has been prepared to be consistent with the requirements of the following documents:

- EPA 600/4-79-019, *Handbook for Analytical Quality Control in Water and Wastewater Laboratories,* EPA, March 1979.
- *Test Methods for Evaluating Solid Waste Physical/Chemical Methods (SW846), Third Edition, September 1986, Final Update I, July 1992, Final Update IIA, August 1993, Final Update II, September 1994; Final Update IIB, January 1995; Final Update III, December 1996; Final Update IV, January 2008; Final Update V, August 2015..*
- Federal Register, 40 CFR Parts 136, 141, 172, 173, 178, 179 and 261.
- *Statement of Work for Inorganics & Organics Analysis, SOM and ISM, current versions, USEPA Contract Laboratory Program Multi-media, Multi-concentration.*
- APHA, *Standard Methods for the Examination of Water and Wastewater,* 18th Edition, 19th, 20th, 21st, and on-line Editions.
- Toxic Substances Control Act (TSCA).

3.2 Terms and Definitions

A Quality Assurance Program is a company-wide system designed to ensure that data produced by the laboratory conforms to the standards set by state and/or federal regulations. The program functions at the management level through company goals and management policies, and at the analytical level through Standard Operating Procedures (SOPs) and quality control. The TestAmerica program is designed to minimize systematic error, encourage constructive, documented problem solving, and provide a framework for continuous improvement within the organization.

Refer to Appendix 2 for the Glossary/Acronyms.

3.3 Scope / Fields of Testing

The laboratory analyzes a broad range of environmental and industrial samples every month. Sample matrices vary among effluent water, groundwater, hazardous waste, sludge and soils. The Quality Assurance Program contains specific procedures and methods to test samples of differing matrices for chemical, physical and biological parameters. The Program also contains guidelines on maintaining documentation of analytical processes, reviewing results, servicing clients and tracking samples through the laboratory. The technical and service requirements of all analytical requests are thoroughly evaluated before commitments are made to accept the work. Measurements are made using published reference methods or methods developed and validated by the laboratory.

The methods covered by this manual include the most frequently requested methodologies needed to provide analytical services in the United States and its territories. The specific list of test methods used by the laboratory can be found on TotalAccess. The approach of this manual is to define the minimum level of quality assurance and quality control necessary to meet these requirements. All methods performed by the laboratory shall meet these criteria as appropriate. In some instances, quality assurance project plans (QAPPs), project specific data quality objectives (DQOs) or local regulations may require criteria other than those contained in this manual. In these cases, the laboratory will abide by the requested criteria following review and acceptance of the requirements by the Laboratory Director and the Quality Assurance (QA) Manager. In some cases, QAPPs and DQOs may specify less stringent requirements. The Laboratory Director and the QA Manager must determine if it is in the lab's best interest to follow the less stringent requirements.

3.4 Management of the Manual

3.4.1 Review Process

The template on which this manual is based is reviewed annually by Corporate Quality Management Personnel to assure that it remains in compliance with Section 3.1. This manual itself is reviewed every two years by senior laboratory management to assure that it reflects current practices and meets the requirements of the laboratory's clients and regulators as well as the CQMP. Occasionally, the manual may need changes in order to meet new or changing regulations and operations. The QA Manager will review the changes in the normal course of business and incorporate changes into revised sections of the document. All updates will be reviewed by the senior laboratory management staff. The laboratory updates and approves such changes according to our Document Control & Updating procedures (refer to SOP No. HS-QA-004).

SECTION 4. MANAGEMENT REQUIREMENTS

4.1 Overview

TestAmerica Houston is a local operating unit of TestAmerica Laboratories, Inc.. The organizational structure, responsibilities and authorities of the corporate staff of TestAmerica Laboratories, Inc. are presented in the CQMP. The laboratory has day-to-day independent operational authority overseen by corporate officers (e.g., President and Chief Executive Officer

(CEO), Chief Operating Officer (COO), Executive Vice President (VP) Operations, Corporate Quality, etc.). The laboratory operational and support staff work under the direction of the Laboratory Director. The organizational structure for both Corporate & TestAmerica Houston is presented in Figure 4-1

4.2 Roles and Responsibilities

In order for the Quality Assurance Program to function properly, all members of the staff must clearly understand and meet their individual responsibilities as they relate to the quality program. The following descriptions briefly define each role in its relationship to the Quality Assurance Program.

4.2.1 Additional Requirements for Laboratories

The responsibility for quality resides with every employee of the laboratory. All employees have access to the QAM, are trained to this manual, and are responsible for upholding the standards therein. Each person carries out his/her daily tasks in a manner consistent with the goals and in accordance with the procedures in this manual and the laboratory's SOPs. Role descriptions for Corporate personnel are defined in the CQMP. This manual is specific to the operations of TestAmerica's Houston laboratory.

4.2.2 President and Chief Executive Officer (CEO)

The President and CEO is a member of the Board of Directors and is ultimately responsible for the quality and performance of all TestAmerica facilities. The President and CEO establishes the overall quality standard and data integrity program for the Analytical Business, providing the necessary leadership and resources to assure that the standard and integrity program are met.

4.2.3 Chief Operation Officer (COO)

The COO reports directly to the President and CEO of TestAmerica. The COO oversees the operations of all TestAmerica laboratories and the EMLab P&K business unit. The VP's of Operations report directly to COO.

4.2.4 Vice President of Operations

Each VP of Operations reports directly to the Executive VP of Operations and is a part of the Executive Committee. Each VP of Operations is responsible for the overall administrative and operational management of their respective laboratories. The VP's responsibilities include allocation of personnel and resources, long-term planning, goal setting, and achieving the financial, business, and quality objectives of TestAmerica. The VP's ensure timely compliance with Corporate Management directives, policies, and management systems reviews. The VP's are also responsible for restricting any laboratory from performing analyses that cannot be consistently and successfully performed to meet the standards set forth in this manual.

4.2.5 Vice President of Quality and Environmental Health and Safety (VP-QA/EHS)

The Vice President (VP) of QA/EHS reports directly to the President and CEO. With the aid of the Executive Committee, Laboratory Directors, Quality Directors, Safety Manager, EH&S Coordinators and QA Managers, the VP-QA/EHS has the responsibility for the establishment,

general overview and Corporate maintenance of the Quality Assurance and EH&S Programs within TestAmerica. Additional responsibilities include:

- Review of QA/QC and EHS aspects of Corporate SOPs & Policies, national projects and expansions or changes in services.
- Work with various organizations outside of TestAmerica to further the development of quality standards and represent TestAmerica at various trade meetings.
- Preparation of a monthly report that includes quality metrics across the analytical laboratories and a summary of any quality related initiatives and issues.
- Preparation of a monthly report that includes EH&S metrics across the analytical laboratories and a summary of any EH&S related initiatives and issues.
- Work with various organizations outside of TestAmerica to further the development of quality standards and represent TestAmerica at various trade meetings.
- With the assistance of the Corporate Senior Management Teams and the EHS Directors, development and implementation of the TestAmerica Environmental, Health and Safety Program.

4.2.6 Vice President of Client Service

The VP of Client Services leads the Client Service Organization (CSO) and is responsible for client satisfaction, driving operational excellence and improving client responsiveness. The VP provides direction to the Client Service Directors, Programs Managers and Project Managers.

4.2.7 Quality Assessment Director

The Quality Assessment Director reports to the VP-QA/EHS. The Quality Assessment Director has QA oversight of laboratories; responsible for the internal audit system, schedule and procedure; monitors laboratory internal audit findings; identifies common laboratory weaknesses; and monitors corrective action closures. Together with the Quality Compliance Director, the Quality Systems Director, and the VP-QA/EHS, the Quality Assessment Director has the responsibility for the establishment, general overview and maintenance of the Analytical Quality Assurance Program within TestAmerica.

4.2.8 Quality Compliance Director

The Quality Compliance Director reports to the VP-QA/EHS. The Quality Compliance Director has QA oversight of laboratories; monitors and communicates DoD / DoE requirements; develops corporate tools for ensuring and improving compliance; develops corporate assessment tools; identifies common laboratory weaknesses; and monitors corrective action closures. Together with the Quality Assessment Director, Quality Systems Director and the VP-QA/EHS, the Quality Compliance Director has the responsibility for the establishment, general overview and maintenance of the Analytical Quality Assurance Program within TestAmerica.

4.2.9 Quality Systems Director

The Quality Systems Director reports to the VP-QA/EHS. The Quality Systems Director has QA oversight of laboratories; develops quality policies, procedures and management tools; monitors and communicates regulatory and certification requirements; identifies common laboratory weaknesses; and monitors corrective action closures. Together with the Quality Assessment

Director, Quality Compliance Director and the VP-QA/EHS, the Quality Systems Director has the responsibility for the establishment, general overview and maintenance of the Analytical Quality Assurance Program within TestAmerica.

4.2.10 Quality Information Manager

The Quality Information Manager is responsible for managing all company official documents (e.g., Policies, Procedures, Work Instructions), the company's accreditation database, intranet websites, external laboratory subcontracting, regulatory limits for clients on the company's TotalAccess website; internal and external client support for various company groups (e.g., Client Services, EH&S, Legal, IT, Sales) for both quality and operational functions. The Quality Information Manager reports to the VP-QA/EHS; and works alongside the Quality Assessment, Quality Compliance and Quality System Directors and EHS Managers to support both the Analytical Quality Assurance and EHS Programs within TestAmerica.

4.2.11 Technical Services Director

The Technical Services Director is responsible for establishing, implementing and communicating TestAmerica's Analytical Business's Technical Policies, SOPs, and Manuals. Other responsibilities include conducting technical assessments as required, acting as a technical resource in national contracts review, coordinating new technologies, establishing best practices, advising staff on technology advances, innovations, and applications.

4.2.12 Ethics and Compliance Officers (ECOs)

TestAmerica has designated two senior members of the Corporate staff to fulfill the role of Ethics and Compliance Officer (ECO) – Corporate Counsel & VP of Human Resources and the VP-QA/EHS. Each ECO acts as a back-up to the other ECO and both are involved when data investigations occur. Each ECO has a direct line of communication to the entire senior Corporate and lab management staff.

The ECOs ensure that the organization distributes the data integrity and ethical practices policies to all employees and ensures annual trainings and orientation of new hires to the ethics program and its policies. The ECO is responsible for establishing a mechanism to foster employee reporting of incidents of illegal, unethical, or improper practices in a safe and confidential environment.

The ECOs monitor and audit procedures to determine compliance with policies and to make recommendations for policy enhancements to the President and CEO, VPOs, Laboratory Director or other appropriate individuals within the laboratory. The ECO will assist the laboratory QA Manager in the coordination of internal auditing of ethical policy related activities and processes within the laboratory, in conjunction with the laboratories regular internal auditing function.

The ECOs will also participate in investigations of alleged violations of policies and work with the appropriate internal departments to investigate misconduct, remedy the situation, and prevent recurrence of any such activity.

4.2.13 Chief Information Officer (CIO)

The CIO is responsible for establishing, implementing and communicating TestAmerica's Information Technology (IT) Policies, SOPs and Manuals. Other responsibilities include coordinating new technologies, development of electronic communication tools such as TestAmerica's intranet and internet sites, ensuring data security and documentation of software, ensuring compliance with the NELAC standard, and assistance in establishing, updating, and maintaining Laboratory Information Management Systems (LIMS) at the various TestAmerica facilities.

4.2.14 Environmental Health and Safety Managers (Corporate)

The EHS Managers report directly to the VP-QA/EHS. The EHS Managers are responsible for the development and implementation of the TestAmerica Environmental, Health and Safety program. Responsibilities include:

- Consolidation and tracking all safety and health-related information and reports for the company, and managing compliance activities for TestAmerica locations.
- Coordination/preparation of the corporate Environmental, Health and Safety Manual Template that is used by each laboratory to prepare its own laboratory-specific Safety Manual/ CHP.
- Preparation of information and training materials for laboratory EHS Coordinators.
- Assistance in the internal and external coordination of employee exposure and medical monitoring programs to insure compliance with applicable safety and health regulations.
- Serving as Department of Transportation (D.O.T.) focal point and providing technical assistance to location management.
- Serving as Hazardous Waste Management main contact and providing technical assistance to location management.

4.2.15 Laboratory Director

TestAmerica Houston's Laboratory Director is responsible for the overall quality, safety, financial, technical, human resource and service performance of the whole laboratory and reports to their respective VPO. The Laboratory Director provides the resources necessary to implement and maintain an effective and comprehensive Quality Assurance and Data Integrity Program.

Specific responsibilities include, but are not limited to:

- Provides one or more technical directors for the appropriate fields of testing. If the Technical Director is absent for a period of time exceeding 15 consecutive calendar days, the Laboratory Manager must designate another full time staff member meeting the qualifications of the Technical Director to temporarily perform this function. If the absence exceeds 65 consecutive calendar days, the primary accrediting authority must be notified in writing.

- Ensures that all analysts and supervisors have the appropriate education and training to properly carry out the duties assigned to them and ensures that this training has been documented.
- Ensures that personnel are free from any commercial, financial and other undue pressures which might adversely affect the quality of their work.
- Ensures TestAmerica's human resource policies are adhered to and maintained.
- Ensures that sufficient numbers of qualified personnel are employed to supervise and perform the work of the laboratory.
- Ensures that appropriate corrective actions are taken to address analyses identified as requiring such actions by internal and external performance or procedural audits. Procedures that do not meet the standards set forth in the QAM or laboratory SOPs may be temporarily suspended by the Laboratory Director.
- Reviews and approves all SOPs prior to their implementation and ensures all approved SOPs are implemented and adhered to.
- Pursues and maintains appropriate laboratory certification and contract approvals. Supports ISO 17025 requirements.
- Ensures client specific reporting and quality control requirements are met.
- Captains the management team, consisting of the QA Manager, and the Technical Director(s).

4.2.16 Quality Assurance (QA) Manager

The QA Manager reports directly to the Laboratory Manager and Corporate Quality Director. This position is able to evaluate data objectively and perform assessments without outside (i.e., managerial) influence. Corporate QA may be used as a resource in dealing with regulatory requirements, certifications and other quality assurance related items.

The QA Manager has responsibility and authority to ensure the continuous implementation of the quality system.

The QA Manager directs the activities to accomplish specific responsibilities, which include, but are not limited to:

- Serves as the focal point for QA/QC in the laboratory.
- Ensuring Communication & monitoring standards of performance to ensure that systems are in place to produce the level of quality as defined in this document.
- Notifying laboratory management of deficiencies in the quality system and ensuring corrective action is taken. Procedures that do not meet the standards set forth in the QAM or laboratory SOPs shall be investigated following procedures outlined in Section 12 and if deemed necessary may be temporarily suspended during the investigation.
- Evaluation of the thoroughness and effectiveness of training.
- Having functions independent from laboratory operations for which he/she has quality assurance oversight.

- Have documented training and/or experience in QA/QC procedures and the laboratory's Quality System.
- Maintaining and updating the QAM.
- Monitoring and evaluating laboratory certifications; scheduling proficiency testing samples.
- Monitoring and communicating regulatory changes that may affect the laboratory to management.
- Training and advising the laboratory staff on quality assurance/quality control procedures that are pertinent to their daily activities.
- Having a general knowledge of the analytical test methods for which data audit/review is performed (and/or having the means of getting this information when needed).
- Arranging for or conducting internal audits on quality systems and the technical operation.
- Notifying laboratory management of deficiencies in the quality system and ensuring corrective action is taken. Procedures that do not meet the standards set forth in the QAM or laboratory SOPs shall be investigated following procedures outlined in Section 12 and if deemed necessary may be temporarily suspended during the investigation.
- Objectively monitor standards of performance in quality control and quality assurance without outside (e.g., managerial) influence.
- The laboratory QA Manager will maintain records of all ethics-related training, including the type and proof of attendance.
- Maintain, improve, and evaluate the corrective action database and the corrective and preventive action systems.
- Monitoring standards of performance in quality control and quality assurance.
- Coordinating of document control of SOPs, MDLs, control limits, and miscellaneous forms and information.
- Review a percentage of all final data reports for internal consistency. Review of Chain of Custody (COC), correspondence with the analytical request, batch QC status, completeness of any corrective action statements, evaluate manual calculations, format, holding time, sensibility and completeness of the project file contents.
- Review of external audit reports and data validation requests.
- Follow-up with audits to ensure client QAPP requirements are met.
- Establishment of reporting schedule and preparation of various quality reports for the Laboratory Director, clients and/or Corporate QA.
- Development of suggestions and recommendations to improve quality systems.
- Research of current state and federal requirements and guidelines.
- Captains the QA team to enable communication and to distribute duties and responsibilities.

4.2.17 Technical(Department) Managers

The Department Manager(s) report(s) directly to the Laboratory Director. He/she is accountable for all analyses and analysts under their experienced supervision. The department Manager is

the technical manager of the department. The scope of responsibility ranges from the new-hire process and existing technology through the ongoing training and development programs for existing analysts and new instrumentation. Specific responsibilities include, but are not limited to:

- Exercises day-to-day supervision of laboratory operations for the appropriate field of accreditation and reporting of results. Coordinating, writing, and reviewing preparation of all test methods, i. e., SOPs, with regard to quality, integrity, regulatory, optimum and efficient production techniques, and subsequent analyst training, and interpretation of the SOPs for implementation and unusual project samples. He/she insures that the SOPs are properly managed and adhered to at the bench. He/she develops standard costing of SOPs to include supplies, labor, overhead, and capacity (design vs. demonstrated versus first-run yield) utilization.
- Reviewing and approving, with input from the QA Manager, proposals from marketing, in accordance with an established procedure for the review of requests and contracts. This procedure addresses the adequate definition of methods to be used for analysis and any limitations, the laboratory's capability and resources, the client's expectations. Differences are resolved before the contract is signed and work begins. A system documenting any significant changes is maintained, as well as pertinent discussions with the client regarding their requirements or the results of the analyses during the performance of the contract. All work subcontracted by the laboratory must be approved by the client. Any deviations from the contract must be disclosed to the client. Once the work has begun, any amendments to the contract must be discussed with the client and so documented.
- Monitoring the validity of the analyses performed and data generated in the laboratory. This activity begins with reviewing and supporting all new business contracts, insuring data quality, analyzing internal and external non-conformances to identify root cause issues and implementing the resulting corrective and preventive actions, facilitating the data review process (training, development, and accountability at the bench), and providing technical and troubleshooting expertise on routine and unusual or complex problems.
- Providing training and development programs to applicable laboratory staff as new hires and, subsequently, on a scheduled basis. Training includes instruction on calculations, instrumentation management to include troubleshooting and preventive maintenance.
- Enhancing efficiency and improving quality through technical advances and improved LIMS utilization. Capital forecasting and instrument life cycle planning for second generation methods and instruments as well as asset inventory management.
- Coordinating sample management from "cradle to grave," insuring that no time is lost in locating samples.
- Scheduling all QA/QC-related requirements for compliance, e.g., MDLs, etc.
- To communicate quality, technical, personnel, and instrumental issues for a consistent team approach.
- Coordinates audit responses with QA Manager.
- Ensure that analysts in their department adhere to applicable SOPs and the QA Manual. They perform frequent SOP and QA Manual review to determine if analysts are in

compliance and if new, modified, and optimized measures are feasible and should be added to these documents.

- With regard to analysts, participates in the selection, training (as documented in Section 8.1), development of performance objectives and standards of performance, appraisal (measurement of objectives), scheduling, counseling, discipline, and motivation of analysts and documents these activities in accordance with systems developed by the QA and Personnel Departments. They evaluate staffing sufficiency and overtime needs. Training consists of familiarization with SOP, QC, Safety, and computer systems.
- Encourage the development of analysts to become cross-trained in various methods and/or operate multiple instruments efficiently while performing maintenance and documentation, self-supervise, and function as a department team.
- Provide guidance to analysts in resolving problems encountered daily during sample prep/analysis in conjunction with the Lab Director and/or QA Manager. Each is responsible for 100% of the data review and documentation, non-conformance and CAR issues, the timely and accurate completion of performance evaluation samples and MDLs, for his department.
- Ensure all logbooks are maintained, current, and properly labeled or archived.
- Report all non-conformance conditions to the QA Manager and/or Laboratory Manager.
- Ensure that preventive maintenance is performed on instrumentation as detailed in the QA Manual or SOPs. He/She is responsible for developing and implementing a system for preventive maintenance, troubleshooting, and repairing or arranging for repair of instruments.
- Maintain adequate and valid inventory of reagents, standards, spare parts, and other relevant resources required to perform daily analysis.
- Achieve optimum turnaround time on analyses and compliance with holding times.
- Conduct efficiency and cost control evaluations on an ongoing basis to determine optimization of labor, supplies, overtime, first-run yield, capacity (designed vs. demonstrated), second- and third-generation production techniques/instruments, and long-term needs for budgetary planning.
- Develop, implement, and enhance calibration programs.

4.2.18 Laboratory Analysts

Laboratory analysts are responsible for conducting analysis and performing all tasks assigned to them by the group leader or supervisor. The responsibilities of the analysts are listed below:

- Perform analyses by adhering to analytical and quality control protocols prescribed by current SOPs, this QA Manual, and project-specific plans honestly, accurately, timely, safely, and in the most cost-effective manner.
- Document standard and sample preparation, instrument calibration and maintenance, data calculations, sample matrix effects, and any observed non-conformance on worklists, benchsheets, lab notebooks and/or the Non-Conformance Database.

- Report all non-conformance situations, instrument problems, matrix problems and QC failures, which might affect the reliability of the data, to their supervisor, the Technical Director, and/or the QA Manager or member of QA staff.
- Perform 100% review of the data generated prior to entering and submitting for secondary level review.
- Suggest method improvements to their supervisor, the Technical Director, and the QA Manager. These improvements, if approved, will be incorporated. Ideas for the optimum performance of their assigned area, for example, through the proper cleaning and maintenance of the assigned instruments and equipment, are encouraged.
- Work cohesively as a team in their department to achieve the goals of accurate results, optimum turnaround time, cost effectiveness, cleanliness, complete documentation, and personal knowledge of environmental analysis.

4.2.19 EH&S Coordinator

The EH&S Coordinator reports to the Laboratory Manager and ensures that systems are maintained for the safe operation of the laboratory. The EH&S coordinator is responsible to:

- Conduct ongoing, necessary safety training and conduct new employee safety orientation.
- Assist in developing and maintaining the Chemical Hygiene/Safety Manual.
- Administer dispersal of all Safety Data Sheet (SDS) information.
- Perform regular chemical hygiene and housekeeping instruction.
- Give instruction on proper labeling and practice.
- Serve as chairman of the laboratory safety committee.
- Provide and train personnel on protective equipment.
- Oversee the inspection and maintenance of general safety equipment – fire extinguishers, safety showers, eyewash fountains, etc. and ensure prompt repairs as needed.
- Supervise and schedule fire drills and emergency evacuation drills.
- Determine what initial and subsequent exposure monitoring, if necessary to determine potential employee exposure to chemicals used in the laboratory.
- When determined necessary, conduct exposure monitoring assessments.
- Determine when a complaint of possible over-exposure is “reasonable” and should be referred for medical consultation.
- Assist in the internal and external coordination of the medical consultation/monitoring program conducted by TestAmerica’s medical consultants.

4.2.20 Log-in/Field Supervisor

The Log-in/Field Supervisor reports to the Operation Manager. The responsibilities are outlined below:

- Direct the logging of incoming samples into the LIMS.
- Ensure the verification of data entry from login.

- Supervises the organized storage and appropriate climate control of samples.
- Supervises the disposal of samples in accordance with the Waste Disposal SOP, the Hazardous Waste Contingency Plan in the Chemical Hygiene/Safety Manual, and the U. S. Department of Agriculture requirements.
- To ensure field sampling occurs to client specifications.
- To ensure planned maintenance of sampling equipment.
- Provides technical and operational support to a specific laboratory area while participating in daily sample production. Responsibilities include but are not limited to scheduling and prioritizing work tasks, training, problem solving, implementing new procedures and methods.
- Supervises field technician to maximize productivity and ensure appropriate testing procedures in compliance with QA and SOP requirements.
- Communicates department issues and provides status reports to Laboratory Manager and/or Lab Director and Project Managers.
- Trains all new analysts and upgrades staff on skills, equipment and procedures. Provides on-going performance feedback.

4.2.21 Manager of Project Management

The Manager of Project Management reports to the Client Services Director and serves as the interface between the laboratory's technical departments and the laboratory's clients. The staff consists of the Client Services Organization team. With the overall goal of total client satisfaction, the functions of this position are outlined below:

- Technical training and growth of the Project Management team.
- Technical liaison for the Project Management team.
- Human resource management of the Project Management team.
- Responsible to ensure that clients receive the proper sampling supplies.
- Accountable for response to client inquiries concerning sample status.
- Responsible for assistance to clients regarding the resolution of problems concerning COC.
- Ensuring that client specifications, when known, are met by communicating project and quality assurance requirements to the laboratory.
- Notifying the supervisors of incoming projects and sample delivery schedules.
- Accountable to clients for communicating sample progress.
- Responsible for discussing any project-related problems with clients, resolving service issues, and coordinating technical details with the laboratory staff.

- Responsible for staff familiarization with specific quotes, sample log-in review, and final report completeness.
- Monitor the status of all data package projects in-house to ensure timely and accurate delivery of reports.
- Monitoring and communicating regulatory changes that may affect the laboratory to management.
- Inform clients of data package-related problems and resolve service issues.
- Coordinate requests for sample containers and other services (data packages).

4.2.22 Project Manager

The Project Managers reports to Manager of Project Management. With the overall goal of total client satisfaction, the functions of this position are outlined below:

- Manages and provides a timely response to client inquires and complaints related to the management of projects and status of work in progress. Ensures resolution of the issues or complaints in the timeframe expected by the client.
- Works with Account Executives and other Sales Team Members, Laboratory Support, and Operations staff to meet client requirements and resolve service and technical issues during every phase of the project.
- As part of project setup, defines project requirements to ensure all contract requirements are met and communicates these requirements to appropriate personnel. The PM may be responsible for facilitating kick-off meetings, as appropriate, for new projects and ongoing projects.
- Works closely with internal sample receiving personnel to ensure proper receipt and login of samples. Verifies receipt and login information as quickly as possible and always within 24 hours from receipt of samples to ensure accuracy and completeness. Verification of login information includes all information required to accurately bill client for services and ensure ultimate collection of invoices.
- Prioritizes client requests based on due dates and complexity of response required.
- Manages task orders, work orders, change orders, and contracts for existing work. This process includes tracking spend against client orders and notifying client if order is insufficient to cover anticipated costs.
- Develops business relationships with clients to further enhance client service and sales.
- Participates in the overall sales process through direct discussions with clients and in coordination with Account Executives and other members of the Sales Team. Ensures client setup is completed including appropriate terms and credit limits. Facilitates internal and

client discussions as needed to eliminate issues after samples are received as they relate to terms and credit status.

- Responsible for oversight of the bottle order process whether completed personally or delegated to other appropriate personnel, such as a Project Manager Assistant or member of the Bottle Prep Team. Ensures that bottle orders are completed accurately and submitted in a timely manner.

- Works with the Manager of Project Manager (MPM), Business Development Manager (BDM), Client Relations Manager (CRM) and Sales Director in order to support the tracking and determination of wins/losses or pending for bids and quotes.

- Responsible for the generation and review of final reports whether completed personally or delegated to Project Management Assistants. Reviews and ensures that the final report meets the client's requirements and the TestAmerica standard for completeness, accuracy, and overall quality.

- Develops the ability to prepare and/or approve invoices to clients.

- Develops the ability to perform proactive collection related tasks in relation to status of client accounts receivables. This can range from ensuring receipt and approval of invoices by client to resolving issues related to unpaid invoices.

- Works with the Manager of Project Management to develop business relationship skills.

- Manages samples sent to other TestAmerica Laboratories and subcontracting to external laboratories.

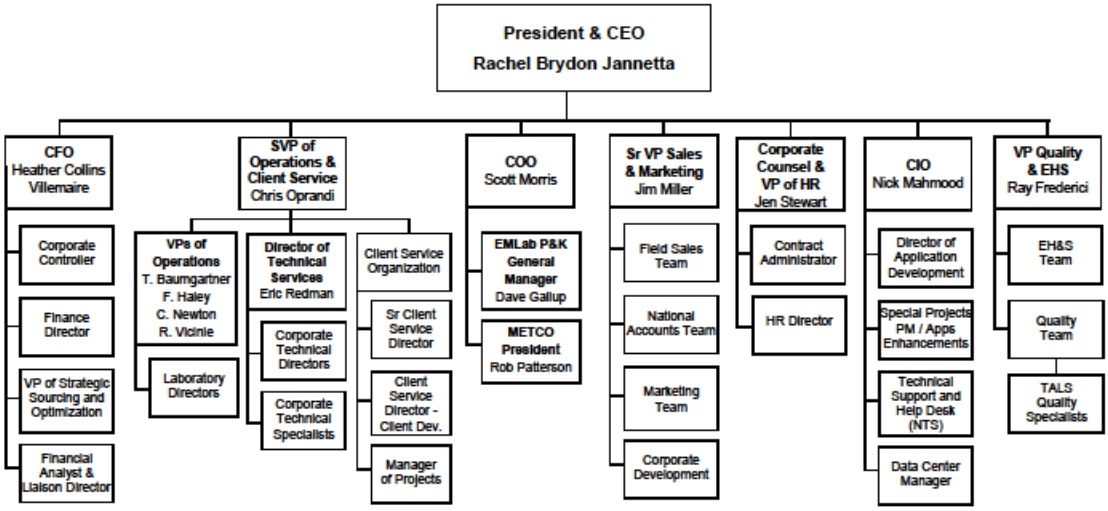
4.3 Deputies

The following table defines who assumes the responsibilities of key personnel in their absence:

Key Personnel	Deputy
Laboratory Director	QA Manager
QA Manager	Laboratory Director
Organic Technical Manager	VOA Supervisor or Technical Director
Metals Technical Manager	Wet Chemistry Technical Manager
Wet Chemistry Technical Manager	QA Manager
EHS Coordinator	Laboratory Director
Manager of Project Management	Laboratory Director

Figure 4-1. Corporate and Laboratory Organization Charts

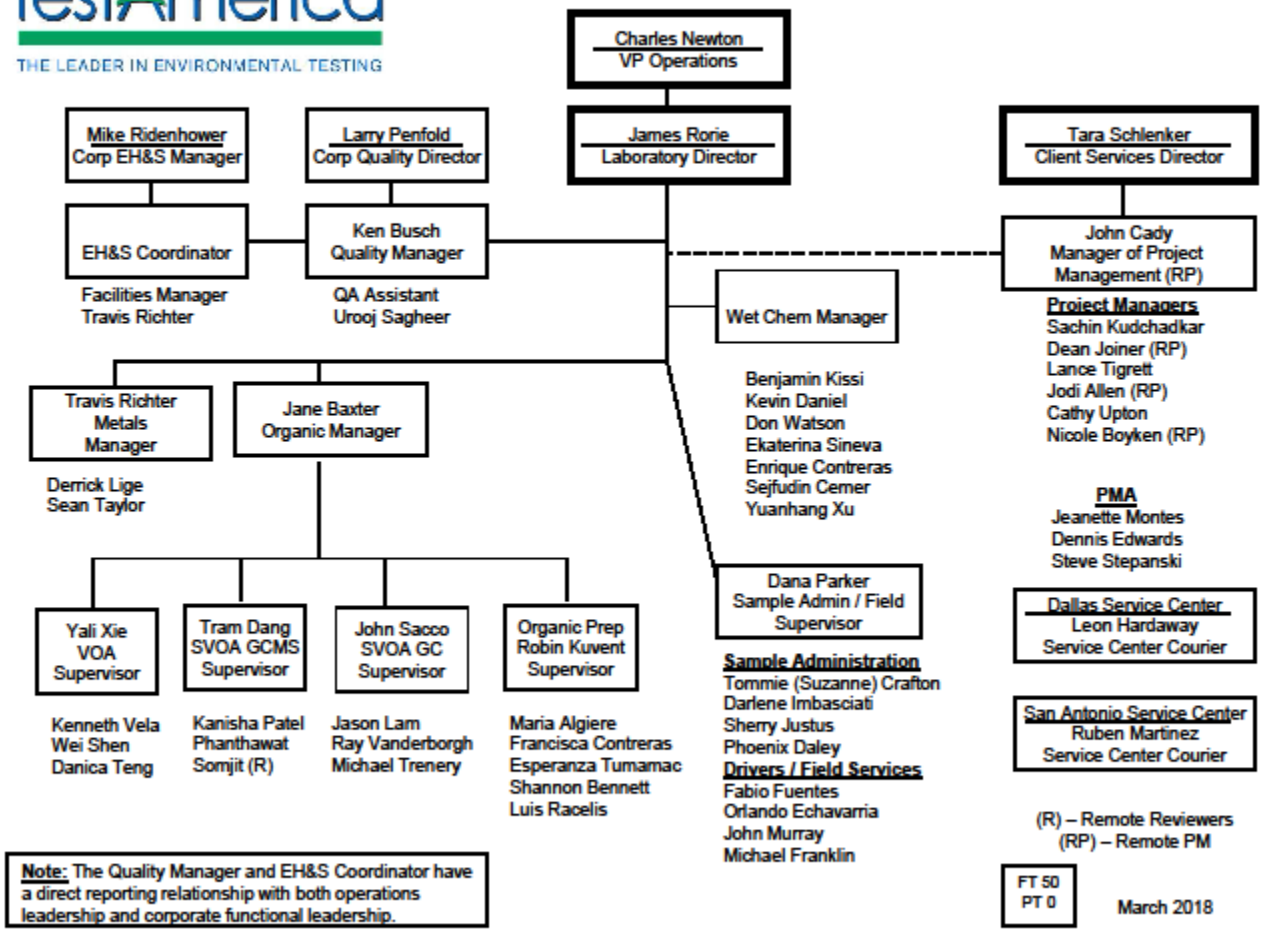
TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING



February 27 2017

Houston Laboratory Organization

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING



SECTION 5. QUALITY SYSTEM

5.1 Quality Policy Statement

It is TestAmerica's Policy to:

- ❖ Provide data of known quality to its clients by adhering to approved methodologies, regulatory requirements and the QA/QC protocols.
- ❖ Effectively manage all aspects of the laboratory and business operations by the highest ethical standards.
- ❖ Continually improve systems and provide support to quality improvement efforts in laboratory, administrative and managerial activities. TestAmerica recognizes that the implementation of a quality assurance program requires management's commitment and support as well as the involvement of the entire staff.
- ❖ Provide clients with the highest level of professionalism and the best service practices in the industry.
- ❖ To comply with the ISO/IEC 17025:2005(E) International Standard, the 2009 TNI Standard and to continually improve the effectiveness of the management system.

Every staff member at the laboratory plays an integral part in quality assurance and is held responsible and accountable for the quality of their work. It is, therefore, required that all laboratory personnel are trained and agree to comply with applicable procedures and requirements established by this document.

5.2 Ethics and Data Integrity

TestAmerica is committed to ensuring the integrity of its data and meeting the quality needs of its clients. The elements of TestAmerica's Ethics and Data Integrity Program include:

- An Ethics Policy (Corporate Policy No. CW-L-P-004) and Employee Ethics Statements.
- Ethics and Compliance Officers (ECOs).
- A Training Program.
- Self-governance through disciplinary action for violations.
- A confidential mechanism for anonymously reporting alleged misconduct and a means for conducting internal investigations of all alleged misconduct. (Corporate SOP No. CW-L-S-002)
- Procedures and guidance for recalling data if necessary (Corporate SOP No. CA-Q-S-005).
- Effective external and internal monitoring system that includes procedures for internal audits (Section 15).
- Produce results, which are accurate and include QA/QC information that meets client pre-defined Data Quality Objectives (DQOs).
- Present services in a confidential, honest and forthright manner.

- Provide employees with guidelines and an understanding of the Ethical and Quality Standards of our Industry.
- Operate our facilities in a manner that protects the environment and the health and safety of employees and the public.
- Obey all pertinent federal, state and local laws and regulations and encourage other members of our industry to do the same.
- Educate clients as to the extent and kinds of services available.
- Assert competency only for work for which adequate personnel and equipment are available and for which adequate preparation has been made.
- Promote the status of environmental laboratories, their employees, and the value of services rendered by them.

5.3 Quality System Documentation

The laboratory's Quality System is communicated through a variety of documents.

- Quality Assurance Manual – Each laboratory has a lab-specific quality assurance manual.
- Corporate SOPs and Policies – Corporate SOPs and Policies are developed for use by all relevant laboratories. They are incorporated into the laboratory's normal SOP distribution, training and tracking system. Corporate SOPs may be general or technical.
- Work Instructions – A subset of procedural steps, tasks or forms associated with an operation of a management system (e.g., checklists, preformatted bench sheets, forms).
- Laboratory SOPs – General and Technical
- Laboratory QA/QC Policy Memorandums

5.3.1 Order of Precedence

In the event of a conflict or discrepancy between policies, the order of precedence is as follows:

- Corporate Quality Management Plan (CQMP)
- Corporate SOPs and Policies
- Laboratory QA/QC Policy Memorandum
- Laboratory Quality Assurance Manual (QAM)
- Laboratory SOPs and Policies
- Other (Work Instructions (WI), memos, flow charts, etc.)

Note: The laboratory has the responsibility and authority to operate in compliance with regulatory requirements of the jurisdiction in which the work is performed. Where the CQMP conflicts with those regulatory requirements, the regulatory requirements of the jurisdiction shall hold primacy. The laboratory's QAM shall take precedence over the CQMP in those cases.

5.4 QA/QC Objectives for the Measurement of Data

Quality Assurance (QA) and Quality Control (QC) are activities undertaken to achieve the goal of producing data that accurately characterize the sites or materials that have been sampled. Quality Assurance is generally understood to be more comprehensive than Quality Control. Quality Assurance can be defined as the integrated system of activities that ensures that a product or service meets defined standards.

Quality Control is generally understood to be limited to the analyses of samples and to be synonymous with the term *"analytical quality control"*. QC refers to the routine application of statistically based procedures to evaluate and control the accuracy of results from analytical measurements. The QC program includes procedures for estimating and controlling precision and bias and for determining reporting limits.

Request for Proposals (RFPs) and Quality Assurance Project Plans (QAPP) provide a mechanism for the client and the laboratory to discuss the data quality objectives in order to ensure that analytical services closely correspond to client needs. The client is responsible for developing the QAPP. In order to ensure the ability of the laboratory to meet the Data Quality Objectives (DQOs) specified in the QAPP, clients are advised to allow time for the laboratory to review the QAPP before being finalized. Additionally, the laboratory will provide support to the client for developing the sections of the QAPP that concern laboratory activities.

Historically, laboratories have described their QC objectives in terms of precision, accuracy, representativeness, comparability, completeness, selectivity and sensitivity (PARCCSS).

5.4.1 Precision

The laboratory objective for precision is to meet the performance for precision demonstrated for the methods on similar samples and to meet data quality objectives of the EPA and/or other regulatory programs. Precision is defined as the degree of reproducibility of measurements under a given set of analytical conditions (exclusive of field sampling variability). Precision is documented on the basis of replicate analysis, usually duplicate or matrix spike (MS) duplicate samples.

5.4.2 Accuracy

The laboratory objective for accuracy is to meet the performance for accuracy demonstrated for the methods on similar samples and to meet data quality objectives of the EPA and/or other regulatory programs. Accuracy is defined as the degree of bias in a measurement system. Accuracy may be documented through the use of laboratory control samples (LCS) and/or MS. A statement of accuracy is expressed as an interval of acceptance recovery about the mean recovery.

5.4.3 Representativeness

The laboratory objective for representativeness is to provide data which is representative of the sampled medium. Representativeness is defined as the degree to which data represent a characteristic of a population or set of samples and is a measurement of both analytical and field sampling precision. The representativeness of the analytical data is a function of the procedures used in procuring and processing the samples. The representativeness can be documented by the relative percent difference between separately procured, but otherwise identical samples or sample aliquots.

The representativeness of the data from the sampling sites depends on both the sampling procedures and the analytical procedures. The laboratory may provide guidance to the client regarding proper sampling and handling methods in order to assure the integrity of the samples.

5.4.4 Comparability

The comparability objective is to provide analytical data for which the accuracy, precision, representativeness and reporting limit statistics are similar to these quality indicators generated by other laboratories for similar samples, and data generated by the laboratory over time.

The comparability objective is documented by inter-laboratory studies carried out by regulatory agencies or carried out for specific projects or contracts, by comparison of periodically generated statements of accuracy, precision and reporting limits with those of other laboratories.

5.4.5 Completeness

The completeness objective for data is 90% (or as specified by a particular project), expressed as the ratio of the valid data to the total data over the course of the project. Data will be considered valid if they are adequate for their intended use. Data usability will be defined in a QAPP, project scope or regulatory requirement. Data validation is the process for reviewing data to determine its usability and completeness. If the completeness objective is not met, actions will be taken internally and with the data user to improve performance. This may take the form of an audit to evaluate the methodology and procedures as possible sources for the difficulty or may result in a recommendation to use a different method.

5.4.6 Selectivity

Selectivity is defined as: The capability of a test method or instrument to respond to a target substance or constituent in the presence of non-target substances. Target analytes are separated from non-target constituents and subsequently identified/detected through one or more of the following, depending on the analytical method: extractions (separation), digestions (separation), interelement corrections (separation), use of matrix modifiers (separation), specific retention times (separation and identification), confirmations with different columns or detectors (separation and identification), specific wavelengths (identification), specific mass spectra (identification), specific electrodes (separation and identification), etc..

5.4.7 Sensitivity

Sensitivity refers to the amount of analyte necessary to produce a detector response that can be reliably detected (Method Detection Limit) or quantified (Reporting Limit).

5.5 Criteria for Quality Indicators

The laboratory maintains a *Quality Control Limit Summary that contains tables* that summarize the precision and accuracy acceptability limits for performed analyses. This summary includes an effective date, is updated each time new limits are generated and are managed by the laboratory's QA department and are tracked in the LIMS. Unless otherwise noted, limits within these tables are laboratory generated. Some acceptability limits are derived from US EPA methods when they are required. Where US EPA method limits are not required, the laboratory has developed limits from evaluation of data from similar matrices. Criteria for development of control limits is contained in SOP number HS-QA-WI-006 and in Section 24.

5.6 Statistical Quality Control

Statistically-derived precision and accuracy limits are required by selected methods (such as SW-846) and programs. The laboratory routinely utilizes statistically-derived limits to evaluate method performance and determine when corrective action is appropriate. The analysts are instructed to use the current limits in the laboratory (dated and approved by the Technical Manager and QA Manager) and entered into the Laboratory Information Management System (LIMS). The Quality Assurance department maintains an archive of all limits used within the laboratory, located in the LIMS. Details may be found in SOP number HS-QA-WI-006. If a method defines the QC limits, the method limits are used.

If a method requires the generation of historical limits, the lab develops such limits from recent data in the QC database of the LIMS following the guidelines described in Section 24. All calculations and limits are documented and dated when approved and effective. On occasion, a client requests contract-specified limits for a specific project.

Current QC limits are entered and maintained in the LIMS analyte database. As sample results and the related QC are entered into LIMS, the sample QC values are compared with the limits in LIMS to determine if they are within the acceptable range. The analyst then evaluates if the sample needs to be rerun or re-extracted/rerun or if a comment should be added to the report explaining the reason for the QC outlier.

5.6.1 QC Charts

The QA Manager evaluates these to determine if adjustments need to be made or for corrective actions to methods. All findings are documented and kept on file.

5.7 Quality System Metrics

In addition to the QC parameters discussed above, the entire Quality System is evaluated on a monthly basis through the use of specific metrics (refer to Section 16). These metrics are used to drive continuous improvement in the laboratory's Quality System.

SECTION 6. DOCUMENT CONTROL

6.1 Overview

The QA Department is responsible for the control of documents used in the laboratory to ensure that approved, up-to-date documents are in circulation and out-of-date (obsolete) documents are archived or destroyed. The following documents, at a minimum, must be controlled:

- Laboratory Quality Assurance Manual
- Laboratory Standard Operating Procedures (SOP)
- Laboratory Policies
- Work Instructions and Forms
- Corporate Policies and Procedures distributed outside the intranet

Corporate Quality posts Corporate Manuals, SOPs, Policies, Work Instructions, White Papers and Training Materials on the company intranet site. These Corporate documents are only considered controlled when they are read on the intranet site. Printed copies are considered uncontrolled unless the laboratory physically distributes them as controlled documents. A detailed description of the procedure for issuing, authorizing, controlling, distributing, and archiving Corporate documents is found in Corporate SOP No. CW-Q-S-001, Corporate Document Control and Archiving. The laboratory's internal document control procedure is defined in SOP No. HS-QA-004.

The laboratory QA Department also maintains access to various references and document sources integral to the operation of the laboratory. This includes reference methods and regulations. Instrument manuals (hard or electronic copies) are also maintained by the laboratory.

The laboratory maintains control of records for raw analytical data and supporting records such as audit reports and responses, logbooks, standard logs, training files, MDL studies, Proficiency Testing (PT) studies, certifications and related correspondence, and corrective action reports. Raw analytical data consists of bound logbooks, instrument printouts, any other notes, magnetic media, electronic data and final reports.

6.2 Document Approval and Issue

The pertinent elements of a document control system for each document include a unique document title and number, pagination, the total number of pages of the item or an 'end of document' page, the effective date, revision number and the laboratory's name. The QA personnel are responsible for the maintenance of this system.

Controlled documents are authorized by the QA Department. In order to develop a new document, a technical manager submits an electronic draft to the QA Department for suggestions and approval before use. Upon approval, QA personnel add the identifying version information to the document and retains that document as the official document on file. That document is then provided to all applicable operational units (may include electronic access). Controlled documents are identified as such and records of their distribution are kept by the QA Department. Document control may be achieved by either electronic or hardcopy distribution.

The QA Department maintains a list of the official versions of controlled documents.

Quality System Policies and Procedures will be reviewed at a minimum of every two years and revised as appropriate. Changes to documents occur when a procedural change warrants.

6.3 Procedures for Document Control Policy

For changes to the QA Manual, the QA Department will approve the change and will add the identifying version information to the document and retains that document on file. Uncontrolled copies must not be used within the laboratory. Previous revisions and back-up data are stored by the QA department. Electronic copies are stored on the Public server in the SOP folder for the applicable revision.

For changes to SOPs, refer to SOP No. CW-Q-S-002, Writing a Standard Operating Procedure SOP. The SOP identified above also defines the process of changes to SOPs.

Forms, worksheets, work instructions and information are organized by department in the QA office. There is a table of contents. Electronic versions are kept on a hard drive in the QA department; hard copies are kept in QA files.

6.4 Obsolete Documents

All invalid or obsolete documents are removed, or otherwise prevented from unintended use. The laboratory has specific procedures as described above to accomplish this. In general, obsolete documents are collected from employees according to distribution lists and are marked obsolete on the cover or destroyed. At least one copy of the obsolete document is archived according to SOP No. HS-QA-004.

SECTION 7. SERVICE TO THE CLIENT

7.1 Overview

The laboratory has established procedures for the review of work requests and contracts, oral or written. The procedures include evaluation of the laboratory's capability and resources to meet the contract's requirements within the requested time period. All requirements, including the methods to be used, must be adequately defined, documented and understood. For many environmental sampling and analysis programs, testing design is site or program specific and does not necessarily "fit" into a standard laboratory service or product. It is the laboratory's intent to provide both standard and customized environmental laboratory services to our clients.

A thorough review of technical and QC requirements contained in contracts is performed to ensure project success. The appropriateness of requested methods, and the lab's capability to perform them must be established. Projects, proposals and contracts are reviewed for adequately defined requirements and the laboratory's capability to meet those requirements. Alternate test methods that are capable of meeting the clients' requirements may be proposed by the lab. A review of the lab's capability to analyze non-routine analytes is also part of this review process.

All projects, proposals and contracts are reviewed for the client's requirements in terms of compound lists, test methodology requested, sensitivity (detection and reporting levels), accuracy, and precision requirements (% Recovery and RPD). The reviewer ensures that the laboratory's test methods are suitable to achieve these requirements and that the laboratory holds the appropriate certifications and approvals to perform the work. The laboratory and any potential subcontract laboratories must be certified, as required, for all proposed tests.

The laboratory must determine if it has the necessary physical, personnel and information resources to meet the contract, and if the personnel have the expertise needed to perform the testing requested. Each proposal is checked for its impact on the capacity of the laboratory's equipment and personnel. As part of the review, the proposed turnaround time will be checked for feasibility.

Electronic or hard copy deliverable requirements are evaluated against the laboratory's capacity for production of the documentation.

If the laboratory cannot provide all services but intends to subcontract such services, whether to another TestAmerica facility or to an outside firm, this will be documented and discussed with the client prior to contract approval. (Refer to Section 8 for Subcontracting Procedures.)

The laboratory informs the client of the results of the review if it indicates any potential conflict, deficiency, lack of accreditation, or inability of the lab to complete the work satisfactorily. Any discrepancy between the client's requirements and the laboratory's capability to meet those requirements is resolved in writing before acceptance of the contract. It is necessary that the contract be acceptable to both the laboratory and the client. Amendments initiated by the client and/or TestAmerica, are documented in writing.

All contracts, QAPPs, Sampling and Analysis Plans (SAPs), contract amendments, and documented communications become part of the project record.
The same contract review process used for the initial review is repeated when there are amendments to the original contract by the client, and the participating personnel are informed of the changes.

7.2 Review Sequence and Key Personnel

Appropriate personnel will review the work request at each stage of evaluation.

For routine projects and other simple tasks, a review by the Project Manager (PM) is considered adequate. The PM confirms that the laboratory has any required certifications, that it can meet the clients' data quality and reporting requirements and that the lab has the capacity to meet the clients turn around needs. It is recommended that, where there is a sales person assigned to the account, an attempt should be made to contact that sales person to inform them of the incoming samples.

For new, complex or large projects, the proposed contract is given to the Client Relationship Manager or Proposal Team, who will decide which lab will receive the work based on the scope of work and other requirements, including certification, testing methodology, and available capacity to perform the work. The contract review process is outlined in TestAmerica's Corporate SOP No. CA-L-P-002**,** Contract Compliance Policy.

This review encompasses all facets of the operation. The scope of work is distributed to the appropriate personnel, as needed based on scope of contract, to evaluate all of the requirements shown above (not necessarily in the order below):

- Contract Administrator
- VP of Operations
- Laboratory Project Manager
- Laboratory Directors and/or Corporate Technical Managers
- Laboratory Directors and/or Corporate Information Technology Managers
- Account Executives
- Laboratory and/or Corporate Quality
- Laboratory and/or Corporate Environmental Health and Safety Managers/Directors
- The Laboratory Director reviews the formal laboratory quote and makes final acceptance for their facility.

The ***Sales Director, Contract Administrator, Account Executive or Proposal Coordinator*** then submits the final proposal to the client.

In the event that one of the above personnel is not available to review the contract, his or her back-up will fulfill the review requirements.

The Contracts Department maintains copies of all signed contracts***.*** The Project Manager assigned to the project will also maintain a copy of the contract.

7.3 Documentation

Appropriate records are maintained for every contract or work request. All stages of the contract review process are documented and include records of any significant changes. This information is kept in the client's file maintained by the Project Manager associated with this contract or work request.

The contract will be distributed to and maintained by the appropriate sales/marketing personnel and the Account Executive. A copy of the contract and formal quote will be filed with the laboratory PM and the Laboratory Director.

Records are maintained of pertinent discussions with a client relating to the client's requirements or the results of the work during the period of execution of the contract. The PM keeps a phone log of conversations with the client and/or a record of any emails.

7.3.1 Project-Specific Quality Planning

Communication of contract specific technical and QC criteria is an essential activity in ensuring the success of site specific testing programs. To achieve this goal, a PM is assigned to each client. It is the PM's responsibility to ensure that project-specific technical and QC requirements are effectively evaluated and communicated to the laboratory personnel before and during the

project. QA department involvement may be needed to assist in the evaluation of custom QC requirements.

PM's are the primary client contact and they ensure resources are available to meet project requirements. Although PM's do not have direct reports or staff in production, they coordinate opportunities and work with laboratory management and supervisory staff to ensure available resources are sufficient to perform work for the client's project. Project management is positioned between the client and laboratory resources.

Prior to work on a new project, the dissemination of project information and/or project opening meetings may occur to discuss schedules and unique aspects of the project. Items to be discussed may include the project technical profile, turnaround times, holding times, methods, analyte lists, reporting limits, deliverables, sample hazards, or other special requirements. The PM introduces new projects to the laboratory staff through project kick-off meetings. These meetings provide direction to the laboratory staff in order to maximize production and client satisfaction, while maintaining quality. In addition, project notes may be associated with each sample batch as a reminder upon sample receipt and analytical processing.

During the project, any change that may occur within an active project is agreed upon between the client/regulatory agency and the PM/laboratory. These changes (e.g., use of a non-standard method or modification of a method) and approvals must be documented prior to implementation. Documentation pertains to any document, e.g., letter, e-mail, variance, contract addendum, which has been signed by both parties.

Such changes are also communicated to the laboratory during production meetings. Such changes are updated to the project notes and are introduced to the managers at these meetings. The laboratory staff is then introduced to the modified requirements via the PM or the individual laboratory Technical Manager. After the modification is implemented into the laboratory process, documentation of the modification is made in the case narrative of the data report(s).

The laboratory strongly encourages client visits to the laboratory and for formal/informal information sharing session with employees in order to effectively communicate ongoing client needs as well as project specific details for customized testing programs.

7.4 Special Services

The laboratory cooperates with clients and their representatives to monitor the laboratory's performance in relation to work performed for the client. It is the laboratory's goal to meet all client requirements in addition to statutory and regulatory requirements. The laboratory has procedures to ensure confidentiality to clients (Section 15 and 25).

Note: ISO/IEC 17025 states that a laboratory "shall afford clients or their representatives cooperation to clarify the client's request". This topic is discussed in Section 7.

The laboratory's standard procedures for reporting data are described in Section 25. Special services are also available and provided upon request. These services include:

- Reasonable access for our clients or their representatives to the relevant areas of the laboratory for the witnessing of tests performed for the client.

- Assist client-specified third party data validators as specified in the client's contract.
- Supplemental information pertaining to the analysis of their samples. Note: An additional charge may apply for additional data/information that was not requested prior to the time of sample analysis or previously agreed upon.

7.5 Client Communication

Project managers are the primary communication link to the clients. They shall inform their clients of any delays in project completion as well as any non-conformances in either sample receipt or sample analysis. Project management will maintain ongoing client communication throughout the entire client project.

Technical Managers / Directors are available to discuss any technical questions or concerns that the client may have.

7.6 Reporting

The laboratory works with our clients to produce any special communication reports required by the contract.

7.7 Client Surveys

The laboratory assesses both positive and negative client feedback. The results are used to improve overall laboratory quality and client service. TestAmerica's Sales and Marketing teams periodically develops lab and client specific surveys to assess client satisfaction.

SECTION 8. SUBCONTRACTING OF TESTS

8.1 Overview

For the purpose of this quality manual, the phrase subcontract laboratory refers to a laboratory external to the TestAmerica laboratories. The phrase "work sharing" refers to internal transfers of samples between the TestAmerica laboratories. The term outsourcing refers to the act of subcontracting tests.

When contracting with our clients, the laboratory makes commitments regarding the services to be performed and the data quality for the results to be generated. When the need arises to outsource testing for our clients because project scope, changes in laboratory capabilities, capacity or unforeseen circumstances, we must be assured that the subcontractors or work sharing laboratories understand the requirements and will meet the same commitments we have made to the client. Refer to TestAmerica's Corporate SOP's on Subcontracting Procedures (CW-L-S-004) and the Work Sharing Process (CA-C-S-001).

When outsourcing analytical services, the laboratory will assure, to the extent necessary, that the subcontract or work sharing laboratory maintains a program consistent with the requirements of this document, the requirements specified in TNI/ISO 17025 and/or the client's Quality Assurance Project Plan (QAPP). All QC guidelines specific to the client's analytical program are transmitted to the subcontractor and agreed upon before sending the samples to the subcontract facility. Additionally, work requiring accreditation will be placed with an

appropriately accredited laboratory. The laboratory performing the subcontracted work will be identified in the final report, as will non-TNI accredited work where required.

Project Managers (PMs), Manager of Project Management (MPM), Client Relations Managers, or Account Executives (AE) for the Export Lab (TestAmerica laboratory that transfers samples to another laboratory) are responsible for obtaining client approval prior to subcontracting any samples. The laboratory will advise the client of a subcontract arrangement in writing and when possible approval from the client shall be retained in the project folder. Standard TestAmerica Terms & Conditions include the flexibility to subcontract samples within the TestAmerica laboratories. Therefore, additional advance notification to clients for intra-laboratory subcontracting is not necessary unless specifically required by a client contract.

Note: In addition to the client, some regulating agencies (e.g, USDA) or contracts (e.g, certain USACE projects) may require notification prior to placing such work. A record of this notification will be documented in the project notes.

8.2 Qualifying and Monitoring Subcontracators

Whenever a PM or Account Executive (AE) or Manager of Project Management (MPM) becomes aware of a client requirement or laboratory need where samples must be outsourced to another laboratory, the other laboratory(s) shall be selected based on the following:

- Subcontractors specified by the client - In these circumstances, the client assumes responsibility for the quality of the data generated from the use of a subcontractor.
- Subcontractors reviewed by TestAmerica – Firms which have been reviewed by the company and are known to meet standards for accreditations (e.g., State, TNI and DoD/DOE); technical specifications; legal and financial information.

A listing of vendors is available on the TestAmerica intranet site.

All TestAmerica laboratories are pre-qualified for work sharing provided they hold the appropriate accreditations, can adhere to the project/program requirements, and the client approved sending samples to that laboratory. The client must provide acknowledgement that the samples can be sent to that facility (an e-mail is sufficient documentation or if acknowledgement is verbal, the date, time, and name of person providing acknowledgement must be documented). The originating laboratory is responsible for communicating all technical, quality, and deliverable requirements as well as other contract needs. (Corporate SOP No. CA-C-S-001, Work Sharing Process).

8.2.1 When the potential sub-contract laboratory has not been previously approved, Account Executives or PMs may nominate a laboratory as a subcontractor based on need. The decision to nominate a laboratory must be approved by the Client Relations Manager (CRM) or Laboratory Director. The CRM or Laboratory Director requests that the PM begin the process of approving the subcontract laboratory as outlined in Corporate SOP No. CW-L-S-004, Subcontracting Procedures.

Once the appropriate accreditation and legal information is received by the laboratory, it is evaluated for acceptability (where applicable) and forwarded to the Corporate Quality Information Manager (QIM) for review. After the Corporate QIM reviews the documents for

completeness, the information is forwarded to the Finance Department for formal signature and contracting with the laboratory. The approved vendor will be added to the approved subcontractor list on the intranet site and the finance group is concurrently notified for JD Edwards.

The client will assume responsibility for the quality of the data generated from the use of a subcontractor they have requested the lab to use. The qualified subcontractors on the intranet site are known to meet minimal standards. TestAmerica does not certify laboratories. The subcontractors on our approved list can only be recommended to the extent that we would use them.

8.3 Oversight and Reporting

8.3.1 The status and performance of qualified subcontractors will be monitored by the Corporate Quality department. Any problems identified will be brought to the attention of TestAmerica's Corporate Finance, Legal and Corporate Quality personnel.

- Complaints shall be investigated. Documentation of the complaint, investigation and corrective action will be maintained in the subcontractor's file on the intranet site. Complaints are posted using the Vendor Performance Report.
- Information shall be updated on the intranet when new information is received from the subcontracted laboratories.
- Subcontractors in good standing will be retained on the intranet listing. CSO personnel will notify all TestAmerica laboratories, Corporate Quality and Corporate Contracts if any laboratory requires removal from the intranet site. This notification will be posted on the intranet site and e-mailed to all CSO Personnel, Laboratory Directors, QA Managers and Sales Personnel.

Prior to initially sending samples to the subcontracted laboratory, the PM confirms their certification status to determine if it's current and scope-inclusive. The information is documented within the project records.

8.3.2 For continued use of a subcontractor, verification of certification is placed upon the subcontractor for the defined project. Samples are subcontracted under Chain of Custody with the program defined as 'Accreditation Required' and the following statement for verification upon sample receipt:

Note: Since laboratory accreditations are subject to change, TestAmerica Laboratories, Inc. places the ownership of method, analyte & accreditation compliance upon our subcontract laboratories. This sample shipment is forwarded under Chain of Custody. If the laboratory does not currently maintain accreditation in the State of Origin listed above for analytes/tests/matrix being analyzed, the samples must be shipped back to the TestAmerica laboratory or other instructions will be provided. Any changes to accreditation status should be brought to TestAmerica Laboratories, Inc. attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said compliance to TestAmerica Laboratories, Inc.

For TestAmerica laboratories, certifications can be viewed on the company's TotalAccess Database.

8.3.3 All subcontracted samples must be accompanied by a TestAmerica Chain of Custody (COC). A copy of the original COC sent by the client must be available in TALS for all samples workshared within TestAmerica. Client COCs are only forwarded to external subcontractors when samples are shipped directly from the project site to the subcontractor lab. Under routine circumstances, client COCs are not provided to external subcontractors.

Through communication with the subcontracted laboratory, the PM monitors the status of the subcontracted analyses, facilitates successful execution of the work, and ensures the timeliness and completeness of the analytical report.

Non-TNI accredited work must be identified in the subcontractor's report as appropriate. If TNI accreditation is not required, the report does not need to include this information.

Reports submitted from subcontractor laboratories are not altered and are included in their original form in the final project report. This clearly identifies the data as being produced by a subcontractor facility. If subcontract laboratory data is incorporated into the laboratories EDD (i.e., imported), the report must explicitly indicate which lab produced the data for which methods and samples.

Note: The results submitted by a TestAmerica work sharing laboratory may be transferred electronically and the results reported by the TestAmerica work sharing lab are identified on the final report. The report must explicitly indicate which lab produced the data for which methods and samples. The final report must include a copy of the completed COC for all work sharing reports.

8.4 Contingency Planning

The full qualification of a subcontractor may be waived to meet emergency needs; however, this decision & justification must be documented in the project files, and the 'Purchase Order Terms And Conditions For Subcontracted Laboratory Services' must be sent with the samples and COC.

In the event this provision is utilized, the laboratory (e.g., PM) will be required to verify and document the applicable accreditations of the subcontractor. All other quality and accreditation requirements will still be applicable, but the subcontractor need not have signed a subcontract with TestAmerica at this time.

The use of any emergency subcontractor will require the PM to complete a JDE New Vendor Add Form in order to process payment to the vendor and add them to TALS. This form requires the user to define the subcontractor's category/s of testing and the reason for testing.

SECTION 9. PURCHASING SERVICES AND SUPPLIES

9.1 Overview

Evaluation and selection of suppliers and vendors is performed, in part, on the basis of the quality of their products, their ability to meet the demand for their products on a continuous and short term basis, the overall quality of their services, their past history, and competitive pricing. This is achieved through evaluation of objective evidence of quality furnished by the supplier, which can include certificates of analysis, recommendations, and proof of historical compliance with similar programs for other clients. To ensure that quality critical consumables and equipment conform to specified requirements, which may affect quality, all purchases from specific vendors are approved by a member of the supervisory or management staff. Capital expenditures are made in accordance with TestAmerica's Corporate Controlled Purchases Procedure, SOP No. CW-F-S-007.

Contracts will be signed in accordance with TestAmerica's Corporate Authorization Matrix Policy, Policy No. CW-F-P-002. Request for Proposals (RFP's) will be issued where more information is required from the potential vendors than just price. Process details are available in TestAmerica's Corporate Procurement and Contracts Policy (Policy No. CW-F-P-004). RFP's allow TestAmerica to determine if a vendor is capable of meeting requirements such as supplying all of the TestAmerica facilities, meeting required quality standards and adhering to necessary ethical and environmental standards. The RFP process also allows potential vendors to outline any additional capabilities they may offer.

9.2 Glassware

Glassware used for volumetric measurements must be Class A or verified for accuracy according to laboratory procedure. Pyrex (or equivalent) glass should be used where possible. For safety purposes, thick-wall glassware should be used where available.

9.3 Reagents, Standards & Supplies

Purchasing guidelines for equipment, consumables, and reagents must meet the requirements of the specific method and testing procedures for which they are being purchased. Solvents and acids are pre-tested in accordance with TestAmerica's Corporate SOP on Solvent & Acid Lot Testing & Approval, SOP No. CA-Q-S-001. Approval information for the solvents and acids tested under SOP CA-Q-S-001 is stored on the TestAmerica Sharepoint, under Solvent Approvals. A master list of all tested materials, as well as the certificates of analysis for the materials, is stored in the same location.

9.3.1 Purchasing

Chemical reagents, solvents, glassware, and general supplies are ordered as needed to maintain sufficient quantities on hand. Materials used in the analytical process must be of a known quality. The wide variety of materials and reagents available makes it advisable to specify recommendations for the name, brand, and grade of materials to be used in any determination. This information is contained in the method SOP. The analyst completes the Material Request Sheet when requesting reagents, standards, or supplies. The analyst may check the item out of the on-site consignment system that contains items approved for laboratory use.

The analyst must provide the master item number (from the master item list that has been approved by the Technical Director), item description, package size, catalogue page number, and the quantity needed. If an item being ordered is not the exact item requested, approval must be obtained from the Technical Director prior to placing the order. The purchasing manager places the order.

9.3.2 Receiving

It is the responsibility of the purchasing manager to receive the shipment. It is the responsibility of the analyst who ordered the materials to document the date materials where received. Once the ordered reagents or materials are received, the analyst compares the information on the label or packaging to the original order to ensure that the purchase meets the quality level specified. This is documented through the addition of the received date and initials to the information present on the daily order log.

The purchasing manager verifies the lot numbers of received solvents and acids against the pre-approval lists. If a received material is listed as unapproved, or is not listed, it is sequestered and returned to the vendor. Alternatively, the laboratory may test the material for the intended use, and if it is acceptable, document the approval on the approval list. Records of any testing performed locally are maintained on the shared “public” folder on the computer network.

Materials may not be released for use in the laboratory until they have been inspected, verified as suitable for use, and the inspection/verification has been documented.

9.3.3 Specifications

Methods in use in the laboratory specify the grade of reagent that must be used in the procedure. If the quality of the reagent is not specified, analytical reagent grade will be used. It is the responsibility of the analyst to check the procedure carefully for the suitability of grade of reagent.

Chemicals must not be used past the manufacturer’s expiration date and must not be used past the expiration time noted in a method SOP. If expiration dates are not provided, the laboratory may contact the manufacturer to determine an expiration date.

The laboratory assumes a five year expiration date on inorganic dry chemicals and solvents unless noted otherwise by the manufacturer or by the reference source method. Chemicals/solvents should not be used past the manufacturer’s or SOPs expiration date unless ‘verified’ (refer to item 3 listed below).

- An expiration date **cannot** be extended if the dry chemical/solvent is discolored or appears otherwise physically degraded, the dry chemical/solvent must be discarded.
- Expiration dates can be extended if the dry chemical/solvent is found to be satisfactory based on acceptable performance of quality control samples (Continuing Calibration Verification (CCV), Blanks, Laboratory Control Sample (LCS), etc.).

- If the dry chemical/solvent is used for the preparation of standards, the expiration dates can be extended 6 months if the dry chemical/solvent is compared to an unexpired independent source in performing the method and the performance of the dry chemical/solvent is found to be satisfactory. The comparison must show that the dry chemical/solvent meets CCV limits. The comparison studies are maintained by the departments.

Wherever possible, standards must be traceable to national or international standards of measurement or to national or international reference materials. Records to that effect are available to the user.

Compressed gases in use are checked for pressure and secure positioning daily. To prevent a tank from going to dryness, or introducing potential impurities, the pressure should be closely watched as it decreases to approximately 15% of the original reading, at which point it should be replaced. For example, a standard sized laboratory gas cylinder containing 3,000 psig of gas should be replaced when it drops to approximately 500 psig. The quality of the gases must meet method or manufacturer specification or be of a grade that does not cause any analytical interference.

Water used in the preparation of standards or reagents must have a specific conductivity of less than 1- µmh/cm (or specific resistivity of greater than 1.0 megohm-cm) at 25^{o}C. The specific conductivity is checked and recorded daily. If the water's specific conductivity is greater than the specified limit, the Facility Manager and appropriate Technical Managers must be notified immediately in order to notify all departments, decide on cessation (based on intended use) of activities, and make arrangements for correction.

The laboratory may purchase reagent grade (or other similar quality) water for use in the laboratory. This water must be certified "clean" by the supplier for all target analytes or otherwise verified by the laboratory prior to use. This verification is documented.

Standard lots are verified before first time use if the laboratory switches manufacturers or has historically had a problem with the type of standard.

Purchased bottleware used for sampling must be certified clean and the certificates must be maintained. If uncertified sampling bottleware is purchased, all lots must be verified clean prior to use. This verification must be maintained.

Records of manufacturer's certification and traceability statements are maintained in files or binders in each laboratory section. These records include date of receipt, lot number (when applicable), and expiration date (when applicable). Incorporation of the item into the record indicates that the analyst has compared the new certificate with the previous one for the same purpose and that no difference is noted, unless approved and so documented by the Technical Director or QA Manager.

9.3.4 Storage

Reagent and chemical storage is important from the aspects of both integrity and safety. Light-sensitive reagents may be stored in brown-glass containers. Storage conditions are per the Corporate Environmental Health & Safety Manual (Corp. Doc. No. CW-E-M-001) and method SOPs or manufacturer instructions.

9.4 Purchase of Equipment / Instruments / Software

When a new piece of equipment is needed, either for additional capacity or for replacing inoperable equipment, the analyst or supervisor makes a supply request to the Technical Manager/Director and/or the Laboratory Director. If they agree with the request, the procedures outlined in TestAmerica's Corporate Policy No. CA-T-P-001, Qualified Products List, are followed. A decision is made as to which piece of equipment can best satisfy the requirements. The appropriate written requests are completed and purchasing places the order.

Upon receipt of a new or used piece of equipment, an identification name is assigned and added to the equipment list. IT must also be notified so that they can synchronize the instrument for back-ups. Its capability is assessed to determine if it is adequate or not for the specific application. For instruments, a calibration curve is generated, followed by MDLs, Demonstration of Capabilities (DOCs), and other relevant criteria (refer to Section 19). For software, its operation must be deemed reliable and evidence of instrument verification must be retained by the IT Department or QA Department. Software certificates supplied by the vendors are filed with the LIMS Administrator. The manufacturer's operation manual is retained at the bench.

9.5 Services

Service to analytical instruments (except analytical balances) is performed on an as needed basis. Routine preventative maintenance is discussed in Section 20. The need for service is determined by analysts and/or Technical Managers. The service providers that perform the services are approved by the Technical Manager / Director.

Analytical balances are serviced and calibrated annually in accordance with SOP HS-QA-030, Balance Calibration. The calibration and maintenance services are performed on-site, and the balances are returned to use immediately following successful calibration. When the calibration certificates are received (usually within two weeks of the service), they are reviewed, and documentation of the review is filed with the certificates. If the calibration was unsuccessful, the balance is immediately removed from service and segregated pending either further maintenance or disposal.

Calibration services for support equipment such as thermometers, weight sets, autopipettors, etc, are obtained from vendors with current and valid ISO 17025 accreditation for calibration of the specific piece of equipment. Prior to utilizing the vendor's services, the vendor's accreditation status is verified. Once the equipment has been calibrated, the calibration certificates are reviewed by the QA department, and documentation of the review is filed with the calibration certificates. The equipment is then returned to service within the laboratory

9.6 Suppliers

TestAmerica selects vendors through a competitive proposal / bid process, strategic business alliances or negotiated vendor partnerships (contracts). This process is defined in the Corporate Finance documents on Procurement & Contracts Policy (Policy No. CW-F-P-004). The level of control used in the selection process is dependent on the anticipated spending amount and the potential impact on TestAmerica business. Vendors that provide test and measuring equipment,

solvents, standards, certified containers, instrument related service contracts or subcontract laboratory services shall be subject to more rigorous controls than vendors that provide off-the-shelf items of defined quality that meet the end use requirements. The JD Edwards purchasing system includes all suppliers/vendors that have been approved for use.

Evaluation of suppliers is accomplished by ensuring the supplier ships the product or material ordered and that the material is of the appropriate quality. This is documented by signing off on packing slips or other supply receipt documents. The purchasing documents contain the data that adequately describe the services and supplies ordered.

Any issues of vendor performance are to be reported immediately by the laboratory staff to the Corporate Purchasing Group by completing a Vendor Performance Report.

The Corporate Purchasing Group will work through the appropriate channels to gather the information required to clearly identify the problem and will contact the vendor to report the problem and to make any necessary arrangements for exchange, return authorization, credit, etc.
As deemed appropriate, the Vendor Performance Reports will be summarized and reviewed to determine corrective action necessary, or service improvements required by vendors

The laboratory has access to a listing of all approved suppliers of critical consumables, supplies and services. This information is provided through the JD Edwards purchasing system.

9.6.1 New Vendor Procedure

TestAmerica employees who wish to request the addition of a new vendor must complete a J.D. Edwards Vendor Add Request Form.

New vendors are evaluated based upon criteria appropriate to the products or services provided as well as their ability to provide those products and services at a competitive cost. Vendors are also evaluated to determine if there are ethical reasons or potential conflicts of interest with TestAmerica employees that would make it prohibitive to do business with them as well as their financial stability. The QA Department and/or the Technical Services Director are consulted with vendor and product selection that have an impact on quality.

SECTION 10. COMPLAINTS

10.1 Overview

The laboratory considers an effective client complaint handling processes to be of significant business and strategic value. Listening to and documenting client concerns captures ‘client knowledge’ that enables our operations to continually improve processes and client satisfaction. An effective client complaint handling process also provides assurance to the data user that the laboratory will stand behind its data, service obligations and products.

A client complaint is any expression of dissatisfaction with any aspect of our business services (e.g., communications, responsiveness, data, reports, invoicing and other functions) expressed by any party, whether received verbally or in written form. Client inquiries, complaints or noted

discrepancies are documented, communicated to management, and addressed promptly and thoroughly.

The laboratory has procedures for addressing both external and internal complaints with the goal of providing satisfactory resolution to complaints in a timely and professional manner.

The nature of the complaint is identified, documented and investigated, and an appropriate action is determined and taken. In cases where a client complaint indicates that an established policy or procedure was not followed, the QA Department must evaluate whether a special audit must be conducted to assist in resolving the issue. A written confirmation or letter to the client, outlining the issue and response taken is recommended as part of the overall action taken.

The process of complaint resolution and documentation utilizes the procedures outlined in Section 12 (Corrective Actions) and is documented following the procedures in Laboratory SOP number HS-QA-024.

10.2 External Complaints

An employee that receives a complaint initiates the complaint resolution process by first documenting the complaint according to SOP# HS-QA-024.

Complaints fall into two categories: correctable and non-correctable. An example of a correctable complaint would be one where a report re-issue would resolve the complaint. An example of a non-correctable complaint would be one where a client complains that their data was repeatedly late. Non-correctable complaints should be reviewed for preventive action measures to reduce the likelihood of future occurrence and mitigation of client impact.

The general steps in the complaint handling process are:

- Receiving and Documenting Complaints
- Complaint Investigation and Service Recovery
- Process Improvement

The laboratory shall inform the initiator of the complaint of the results of the investigation and the corrective action taken, if any.

10.3 Internal Complaints

Internal complaints include, but are not limited to: errors and non-conformances, training issues, internal audit findings, and deviations from methods. Corrective actions may be initiated by any staff member who observes a nonconformance and shall follow the procedures outlined in Section 12. In addition, Corporate Management, Sales and Marketing and IT may initiate a complaint by contacting the laboratory or through the corrective action system described in Section 12.

10.4 Management Review

The number and nature of client complaints is reported by the QA Manager to the laboratory and QA Director in the QA Monthly report. Monitoring and addressing the overall level and nature of client complaints and the effectiveness of the solutions is part of the Annual Management Review (Section 16).

SECTION 11. CONTROL OF NON-CONFORMING WORK

11.1 Overview

When data discrepancies are discovered or deviations and departures from laboratory SOPs, policies and/or client requests have occurred, corrective action is taken immediately. First, the laboratory evaluates the significance of the nonconforming work. Then, a corrective action plan is initiated based on the outcome of the evaluation. If it is determined that the nonconforming work is an isolated incident, the plan could be as simple as adding a qualifier to the final results and/or making a notation in the case narrative. If it is determined that the nonconforming work is a systematic or improper practices issue, the corrective action plan could include a more in depth investigation and a possible suspension of an analytical method. In all cases, the actions taken are documented using the laboratory's corrective action system (refer to Section 12).

Due to the frequently unique nature of environmental samples, sometimes departures from documented policies and procedures are needed. When an analyst encounters such a situation, the problem is presented to the supervisor for resolution. The supervisor may elect to discuss it with the Technical Director and Quality Manager or have a representative contact the client to decide on a logical course of action. Once an approach is agreed upon, the analyst documents it using the laboratories corrective action system described in Section 12. This information can then be supplied to the client in the form of a footnote or a case narrative with the report.

Project Management may encounter situations where a client may request that a special procedure be applied to a sample that is not standard lab practice. Based on a technical evaluation, the lab may accept or opt to reject the request based on technical or ethical merit. An example might be the need to report a compound that the lab does not normally report. The lab would not have validated the method for this compound following the procedures in Section 19. The client may request that the compound be reported based only on the calibration. Such a request would need to be approved by the Technical Director and QA Manager, documented and included in the project folder. Deviations **must** also be noted on the final report with a statement that the compound is not reported in compliance with TNI (or the analytical method) requirements and the reason. Data being reported to a non- TNI state would need to note the change made to how the method is normally run.

11.2 Responsibilities and Authorities

Under certain circumstances, the Laboratory Director, a Technical Manager, or a member of the QA team may authorize departures from documented procedures or policies. The departures may be a result of procedural changes due to the nature of the sample; a one-time procedure for a client; QC failures with insufficient sample to reanalyze, etc.. In most cases, the client will be informed of the departure prior to the reporting of the data. Any departures must be well

documented using the laboratory's corrective action procedures. This information may also be documented in logbooks and/or data review checklists as appropriate. Any impacted data must be referenced in a case narrative and/or flagged with an appropriate data qualifier.

Any misrepresentation or possible misrepresentation of analytical data discovered by any laboratory staff member must be reported to facility Senior Management within 24-hours. The Senior Management staff is comprised of the Laboratory Director, the QA Manager, and the Technical Managers. The reporting of issues involving alleged violations of the company's Data Integrity or Manual Integration procedures must be conveyed to an ECO (e.g., the VP-QA/EHS) and the laboratory's Quality Director within 24 hours of discovery.

Whether an inaccurate result was reported due to calculation or quantitation errors, data entry errors, improper practices, or failure to follow SOPs, the data must be evaluated to determine the possible effect.

The Laboratory Director, QA Manager, ECOs, VP of Operations and the Quality Directors have the authority and responsibility to halt work, withhold final reports, or suspend an analysis for due cause as well as authorize the resumption of work.

11.3 Evaluation of Significance and Actions Taken

For each nonconforming issue reported, an evaluation of its significance and the level of management involvement needed is made. This includes reviewing its impact on the final data, whether or not it is an isolated or systematic issue, and how it relates to any special client requirements.

Corporate SOP entitled Data Recalls (CW-Q-S-005) is the procedure to be followed when it is discovered that erroneous or biased data may have been reported to clients or regulatory agencies.

Corporate SOP entitled Internal Investigations (CW-L-S-002) is the procedure to be followed for investigation and correction of situations involved alleged incidents of misconduct or violation of the company's ethics policy.

Laboratory level decisions are documented and approved using the laboratory's standard nonconformance/corrective action reporting in lieu of the data recall determination form contained in TestAmerica's Corporate SOP No. CW-Q-S-005.

11.4 Prevention of NonConforming Work

If it is determined that the nonconforming work could recur, further corrective actions must be made following the laboratory's corrective action system. Periodically as defined by the laboratory's preventive action schedule, the QA Department evaluates non-conformances to determine if any nonconforming work has been repeated multiple times. If so, the laboratory's corrective action process may be followed.

11.5 Method Suspension / Restriction (Stop Work Procedures)

In some cases, it may be necessary to suspend/restrict the use of a method or target compound which constitutes significant risk and/or liability to the laboratory. Suspension/restriction procedures can be initiated by any of the persons noted in Section 11.2, Paragraph 5.

Prior to suspension/restriction, confidentiality will be respected, and the problem with the required corrective and preventive action will be stated in writing and presented to the Laboratory Director.

The Laboratory Director shall arrange for the appropriate personnel to meet with the QA Manager as needed. This meeting shall be held to confirm that there is a problem, that suspension/restriction of the method is required and will be concluded with a discussion of the steps necessary to bring the method/target or test fully back on line. In some cases, that may not be necessary if all appropriate personnel have already agreed there is a problem and there is agreement on the steps needed to bring the method, target or test fully back on line. The QA Manager will also initiate a corrective action report as described in Section 12 if one has not already been started. A copy of any meeting notes and agreed upon steps should be faxed or e-mailed by the laboratory to the appropriate General Manager and member of Corporate QA. This fax/e-mail acts as notification of the incident.

After suspension/restriction, the lab will hold all reports to clients pending review. No faxing, mailing or distributing through electronic means may occur. The report must not be posted for viewing on the internet. It is the responsibility of the Laboratory Director to hold all reporting and to notify all relevant laboratory personnel regarding the suspension/restriction (e.g., Project Management, Log-in, etc…). Clients will NOT generally be notified at this time. Analysis may proceed in some instances depending on the non-conformance issue.

Within 72 hours, the QA Manager will determine if compliance is now met and reports can be released, OR determine the plan of action to bring work into compliance, and release work. A team, with all principals involved (Laboratory Director, Technical Manager/Director, QA Manager) can devise a start-up plan to cover all steps from client notification through compliance and release of reports. Project Management, and the Directors of Client Services and Sales and Marketing must be notified if clients must be notified or if the suspension/restriction affects the laboratory's ability to accept work. The QA Manager must approve start-up or elimination of any restrictions after all corrective action is complete. This approval is given by final signature on the completed corrective action report.

SECTION 12. CORRECTIVE ACTION

12.1 Overview

A major component of TestAmerica's Quality Assurance (QA) Program is the problem investigation and feedback mechanism designed to keep the laboratory staff informed on quality related issues and to provide insight to problem resolution. When nonconforming work or departures from policies and procedures in the quality system or technical operations are identified, the corrective action procedure provides a systematic approach to assess the issues,

restore the laboratory's system integrity, and prevent reoccurrence. Corrective actions are documented using Non-Conformance Memos (NCM) and Corrective Action Reports (CAR) (refer to Figure 12-1).

12.2 General

Problems within the quality system or within analytical operations may be discovered in a variety of ways, such as QC sample failures, internal or external audits, proficiency testing (PT) performance, client complaints, staff observation, etc..

The purpose of a corrective action system is to:

- Identify non-conformance events and assign responsibility(s) for investigating.
- Resolve non-conformance events and assign responsibility for any required corrective action.
- Identify systematic problems before they become serious.
- Identify and track client complaints and provide resolution.

12.2.1 Non-Conformance Memo (NCM) - is used to document the following types of corrective actions:

- Deviations from an established procedure or SOP
- QC outside of limits (non-matrix related)
- Isolated reporting / calculation errors
- Client complaints
- Discrepancies in materials / goods received vs. manufacturer packing slips.

12.2.2 Corrective Action Report (CAR) - is used to document the following types of corrective actions:

- Questionable trends that are found in the review of NCMs.
- Issues found while reviewing NCMs that warrant further investigation.
- Internal and external audit findings.
- Failed or unacceptable PT results.
- Corrective actions that cross multiple departments in the laboratory.
- Systematic reporting / calculation errors
- Client complaints
- Data recall investigations
- Identified poor process or method performance trends
- Excessive revised reports

This will provide background documentation to enable root cause analysis and preventive action.

12.3 Closed Loop Corrective Action Process

Any employee in the company can initiate a corrective action. There are four main components to a closed-loop corrective action process once an issue has been identified: Cause Analysis, Selection and Implementation of Corrective Actions (both short and long term), Monitoring of the Corrective Actions, and Follow-up.

12.3.1 Cause Analysis

- Upon discovery of a non-conformance event, the event must be defined and documented. An NCM or CAR must be initiated, someone is assigned to investigate the issue and the event is investigated for cause. Table 12-1 provides some general guidelines on determining responsibility for assessment.
- The cause analysis step is the key to the process as a long term corrective action cannot be determined until the cause is determined.
- If the cause is not readily obvious, the Technical Manager, Laboratory Director, or QA Manager (or QA designee) is consulted.

12.3.2 Selection and Implementation of Corrective Actions

- Where corrective action is needed, the laboratory shall identify potential corrective actions. The action(s) most likely to eliminate the problem and prevent recurrence are selected and implemented. Responsibility for implementation is assigned.
- Corrective actions shall be to a degree appropriate to the magnitude of the problem identified through the cause analysis.
- Whatever corrective action is determined to be appropriate, the laboratory shall document and implement the changes. The NCM or CAR is used for this documentation.

12.3.3 Root Cause Analysis

Root Cause Analysis is a class of problem solving (investigative) methods aimed at identifying the basic or causal factor(s) that underlie variation in performance or the occurrence of a significant failure. The root cause may be buried under seemingly innocuous events, many steps preceding the perceived failure. At first glance, the immediate response is typically directed at a symptom and not the cause. Typically, root cause analysis would be best with three or more incidents to triangulate a weakness. Corporate SOP Root Cause Analysis (No. CA-Q-S-009) describes the procedure.

Systematically analyze and document the root causes of the more significant problems that are reported. Identify, track, and implement the corrective actions required to reduce the likelihood of recurrence of significant incidents. Trend the Root Cause data from these incidents to identify Root Causes that, when corrected, can lead to dramatic improvements in performance by eliminating entire classes of problems.

Identify the one event associated with problem and ask why this event occurred. Brainstorm the root causes of failures; for example, by asking why events occurred or conditions existed; and then why the cause occurred 5 consecutive times until you get to the root cause. For each

of these sub events or causes, ask why it occurred. Repeat the process for the other events associated with the incident.

Root cause analysis does not mean the investigation is over. Look at technique, or other systems outside the normal indicators. Often creative thinking will find root causes that ordinarily would be missed, and continue to plague the laboratory or operation.

12.3.4 Monitoring of the Corrective Actions

- The Technical Manager and QA Manager are responsible to ensure that the corrective action taken was effective.
- Ineffective actions are documented and re-evaluated until acceptable resolution is achieved. Technical Managers are accountable to the Laboratory Director to ensure final acceptable resolution is achieved and documented appropriately.
- Each NCM and CAR is entered into a database for tracking purposes and a monthly summary of all corrective actions is printed out for review to aid in ensuring that the corrective actions have taken effect.
- TestAmerica laboratories began using the Incident/Corrective Action Tracker (iCAT) database developed by the company in 2015. (Previously, a local database [name of local system here] served this purpose.) An incident is an event triggering the need for one or more corrective actions as distinct from a corrective action, a potential deficiency stemming from an incident that requires investigation and possibly fixing. The database is independent of TALS, available to all local and corporate managers, and capable of notifying and tracking multiple corrective actions per event, dates, and personnel. iCAT allows associated document upload, categorization (such as, external/internal audit, client service concerns, data quality issues, proficiency testing, etc.), and trend analysis. Refer to Figure 12-1.
- The QA Manager reviews monthly NCMs and CARs for trends. Highlights are included in the QA monthly report (refer to Section 16). If a significant trend develops that adversely affects quality, an audit of the area is performed and corrective action implemented.
- Any out-of-control situations that are not addressed acceptably at the laboratory level may be reported to the Corporate Quality Director by the QA Manager, indicating the nature of the out-of-control situation and problems encountered in solving the situation.

12.3.5 Follow-up Audits

- Follow-up audits may be initiated by the QA Manager and shall be performed as soon as possible when the identification of a nonconformance casts doubt on the laboratory's compliance with its own policies and procedures, or on its compliance with state or federal requirements.
- These audits often follow the implementation of the corrective actions to verify effectiveness. An additional audit would only be necessary when a critical issue or risk to business is discovered.

(Also refer to Section 15.1.4, Special Audits.)

12.4 Technical Corrective Actions

In addition to providing acceptance criteria and specific protocols for technical corrective actions in the method SOPs, the laboratory has general procedures to be followed to determine when departures from the documented policies and procedures and quality control have occurred (refer to Section 11). The documentation of these procedures is through the use of an NCM or CAR.

Table 12-1 includes examples of general technical corrective actions. For specific criteria and corrective actions, refer to the analytical methods or specific method SOPs. The laboratory may also maintain Work Instructions on these items that are available upon request.

Table 12-1 provides some general guidelines for identifying the individual(s) responsible for assessing each QC type and initiating corrective action. The table also provides general guidance on how a data set should be treated if associated QC measurements are unacceptable. Specific procedures are included in Method SOPs, Work Instructions, QAM Sections 19 and 20. All corrective actions are reviewed monthly, at a minimum, by the QA Manager and highlights are included in the QA monthly report.

To the extent possible, samples shall be reported only if all quality control measures are acceptable. If the deficiency does not impair the usability of the results, data will be reported with an appropriate data qualifier and/or the deficiency will be noted in the case narrative. Where sample results may be impaired, the Project Manager is notified by an NCM and appropriate corrective action (e.g., reanalysis) is taken and documented**.**

12.5 Basic Corrections

When mistakes occur in records, each mistake shall be crossed-out, [not obliterated (e.g. no white-out)], and the correct value entered alongside. All such corrections shall be initialed (or signed) and dated by the person making the correction. In the case of records stored electronically, the original “uncorrected” file must be maintained intact and a second “corrected” file is created.

This same process applies to adding additional information to a record. All additions made later than the initial must also be initialed (or signed) and dated.

When corrections are due to reasons other than obvious transcription errors, the reason for the corrections (or additions) shall also be documented.

Figure 12-1.
Example - Corrective Action Report in iCAT

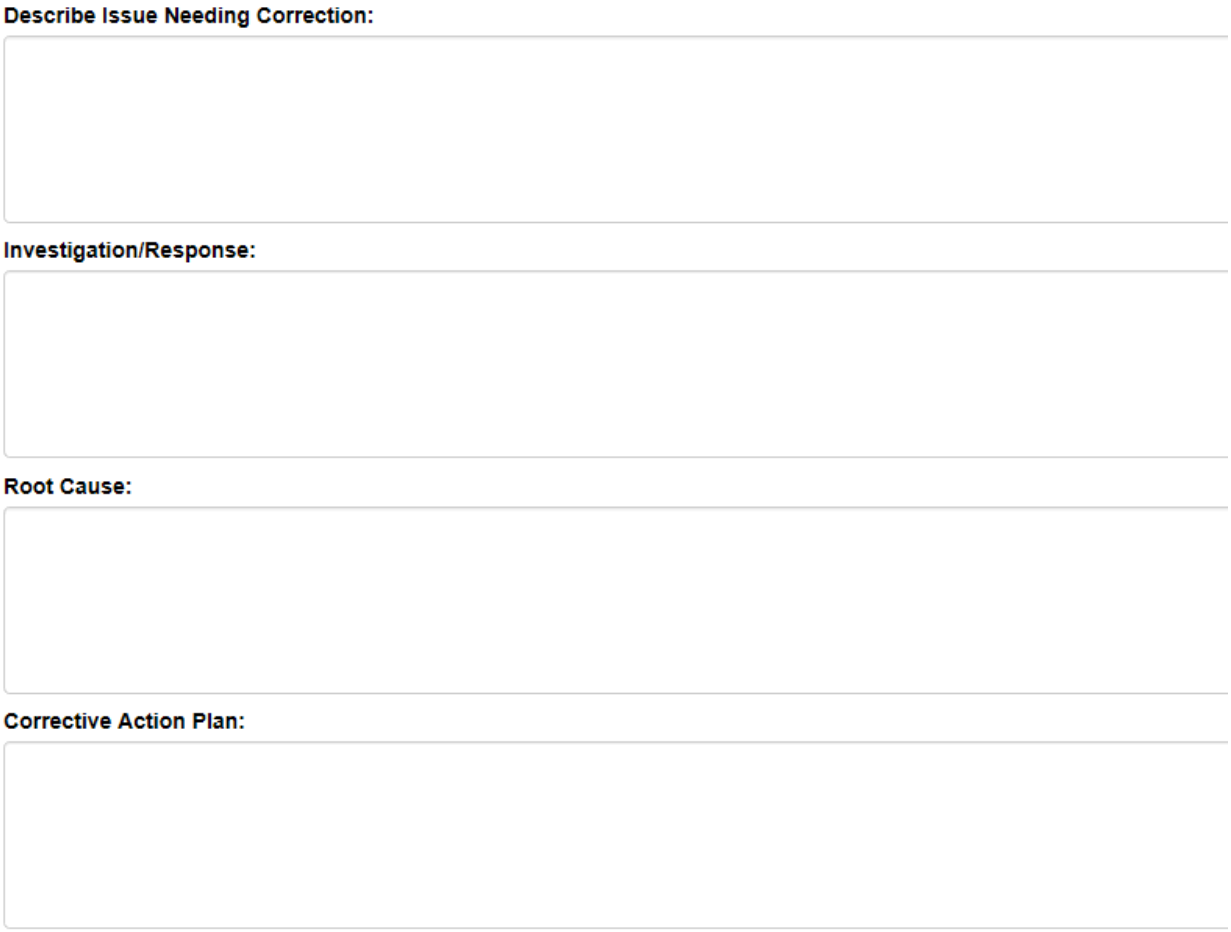


Table 12-1. Example – General Corrective Action Procedures

QC Activity *(Individual Responsible for Initiation/Assessment)*	Acceptance Criteria	Recommended Corrective Action
Initial Instrument Blank *(Analyst)*	- Instrument response < MDL.	- Prepare another blank. - If same response, determine cause of contamination: reagents, environment, instrument equipment failure, etc..
Initial Calibration Standards *(Analyst, Technical Manager(s))*	- Correlation coefficient > 0.99 or standard concentration value. - % Recovery within acceptance range. - See details in Method SOP.	- Reanalyze standards. - If still unacceptable, remake standards and recalibrate instrument.
Independent Calibration Verification (Second Source) *(Analyst, Technical Manager(s))*	- % Recovery within control limits.	- Remake and reanalyze standard. - If still unacceptable, then remake calibration standards or use new primary standards and recalibrate instrument.
Continuing Calibration Standards *(Analyst, Data Reviewer)*	% Recovery within control limits.	- Reanalyze standard. - If still unacceptable, then recalibrate and rerun affected samples.
Matrix Spike / Matrix Spike Duplicate (MS/MSD) *(Analyst, Data Reviewer)*	- % Recovery within limits documented in *TALS.*	- If the acceptance criteria for duplicates or matrix spikes are not met because of matrix interferences, the acceptance of the analytical batch is determined by the validity of the LCS. - If the LCS is within acceptable limits the batch is acceptable. - The results of the duplicates, matrix spikes and the LCS are reported with the data set. - For matrix spike or duplicate results outside criteria the data for that sample shall be reported with qualifiers.

QC Activity *(Individual Responsible for Initiation/Assessment)*	Acceptance Criteria	Recommended Corrective Action
Laboratory Control Sample (LCS) *(Analyst, Data Reviewer)*	- % Recovery within limits specified in ***TALS.***	- Batch must be re-prepared and re-analyzed. This includes any allowable marginal exceedance. When not using marginal exceedances, the following exceptions apply: 1) when the acceptance criteria for the positive control are exceeded high (i.e., high bias) and there are associated samples that are non-detects, then those non-detects may be reported with data qualifying codes; 2) when the acceptance criteria for the positive control are exceeded low (i.e., low bias), those sample results may be reported if they exceed a maximum regulatory limit/decision level with data qualifying codes. **Note:** If there is insufficient sample or the holding time cannot be met, contact client and report with flags.
Surrogates *(Analyst, Data Reviewer)*	- % Recovery within limits of method or within three standard deviations of the historical mean.	- Individual sample must be repeated. Place comment in LIMS. - Surrogate results outside criteria shall be reported with qualifiers.
Method Blank (MB) *(Analyst, Data Reviewer)*	< Reporting Limit [1]	- Reanalyze blank. - If still positive, determine source of contamination. If necessary, reprocess (i.e. digest or extract) entire sample batch. Report blank results. - Qualify the result(s) if the concentration of a targeted analyte in the MB is at or above the reporting limit AND is > 1/10 of the amount measured in the sample.
Proficiency Testing (PT) Samples *(QA Manager, Technical Manager(s))*	- Criteria supplied by PT Supplier.	- Any failures or warnings must be investigated for cause. Failures may result in the need to repeat a PT sample to show the problem is corrected.
Internal / External Audits *(QA Manager, Technical Manager(s))*	- Defined in Quality System documentation such as SOPs, QAM, etc..	- Non-conformances must be investigated through CAR system and necessary corrections must be made.

QC Activity *(Individual Responsible for Initiation/Assessment)*	Acceptance Criteria	Recommended Corrective Action
Reporting / Calculation Errors (Depends on issue – possible individuals include: Analysts, Data Reviewers, Project Managers, Technical Managers, QA Manager, Corporate QA, Corporate Management)	–SOP CW-Q-S-005, Data Recall	- Corrective action is determined by type of error. Follow the procedures in SOP CW-L-S-002.
Client Complaints *(Project Managers, Lab Director/Manager, Sales and Marketing)*		- Corrective action is determined by the type of complaint. For example, a complaint regarding an incorrect address on a report will result in the report being corrected and then follow-up must be performed on the reasons the address was incorrect (e.g., database needs to be updated).
QA Monthly Report (Refer to Section 16 for an example) (QA Manager, Lab Director/Manager, *Technical Manager(s)*)	- QAM, SOPs.	- Corrective action is determined by the type of issue. For example, CARs for the month are reviewed and possible trends are investigated.
Health and Safety Violation (Safety Officer, Lab Director/Manager, *Technical Manager(s)*)	- Environmental Health and Safety (EHS) Manual.	- Non-conformance is investigated and corrected through CAR system.

Note:
1. Except as noted below for certain compounds, the method blank should be below the detection limit. Concentrations up to five times the reporting limit will be allowed for the ubiquitous laboratory and reagent contaminants: methylene chloride, toluene, acetone, 2-butanone and phthalates **provided** they appear in similar levels in the reagent blank and samples. This allowance presumes that the detection limit is significantly below any regulatory limit to which the data are to be compared and that blank subtraction will not occur. For benzene and ethylene dibromide (EDB) and other analytes for which regulatory limits are extremely close to the detection limit, the method blank must be below the method detection limit

SECTION 13. PREVENTIVE ACTION / IMPROVEMENT

13.1 Overview

The laboratory's preventive action programs improve or eliminate potential causes of nonconforming product and/or nonconformance to the quality system. This preventive action process is a proactive and continuous process of improvement activities that can be initiated through feedback from clients, employees, business providers, and affiliates. The QA Department has the overall responsibility to ensure that the preventive action process is in place, and that relevant information on actions is submitted for management review.

Dedicating resources to an effective preventive action system emphasizes the laboratory's commitment to its Quality Program. It is beneficial to identify and address negative trends before they develop into complaints, problems and corrective actions. Additionally, the laboratory continually strives to improve customer service and client satisfaction through continuous improvements to laboratory systems.

Opportunities for improvement may be discovered through any of the following:

- review of the monthly QA Metrics Report,
- trending NCMs,
- review of control charts and QC results,
- trending proficiency testing (PT) results,
- performance of management system reviews,
- trending client complaints,
- review of processing operations, or
- staff observations.

The monthly Management Systems Metrics Report shows performance indicators in all areas of the laboratory and quality system. These areas include revised reports, corrective actions, audit findings, internal auditing and data authenticity audits, client complaints, PT samples, holding time violations, SOPs, ethics training, etc. The metrics report is reviewed monthly be the laboratory management, Corporate QA and TestAmerica's Executive Committee. These metrics are used ~~to~~ in evaluating the management and quality system performance on an ongoing basis and provide a tool for identifying areas for improvement.

Items identified as continuous improvement opportunities to the management system may be issued as goals from the annual management systems review, recommendations from internal audits, white papers, Lesson Learned, Technical Services audit report, Technical Best Practices, or as Corporate or management initiatives.

The laboratory's corrective action process is integral to implementation of preventive actions. A critical piece of the corrective action process is the implementation of actions to prevent further occurrence of a non-compliance event. Historical review of corrective action and non-conformances provides a valuable mechanism for identifying preventive action opportunities.

13.1.1 The following elements are part of a preventive action/process improvement system:

- Identification of an opportunity for preventive action or process improvement.
- Process for the preventive action or improvement.
- Define the measurements of the effectiveness of the process once undertaken.
- Execution of the preventive action or improvement.
- Evaluation of the plan using the defined measurements.
- Verification of the effectiveness of the preventive action or improvement.
- Close-Out by documenting any permanent changes to the Quality System as a result of the Preventive Action or Process Improvement. Documentation of Preventive Action/process Improvement is incorporated into the monthly QA reports, corrective action process and management review.

13.1.2 Any Preventive Actions/Process Improvement undertaken or attempted shall be taken into account during the annual Management Systems Review (Section 16). A highly detailed report is not required; however, a summary of successes and failures within the preventive action program is sufficient to provide management with a measurement for evaluation.

13.2 Management of Change

The Management of Change process is designed to manage significant events and changes that occur within the laboratory. Through these procedures, the potential risks inherent with a new event or change are identified and evaluated. The risks are minimized or eliminated through pre-planning and the development of preventive measures. The types of changes covered under this system include:

- SOP Tracking
    - Current Revisions w/ Effective Dates
    - Required Annual/Biennial Revisions w/ Due Date
- Proficiency Testing (PT) Sample Tracking
    - Pass / Fail – most current 2 out of 3 studies.
- Instrument / Equipment List
    - Current / Location
- Accreditations
    - New / Expiring
- Method Capabilities
    - Current Listing by program (e.g., Potable Water, Soils, etc.)
- Key Personnel
    - Technical Managers, Department managers, etc.

This process is discussed in further detail in HS-QA-023.

SECTION 14. CONTROL OF RECORDS

The laboratory maintains a records management system appropriate to its needs and that

complies with applicable standards or regulations as required. The system produces unequivocal, accurate records that document all laboratory activities. The laboratory retains all original observations, calculations and derived data, calibration records and a copy of the analytical report for a minimum of five years after it has been issued. Exceptions for programs with longer retention requirements are discussed in Section 14.1.2.

14.1 Overview

The laboratory has established procedures for identification, collection, indexing, access, filing, storage, maintenance and disposal of quality and technical records. A record index is listed in Table 14-1. More detailed information on retention of specific records is provided in CW-L-P-001, Records Retention Policy and CW-L-WI-001, TestAmerica Records Retention/Storage Schedule. Quality records are maintained by the QA department in a database, which is backed up as part of the regular laboratory backup. Records are of two types; either electronic or hard copy paper formats depending on whether the record is computer or hand generated (some records may be in both formats). Technical records are maintained by the Department Managers.

Table 14-1. Record Index[1]

	Record Types [1]:	Retention Time:
Technical Records	- Raw Data - Logbooks[2] - Standards - Certificates - Analytical Records - MDLs/IDLs/DOCs - Lab Reports	10 Years from analytical report issue*
Official Documents	- Quality Assurance Manual (QAM) - Work Instructions - Policies - SOPs - Policy Memorandums - Manuals - Published Methods	Indefinitely
QA Records	- Certifications - Method and Software Validation / Verification Data	Indefinitely
QA Records	- Internal & External Audits/Responses - Corrective/Preventive Actions - Management Reviews - Data Investigation	10 Years from archival* **Data Investigation:** 5 years or the life of the affected raw data storage whichever is greater (beyond 5 years if ongoing project or pending investigation)
Project Records	- Sample Receipt & COC Documents - Contracts and Amendments - Correspondence - QAPP - SAP - Telephone Logbooks - Lab Reports	10 Years from analytical report issue*

	Record Types [1]:	Retention Time:
Administrative Records	Financial and Business Operations	Refer to CW-L-WI-001
	EH&S Manual, Permits	Indefinitely
	Disposal Records	Indefinitely
	Employee Handbook	Indefinitely
	Personnel files, Employee Signature & Initials, Administrative Training Records (e.g., Ethics)	All HR docs have different retention times: Refer to HR Manual
	Administrative Policies Technical Training Records	Indefinitely
	Technical Training Records	7 years
	Legal Records	Indefinitely
	HR Records	Refer to CW-L-WI-001
	IT Records	Refer to CW-L-WI-001
	Corporate Governance Records	Refer to CW-L-WI-001
	Sales & Marketing	5 years
	Real Estate	Indefinitely

[1] Record Types encompass hardcopy and electronic records.
[2] Examples of Logbook types: Maintenance, Instrument Run, Preparation (standard and samples), Standard and Reagent Receipt, Archiving, Balance Calibration, Temperature (hardcopy or electronic records).
* Exceptions listed in Table 14-2.

14.1.1 All records are stored and retained in such a way that they are secure and readily retrievable at the laboratory facility that provides a suitable environment to prevent damage or deterioration and to prevent loss. All records shall be protected against fire, theft, loss, environmental deterioration, and vermin. In the case of electronic records, electronic or magnetic sources, storage media are protected from deterioration caused by magnetic fields and/or electronic deterioration.

Access to the data is limited to laboratory and company employees and shall be documented with an access log**.** Records are maintained for a minimum of five years unless otherwise specified by a client or regulatory requirement.

For raw data and project records, record retention shall be calculated from the date the project report is issued. For other records, such as Controlled Documents, QA, or Administrative Records, the retention time is calculated from the date the record is formally retired. Records related to the programs listed in Table 14-2 have lengthier retention requirements and are subject to the requirements in Section 14.1.3.

14.1.2 Programs with Longer Retention Requirements

Some regulatory programs have longer record retention requirements than the standard record retention time. These are detailed in Table 14-2 with their retention requirements. In these cases, the longer retention requirement is enacted. If special instructions exist such that client data cannot be destroyed prior to notification of the client, the container or box containing that data is marked as to who to contact for authorization prior to destroying the data.

Table 14-2. Example: Special Record Retention Requirements

Program	[1]Retention Requirement
Drinking Water – All States	10 years (lab reports and raw data) 10 years - Radiochemistry (project records)
Drinking Water Lead and Copper Rule	12 years (project records)
Commonwealth of MA – All environmental data 310 CMR 42.14	10 years
FIFRA – 40 CFR Part 160	Retain for life of research or marketing permit for pesticides regulated by EPA
Housing and Urban Development (HUD) Environmental Lead Testing	10 years
Alaska	10 years
Louisiana – All	10 years
Michigan Department of Environmental Quality – all environmental data	10 years
Navy Facilities Engineering Service Center (NFESC)	10 years
NY Potable Water NYCRR Part 55-2	10 years
Ohio VAP	10 years and State contacted prior to disposal
TSCA - 40 CFR Part 792	10 years after publication of final test rule or negotiated test agreement
OSHA	30 years

[1]Note: Extended retention requirements must be noted with the archive documents or addressed in facility-specific records retention procedures.

14.1.3 The laboratory has procedures to protect and back-up records stored electronically and to prevent unauthorized access to or amendment of these records. All analytical data is maintained as hard copy or in a secure readable electronic format. For analytical reports that are maintained as copies in PDF format, refer to Section **19.14.1** for more information.

14.1.4 The record keeping system allows for historical reconstruction of all laboratory activities that produced the analytical data, as well as rapid recovery of historical data. The history of the sample from when the laboratory took possession of the samples must be readily understood through the documentation. This shall include inter-laboratory transfers of samples and/or extracts.

- The records include the identity of personnel involved in sampling, sample receipt, preparation, or testing. All analytical work contains the initials (at least) of the personnel involved. The laboratory's copy of the COC is stored in the project folder. The chain of custody would indicate the name of the sampler. If any sampling notes are provided with a work order, they are kept with this package.

- All information relating to the laboratory facilities equipment, analytical test methods, and related laboratory activities, such as sample receipt, sample preparation, or data verification are documented.

- The record keeping system facilitates the retrieval of all working files and archived records

for inspection and verification purposes (e.g., set format for naming electronic files, set format for what is included with a given analytical data set). Instrument data is stored sequentially by instrument. A given day's analyses are maintained in the order of the analysis. Run logs are maintained for each instrument or method; a copy of each day's run log or instrument sequence is stored with the data to aid in re-constructing an analytical sequence. Where an analysis is performed without an instrument, bound logbooks or bench sheets are used to record and file data. Standard and reagent information is recorded in logbooks or entered into the LIMS for each method as required.

- Changes to hardcopy records shall follow the procedures outlined in Section 12 and 19. Changes to electronic records in LIMS or instrument data are recorded in audit trails.

- The reason for a signature or initials on a document is clearly indicated in the records such as "sampled by," "prepared by," "reviewed by", or "analyzed by".

- All generated data except those that are generated by automated data collection systems, are recorded directly, promptly and legibly in permanent dark ink.

- Hard copy data may be scanned into PDF format for record storage as long as the scanning process can be verified in order to ensure that no data is lost and the data files and storage media must be tested to verify the laboratory's ability to retrieve the information prior to the destruction of the hard copy that was scanned.

- Also refer to Section 19.14.1 'Computer and Electronic Data Related Requirements'**.**

14.2 Technical and Analytical Records

14.2.1 The laboratory retains records of original observations, derived data and sufficient information to establish an audit trail, calibration records, staff records and a copy of each analytical report issued, for a minimum of five years unless otherwise specified by a client or regulatory requirement. The records for each analysis shall contain sufficient information to enable the analysis to be repeated under conditions as close as possible to the original. The records shall include the identity of laboratory personnel responsible for the sampling, performance of each analysis and reviewing results.

14.2.2 Observations, data and calculations are recorded real-time and are identifiable to the specific task.

14.2.3 Changes to hardcopy records shall follow the procedures outlined in Section 12 and 19. Changes to electronic records in LIMS or instrument data are recorded in audit trails.

The essential information to be associated with analysis, such as strip charts, tabular printouts, computer data files, analytical notebooks, and run logs, include:

- laboratory sample ID code**;**
- Date of analysis; Time of Analysis is also required if the holding time is seventy-two (72) hours or less, or when time critical steps are included in the analysis (e.g., drying times, incubations, etc.); instrumental analyses have the date and time of analysis recorded as part of their general operations. Where a time critical step exists in an analysis, location for such

a time is included as part of the documentation in a specific logbook or on a benchsheet.

- Instrumentation identification and instrument operating conditions/parameters. Operating conditions/parameters are typically recorded in instrument maintenance logs where available.
- analysis type**;**
- all manual calculations and manual integrations**;**
- analyst's or operator's initials/signature**;**
- sample preparation including cleanup, separation protocols, incubation periods or subculture, ID codes, volumes, weights, instrument printouts, meter readings, calculations, reagents**;**
- test results**;**
- standard and reagent origin, receipt, preparation, and use**;**
- calibration criteria, frequency and acceptance criteria**;**
- data and statistical calculations, review, confirmation, interpretation, assessment and reporting conventions**;**
- quality control protocols and assessment**;**
- electronic data security, software documentation and verification, software and hardware audits, backups, and records of any changes to automated data entries; and
- Method performance criteria including expected quality control requirements. These are indicated both in the LIMS and on specific analytical report formats**.**

14.2.4 All logbooks used during receipt, preparation, storage, analysis, and reporting of samples or monitoring of support equipment shall undergo a documented supervisory or peer review on a monthly basis.

14.3 Laboratory Support Activities

In addition to documenting all the above-mentioned activities, the following are retained QA records and project records (previous discussions in this section relate where and how these data are stored):

- all original raw data, whether hard copy or electronic, for calibrations, samples and quality control measures, including analysts' work sheets and data output records (chromatograms, strip charts, and other instrument response readout records)**;**
- a written description or reference to the specific test method used which includes a description of the specific computational steps used to translate parametric observations into a reportable analytical value**;**
- copies of final reports**;**
- archived SOPs**;**
- correspondence relating to laboratory activities for a specific project**;**
- all corrective action reports, audits and audit responses**;**

- proficiency test results and raw data; and
- results of data review, verification, and crosschecking procedures

14.3.1 Sample Handling Records

Records of all procedures to which a sample is subjected while in the possession of the laboratory are maintained. These include but are not limited to records pertaining to:

- sample preservation including appropriateness of sample container and compliance with holding time requirement;
- sample identification, receipt, acceptance or rejection and login;
- sample storage and tracking including shipping receipts, sample transmittal / COC forms; and
- procedures for the receipt and retention of samples, including all provisions necessary to protect the integrity of samples.

14.4 Administrative Records

The laboratory also maintains the administrative records in either electronic or hard copy form. Refer to Table 14-1.

14.5 Records Management, Storage and Disposal

All records (including those pertaining to test equipment), certificates and reports are safely stored, held secure and in confidence to the client. Certification related records are available upon request.

All information necessary for the historical reconstruction of data is maintained by the laboratory. Records that are stored only on electronic media must be supported by the hardware and software necessary for their retrieval.

Records that are stored or generated by computers or personal computers have hard copy, write-protected backup copies, or an electronic audit trail controlling access**.**

The laboratory has a record management system (a.k.a., document control) for control of laboratory notebooks, instrument logbooks, standards logbooks, and records for data reduction, validation, storage and reporting. Laboratory notebooks are issued on a per analysis basis, and are numbered sequentially. All data are recorded sequentially within a series of sequential notebooks. Bench sheets are filed sequentially. Standards are maintained in the LIMS – no logbooks are used to record that data**.** Records are considered archived when noted as such in the records management system (a.k.a., document control.)

14.5.1 Transfer of Ownership

In the event that the laboratory transfers ownership or goes out of business, the laboratory shall ensure that the records are maintained or transferred according to client's instructions. Upon

ownership transfer, record retention requirements shall be addressed in the ownership transfer agreement and the responsibility for maintaining archives is clearly established. In addition, in cases of bankruptcy, appropriate regulatory and state legal requirements concerning laboratory records must be followed. In the event of the closure of the laboratory, all records will revert to the control of the corporate headquarters. Should the entire company cease to exist, as much notice as possible will be given to clients and the accrediting bodies who have worked with the laboratory during the previous 5 years of such action.

14.5.2 Records Disposal

Records are removed from the archive and destroyed after 10 years unless otherwise specified by a client or regulatory requirement. On a project specific or program basis, clients may need to be notified prior to record destruction. Records are destroyed in a manner that ensures their confidentiality such as shredding, mutilation or incineration. (Refer to Tables 14-1 and 14-2).

Electronic copies of records must be destroyed by erasure or physically damaging off-line storage media so no records can be read.

If a third party records management company is hired to dispose of records, a “Certificate of Destruction” is required.

SECTION 15. AUDITS

15.1 Internal Audits

Internal audits are performed to verify that laboratory operations comply with the requirements of the lab’s quality system and with the external quality programs under which the laboratory operates. Audits are planned and organized by the QA staff. Personnel conducting the audits should be independent of the area being evaluated. Auditors will have sufficient authority, access to work areas, and organizational freedom necessary to observe all activities affecting quality and to report the assessments to laboratory management and, when requested, to corporate management.

Audits are conducted and documented as described in the TestAmerica Corporate SOP on performing Internal Auditing, SOP No. CA-Q-S-003. The types and frequency of routine internal audits are described in Table 15-1. Special or ad hoc assessments may be conducted as needed under the direction of the QA staff.

Table 15-1. Types of Internal Audits and Frequency

Description	Performed by	Frequency
Quality Systems Audits	QA Department, QA approved designee, or Corporate QA	All areas of the laboratory annually

Description	Performed by	Frequency
Method Audits QA Technical Audits	Joint responsibility: a) QA Manager or designee b) Technical Manager or Designee (Refer to CW-Q-S-003)	QA Technical Audits Frequency: 50% of methods annually
SOP Method Compliance	Joint responsibility: a) QA Manager or designee b) Technical Manager or Designee (Refer to CW-Q-S-003)	SOP Compliance Review Frequency: • Every 2 years
Special	QA Department or Designee	Surveillance or spot checks performed as needed, e.g., to confirm corrective actions from other audits.
Performance Testing	Analysts with QA oversight	Two successful per year for each TNI-field of testing or as dictated by regulatory requirements

15.1.1 Annual Quality Systems Audit

An annual quality systems audit is required to ensure compliance to analytical methods and SOPs, TestAmerica's Data Integrity and Ethics Policies, TNI quality systems, client and state requirements, and the effectiveness of the internal controls of the analytical process, including but not limited to data review, quality controls, preventive action and corrective action. The completeness of earlier corrective actions is assessed for effectiveness & sustainability. The audit is divided into sections for each operating or support area of the lab, and each section is comprehensive for a given area. The area audits may be performed on a rotating schedule throughout the year to ensure adequate coverage of all areas. This schedule may change as situations in the laboratory warrant.

15.1.2 QA Technical Audits

QA technical audits assess data authenticity and analyst integrity. These audits are based on client projects, associated sample delivery groups, and the methods performed. Reported results are compared to raw data to verify the authenticity of results. The validity of calibrations and QC results are compared to data qualifiers, footnotes, and case narratives. Documentation is assessed by examining run logs and records of manual integrations. Manual calculations are checked. Where possible, electronic audit miner programs (e.g., Chrom AuditMiner) are used to identify unusual manipulations of the data deserving closer scrutiny. QA technical audits will include all methods within a two-year period. All analysts should be reviewed over the course of a two year period through at least one QA Technical Audit

15.1.3 SOP Method Compliance

Compliance of all SOPs with the source methods and compliance of the operational groups with the SOPs will be assessed by the Technical or qualified designee at least every two years. It is also recommended that the work of each newly hired analyst is assessed within 3 months of working independently, (e.g., completion of method IDOC). In addition, as analysts add

methods to their capabilities, (new IDOC) reviews of the analyst work products will be performed within 3 months of completing the documented training.

15.1.4 Special Audits

Special audits are conducted on an as needed basis, generally as a follow up to specific issues such as client complaints, corrective actions, PT results, data audits, system audits, validation comments, regulatory audits or suspected ethical improprieties. Special audits are focused on a specific issue, and report format, distribution, and timeframes are designed to address the nature of the issue.

15.1.5 Performance Testing

The laboratory participates semi-annually in performance audits conducted through the analysis of PT samples provided by a third party. The laboratory generally participates in the following types of PT studies: Non-potable Water, Hazardous Waste, and UST Soil.

It is TestAmerica's policy that PT samples be treated as typical samples in the production process. Furthermore, where PT samples present special or unique problems, in the regular production process they may need to be treated differently, as would any special or unique request submitted by any client. The QA Manager must be consulted and in agreement with any decisions made to treat a PT sample differently due to some special circumstance.

Written responses to unacceptable PT results are required. In some cases it may be necessary for blind QC samples to be submitted to the laboratory to show a return to control.

15.2 External Audits

External audits are performed when certifying agencies or clients conduct on-site inspections or submit performance testing samples for analysis. It is TestAmerica's policy to cooperate fully with regulatory authorities and clients. The laboratory makes every effort to provide the auditors with access to personnel, documentation, and assistance. Laboratory supervisors are responsible for providing corrective actions to the QA Manager who coordinates the response for any deficiencies discovered during an external audit. Audit responses are due in the time allotted by the client or agency performing the audit. When requested, a copy of the audit report and the labs corrective action plan will be forwarded to Corporate Quality.

The laboratory cooperates with clients and their representatives to monitor the laboratory's performance in relation to work performed for the client. The client may only view data and systems related directly to the client's work. All efforts are made to keep other client information confidential.

15.2.1 Confidential Business Information (CBI) Considerations

During on-site audits, auditors may come into possession of information claimed as business confidential. A business confidentiality claim is defined as "a claim or allegation that business information is entitled to confidential treatment for reasons of business confidentiality or a request for a determination that such information is entitled to such treatment." When information is claimed as business confidential, the laboratory must place on (or attach to) the

information at the time it is submitted to the auditor, a cover sheet, stamped or typed legend or other suitable form of notice, employing language such as “trade secret”, “proprietary” or “company confidential”. Confidential portions of documents otherwise non-confidential must be clearly identified. CBI may be purged of references to client identity by the responsible laboratory official at the time of removal from the laboratory. However, sample identifiers may not be obscured from the information. Additional information regarding CBI can be found in within the 2009 TNI standards.

15.3 Audit Findings

Audit findings are documented using the corrective action process and database. The laboratory’s corrective action responses for both types of audits may include action plans that could not be completed within a predefined timeframe. In these instances, a completion date must be set and agreed to by operations management and the QA Manager.

Developing and implementing corrective actions to findings is the responsibility of the Technical Manager where the finding originated. Findings that are not corrected by specified due dates are reported monthly to management in the QA monthly report. When requested, a copy of the audit report and the labs corrective action plan will be forwarded to Corporate Quality.

If any audit finding casts doubt on the effectiveness of the operations or on the correctness or validity of the laboratory’s test results, the laboratory shall take timely corrective action, and shall notify clients in writing if the investigations show that the laboratory results have been affected. Once corrective action is implemented, a follow-up audit is scheduled to ensure that the problem has been corrected.

Clients must be notified promptly in writing, of any event such as the identification of defective measuring or test equipment that casts doubt on the validity of results given in any test report or amendment to a test report. The investigation must begin within 24-hours of discovery of the problem and all efforts are made to notify the client within two weeks after the completion of the investigation.

SECTION 16. MANAGEMENT REVIEWS

16.1 Quality Assurance Report

A comprehensive QA Report shall be prepared each month by the laboratory’s QA Department and forwarded to the Laboratory Director, Technical Managers, their Quality Director as well as the VP of Operations. All aspects of the QA system are reviewed to evaluate the suitability of policies and procedures. During the course of the year, the Laboratory Director, General Manager or Corporate QA may request that additional information be added to the report.

On a monthly basis, Corporate QA compiles information from all the monthly laboratory reports. The Corporate Quality Directors prepare a report that includes a compilation of all metrics and notable information and concerns regarding the QA programs within the laboratories. The report also includes a listing of new regulations that may potentially impact the laboratories. This report is presented to the Senior Management Team and General Managers.

16.2 Annual Management Review

The senior lab management team (Laboratory Director, Technical Managers, QA Manager) conducts a review annually of its quality systems and LIMS to ensure its continuing suitability and effectiveness in meeting client and regulatory requirements and to introduce any necessary changes or improvements. It will also provide a platform for defining goals, objectives and action items that feed into the laboratory planning system. Corporate Operations and Corporate QA personnel is be included in this meeting at the discretion of the Laboratory Director. The LIMS review consists of examining any audits, complaints or concerns that have been raised through the year that are related to the LIMS. The laboratory will summarize any critical findings that can not be solved by the lab and report them to Corporate IT.

This management systems review (Corporate SOP No. CA-Q-S-004 & Work Instruction No. CA-Q-WI-003) uses information generated during the preceding year to assess the "big picture" by ensuring that routine actions taken and reviewed on a monthly basis are not components of larger systematic concerns. The monthly review should keep the quality systems current and effective, therefore, the annual review is a formal senior management process to review specific existing documentation. Significant issues from the following documentation are compiled or summarized by the QA Manager prior to the review meeting:

- Matters arising from the previous annual review.
- Prior Monthly QA Reports issues.
- Laboratory QA Metrics.
- Review of report reissue requests.
- Review of client feedback and complaints.
- Issues arising from any prior management or staff meetings.
- Minutes from prior senior lab management meetings. Issues that may be raised from these meetings include:
    - Adequacy of staff, equipment and facility resources.
    - Adequacy of policies and procedures.
    - Future plans for resources and testing capability and capacity.
- The annual internal double blind PT program sample performance (if performed),
- Compliance to the Ethics Policy and Data Integrity Plan. Including any evidence/incidents of inappropriate actions or vulnerabilities related to data Integrity.

A report is generated by the QA Manager and management. The report is distributed to the appropriate General Manager and the Quality Director. The report includes, but is not limited to:

- The date of the review and the names and titles of participants.
- A reference to the existing data quality related documents and topics that were reviewed.
- Quality system or operational changes or improvements that will be made as a result of the review [e.g., an implementation schedule including assigned responsibilities for the changes (Action Table)].

Changes to the quality systems requiring update to the laboratory QA Manual shall be included in the next revision of the QA Manual.

16.3 Potential Integrity Related Managerial Reviews

Potential integrity issues (data or business related) must be handled and reviewed in a confidential manner until such time as a follow-up evaluation, full investigation, or other appropriate actions have been completed and issues clarified. TestAmerica's Corporate Internal Investigations SOP shall be followed (SOP No. CW-L-S-002). All investigations that result in finding of inappropriate activity are documented and include any disciplinary actions involved, corrective actions taken, and all appropriate notifications of clients.

TestAmerica's President and CEO, Executive VP of Operations, VP of Client & Technical Services, VPs of Operations and Quality Directors receive a monthly report from the VP-QA/EHS summarizing any current data integrity or data recall investigations. The VPs of Operations are also made aware of progress on these issues for their specific labs.

SECTION 17. PERSONNEL

17.1 Overview

The laboratory's management believes that its highly qualified and professional staff is the single most important aspect in assuring a high level of data quality and service. The staff consists of professionals and support personnel as outlined in the organization chart in Figure 4-1.

All personnel must demonstrate competence in the areas where they have responsibility. Any staff that is undergoing training shall have appropriate supervision until they have demonstrated their ability to perform their job function on their own. Staff shall be qualified for their tasks based on appropriate education, training, experience and/or demonstrated skills as required.

The laboratory employs sufficient personnel with the necessary education, training, technical knowledge and experience for their assigned responsibilities.

All personnel are responsible for complying with all QA/QC requirements that pertain to the laboratory and their area of responsibility. Each staff member must have a combination of experience and education to adequately demonstrate a specific knowledge of their particular area of responsibility. Technical staff must also have a general knowledge of lab operations, test methods, QA/QC procedures and records management.

Laboratory management is responsible for formulating goals for lab staff with respect to education, training and skills and ensuring that the laboratory has a policy and procedures for identifying training needs and providing training of personnel. The training shall be relevant to the present and anticipated responsibilities of the lab staff.

The laboratory only uses personnel that are employed by or under contract to, the laboratory. Contracted personnel, when used, must meet competency standards of the laboratory and work in accordance to the laboratory's quality system.

17.2 Education and Experience Requirements for Technical Personnel

The laboratory makes every effort to hire analytical staffs that possess a college degree (AA, BA, BS) in an applied science with some chemistry in the curriculum. Exceptions can be made based upon the individual's experience and ability to learn. Selection of qualified candidates for laboratory employment begins with documentation of minimum education, training, and experience prerequisites needed to perform the prescribed task. Minimum education and training requirements for TestAmerica employees are outlined in job descriptions and are generally summarized for analytical staff in the table below.

The laboratory maintains job descriptions for all personnel who manage, perform or verify work affecting the quality of the environmental testing the laboratory performs. Job Descriptions are located on the TestAmerica intranet site's Human Resources web-page (Also see Section 4 for position descriptions/responsibilities).

Experience and specialized training are occasionally accepted in lieu of a college degree (basic lab skills such as using a balance, colony counting, aseptic or quantitation techniques, etc., are also considered).

As a general rule for analytical staff:

Specialty	Education	Experience
Extractions, Digestions, some electrode methods (pH, DO, Redox, etc.), or Titrimetric and Gravimetric Analyses	H.S. Diploma	On the job training (OJT)
GFAA, CVAA, FLAA, Single component or short list Chromatography (e.g., Fuels, BTEX-GC, IC	A college degree in an applied science or 2 years of college and at least 1 year of college chemistry	Or 2 years prior analytical experience is required
ICP, ICPMS, Long List or complex chromatography (e.g., Pesticides, PCB, Herbicides, HPLC, etc.), GCMS	A college degree in an applied science or 2 years of college chemistry	or 5 years of prior analytical experience
Spectra Interpretation	A college degree in an applied science or 2 years of college chemistry	And 2 years relevant experience Or 5 years of prior analytical experience
Technical Managers – **General**	Bachelors Degree in an applied science or engineering with 24 semester hours in chemistry An advanced (MS, PhD.) degree may substitute for one year of experience	And 2 years experience in environmental analysis of representative analytes for which they will oversee
Technical Managers – **Wet Chem** only (no advanced instrumentation)	Associates degree in an applied science or engineering or 2 years of college with 16 semester hours in chemistry	And 2 years relevant experience

Specialty	Education	Experience
Technical Managers - Microbiology	Bachelors degree in applied science with at least 16 semester hours in general microbiology and biology An advanced (MS, PhD.) degree may substitute for one year of experience	And 2 years of relevant experience

When an analyst does not meet these requirements, they can perform a task under the direct supervision of a qualified analyst, peer reviewer or Technical Manager, and are considered an analyst in training. The person supervising an analyst in training is accountable for the quality of the analytical data and must review and approve data and associated corrective actions.

17.3 Training

The laboratory is committed to furthering the professional and technical development of employees at all levels.

Orientation to the laboratory's policies and procedures, in-house method training, and employee attendance at outside training courses and conferences all contribute toward employee proficiency. Below are examples of various areas of required employee training:

Required Training	Time Frame	Employee Type
Environmental Health & Safety	Prior to lab work	All
Ethics – New Hires	1 week of hire	All
Ethics – Comprehensive	90 days of hire	All
Data Integrity	30 days of hire	Technical and PMs
Quality Assurance	90 days of hire	All
Ethics – Comprehensive Refresher	Annually	All
Initial Demonstration of Capability (DOC)	Prior to unsupervised method performance	Technical

The laboratory maintains records of relevant authorization/competence, education, professional qualifications, training, skills and experience of technical personnel (including contracted personnel) as well as the date that approval/authorization was given. These records are kept on file at the laboratory. Also refer to "Demonstration of Capability" in Section 19.

The training of technical staff is kept up to date by:

- Each employee must have documentation in their training file that they have read, understood and agreed to follow the most recent version of the laboratory QA Manual and SOPs in their area of responsibility. This documentation is updated as SOPs are updated.
- Documentation from any training courses or workshops on specific equipment, analytical techniques or other relevant topics are maintained in their training file.
- Documentation of proficiency (refer to Section 19).

- An Ethics Agreement signed by each staff member (renewed each year) and evidence of annual ethics training.
- A Confidentiality Agreement signed by each staff member signed at the time of employment.
- Human Resources maintains documentation and attestation forms on employment status & records; benefit programs; timekeeping/payroll; and employee conduct (e.g., ethics violations). This information is maintained in the employee's secured personnel file.

Evidence of successful training could include such items as:

- Adequate documentation of training within operational areas, including one-on-one technical training for individual technologies, and particularly for people cross-trained.
- Analysts knowledge to refer to QA Manual for quality issues.
- Analysts following SOPs, i.e., practice matches SOPs.
- Analysts regularly communicate to supervisors and QA if SOPs need revision, rather than waiting for auditors to find problems.

Further details of the training program are described in the Laboratory Training SOP (HS-QA-001).

17.4 Data Integrity and Ethics Training Program

Establishing and maintaining a high ethical standard is an important element of a Quality System. Ethics and data integrity training is integral to the success of TestAmerica and is provided for each employee at TestAmerica. It is a formal part of the initial employee orientation within 1 week of hire followed by technical data integrity training within 30 days, comprehensive training within 90 days, and an annual refresher for all employees. Senior management at each facility performs the ethics training for their staff.

In order to ensure that all personnel understand the importance TestAmerica places on maintaining high ethical standards at all times; TestAmerica has established a Corporate Ethics Policy (Policy No. CW-L-P-004) and an Ethics Statement. All initial and annual training is documented by signature on the signed Ethics Statement demonstrating that the employee has participated in the training and understands their obligations related to ethical behavior and data integrity.

Violations of this Ethics Policy will not be tolerated. Employees who violate this policy will be subject to disciplinary actions up to and including termination. Criminal violations may also be referred to the Government for prosecution. In addition, such actions could jeopardize TestAmerica's ability to do work on Government contracts, and for that reason, TestAmerica has a Zero Tolerance approach to such violations.
Employees are trained as to the legal and environmental repercussions that result from data misrepresentation. Key topics covered in the presentation include:

- Organizational mission and its relationship to the critical need for honesty and full disclosure in all analytical reporting.
- Ethics Policy
- How and when to report ethical/data integrity issues. Confidential reporting.
- Record keeping.

- Discussion regarding data integrity procedures.
- Specific examples of breaches of ethical behavior (e.g. peak shaving, altering data or computer clocks, improper macros, etc., accepting/offering kickbacks, illegal accounting practices, unfair competition/collusion)
- Internal monitoring. Investigations and data recalls.
- Consequences for infractions including potential for immediate termination, debarment, or criminal prosecution.
- Importance of proper written narration / data qualification by the analyst and project manager with respect to those cases where the data may still be usable but are in one sense or another partially deficient.

Additionally, a data integrity hotline (1-800-736-9407) is maintained by TestAmerica and administered by the Corporate Quality Department.

SECTION 18. ACCOMMODATIONS AND ENVIRONMENTAL CONDITIONS

18.1 Overview

The laboratory is a 28,000 ft^2 secure laboratory facility with controlled access and designed to accommodate an efficient workflow and to provide a safe and comfortable work environment for employees. All visitors sign in and are escorted by laboratory personnel. Access is controlled by various measures.

The laboratory is equipped with structural safety features. Each employee is familiar with the location, use, and capabilities of general and specialized safety features associated with their workplace. The laboratory provides and requires the use of protective equipment including safety glasses, protective clothing, gloves, etc., OSHA and other regulatory agency guidelines regarding required amounts of bench and fume hood space, lighting, ventilation (temperature and humidity controlled), access, and safety equipment are met or exceeded.

Traffic flow through sample preparation and analysis areas is minimized to reduce the likelihood of contamination. Adequate floor space and bench top area is provided to allow unencumbered sample preparation and analysis space. Sufficient space is also provided for storage of reagents and media, glassware, and portable equipment. Ample space is also provided for refrigerated sample storage before analysis and archival storage of samples after analysis. Laboratory HVAC and deionized water systems are designed to minimize potential trace contaminants.

The laboratory is separated into specific areas for sample receiving, sample preparation, volatile organic sample analysis, non-volatile organic sample analysis, inorganic sample analysis, microbiological sample analysis, and administrative functions.

18.2 Environment

Laboratory accommodation, test areas, energy sources, lighting are adequate to facilitate proper performance of tests. The facility is equipped with heating, ventilation, and air conditioning (HVAC) systems appropriate to the needs of environmental testing performed at this laboratory.

The environment in which these activities are undertaken does not invalidate the results or adversely affect the required accuracy of any measurements.

The laboratory provides for the effective monitoring, control and recording of environmental conditions that may affect the results of environmental tests as required by the relevant specifications, methods, and procedures. Such environmental conditions include humidity, voltage, temperature, and vibration levels in the laboratory.

When any of the method or regulatory required environmental conditions change to a point where they may adversely affect test results, analytical testing will be discontinued until the environmental conditions are returned to the required levels.

Environmental conditions of the facility housing the computer network and LIMS are regulated to protect against raw data loss.

18.3 Work Areas

There is effective separation between neighboring areas when the activities therein are incompatible with each other. Examples include:

- Microbiological culture handling and sample incubation areas.
- Volatile organic chemical handling areas, including sample preparation and waste disposal, and volatile organic chemical analysis areas.

Access to and use of all areas affecting the quality of analytical testing is defined and controlled by secure access to the laboratory building as described below in the Building Security section.

Adequate measures are taken to ensure good housekeeping in the laboratory and to ensure that any contamination does not adversely affect data quality. These measures include regular cleaning to control dirt and dust within the laboratory. Work areas are available to ensure an unencumbered work area. Work areas include:

- Access and entryways to the laboratory.
- Sample receipt areas.
- Sample storage areas.
- Chemical and waste storage areas.
- Data handling and storage areas.
- Sample processing areas.
- Sample analysis areas.

18.4 Floor Plan

A floor plan can be found in Appendix 1.

18.5 Building Security

Building keys and alarm codes are distributed to employees as necessary.

Visitors to the laboratory sign in and out in a visitor's logbook. A visitor is defined as any person who visits the laboratory who is not an employee of the laboratory. In addition to signing into the laboratory, the Environmental, Health and Safety Manual contains requirements for visitors and vendors. There are specific safety forms that must be reviewed and signed. Visitors (with the exception of company employees) are escorted by laboratory personnel at all times, or the location of the visitor is noted in the visitor's logbook.

SECTION 19. TEST METHODS AND METHOD VALIDATION

19.1 Overview

The laboratory uses methods that are appropriate to meet our clients' requirements and that are within the scope of the laboratory's capabilities. These include sampling, handling, transport, storage and preparation of samples, and, where appropriate, an estimation of the measurement of uncertainty as well as statistical techniques for analysis of environmental data.

Instructions are available in the laboratory for the operation of equipment as well as for the handling and preparation of samples. All instructions, Standard Operating Procedures (SOPs), reference methods and manuals relevant to the working of the laboratory are readily available to all staff. Deviations from published methods are documented (with justification) in the laboratory's approved SOPs. SOPs are submitted to clients for review at their request. Significant deviations from published methods require client approval and regulatory approval where applicable.

19.2 Standard Operating Procedures (SOPS)

The laboratory maintains SOPs that accurately reflect all phases of the laboratory such as assessing data integrity, corrective actions, handling customer complaints as well as all analytical methods and sampling procedures. The method SOPs are derived from the most recently promulgated/approved, published methods and are specifically adapted to the laboratory facility. Modifications or clarifications to published methods are clearly noted in the SOPs. All SOPs are controlled in the laboratory.

- All SOPs contain a revision number, effective date, and appropriate approval signatures. Controlled copies are available to all staff.
- Procedures for writing an SOP are incorporated by reference to TestAmerica's Corporate SOP entitled 'Writing a Standard Operating Procedure', No. CW-Q-S-002 or the laboratory's SOP HS-QA-004.
- SOPs are reviewed at a minimum of every 2 years (annually for Drinking Water and DoD SOPs), and where necessary, revised to ensure continuing suitability and compliance with applicable requirements.

19.3 Laboratory Methods Manual

For each test method, the laboratory shall have available the published referenced method as well as the laboratory developed SOP.

Note: If more stringent standards or requirements are included in a mandated test method or regulation than those specified in this manual, the laboratory shall demonstrate that such requirements are met. If it is not clear which requirements are more stringent, the standard from the method or regulation is to be followed. Any exceptions or deviations from the referenced methods or regulations are noted in the specific analytical SOP.

The laboratory maintains an SOP Index for both technical and non-technical SOPs. Technical SOPs are maintained to describe a specific test method. Non-technical SOPs are maintained to describe functions and processes not related to a specific test method.

19.4 Selection of Methods

Since numerous methods and analytical techniques are available, continued communication between the client and laboratory is imperative to assure the correct methods are utilized. Once client methodology requirements are established, this and other pertinent information is summarized by the Project Manager. These mechanisms ensure that the proper analytical methods are applied when the samples arrive for log-in. For non-routine analytical services (e.g., special matrices, non-routine compound lists), the method of choice is selected based on client needs and available technology. The methods selected should be capable of measuring the specific parameter of interest, in the concentration range of interest, and with the required precision and accuracy.

19.4.1 Sources of Methods

Routine analytical services are performed using standard EPA-approved methodology. In some cases, modification of standard approved methods may be necessary to provide accurate analyses of particularly complex matrices. When the use of specific methods for sample analysis is mandated through project or regulatory requirements, only those methods shall be used.

When clients do not specify the method to be used or methods are not required, the methods used will be clearly validated and documented in an SOP and available to clients and/or the end user of the data.

The analytical methods used by the laboratory are those currently accepted and approved by the U. S. EPA and the state or territory from which the samples were collected. Reference methods include:

- *Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act; Analysis and sampling procedures; 40CFR Part 136 as amended by method update rule; May 18, 2012;*
- *Methods for Chemical Analysis of Water and Wastes, EPA 600 (4-79-020), 1983.*
- *Methods for the Determination of Inorganic Substances in Environmental Samples, EPA-600/R-93/100, August 1993.*

- *Methods for the Determination of Metals in Environmental Samples, EPA/600/4-91/010, June 1991. Supplement I: EPA-600/R-94/111, May 1994.*
- *Statement of Work for Inorganics & Organics Analysis, SOM and ISM, current versions, USEPA Contract Laboratory Program Multi-media, Multi-concentration.*
- *Standard Methods for the Examination of Water and Wastewater, 18th/19th /20th/ on-line edition; Eaton, A.D. Clesceri, L.S. Greenberg, A.E. Eds; American Water Works Association, Water Pollution Control Federation, American Public Health Association: Washington, D.C.*
- *Test Methods for Evaluating Solid Waste Physical/Chemical Methods (SW846), Third Edition, September 1986, Final Update I, July 1992, Final Update IIA, August 1993, Final Update II, September 1994; Final Update IIB, January 1995; Final Update III, December 1996; Final Update IV, January 2008; Final Update V, August 2015.*
- *Annual Book of ASTM Standards, American Society for Testing & Materials (ASTM), Philadelphia, PA.*
- *National Status and Trends Program, National Oceanographic and Atmospheric Administration, Volume I-IV, 1985-1994.*
- *Code of Federal Regulations (CFR) 40, Parts 136, 141, 172, 173, 178, 179 and 261*
- *Texas Risk Reduction Program (TRRP), Texas Commission on Environmental Quality, Texas Administrative Code, Title 30, Part 1, Chapter 350, March, 19, 2007.*

The laboratory reviews updated versions to all the aforementioned references for adaptation based upon capabilities, instrumentation, etc., and implements them as appropriate. As such, the laboratory strives to perform only the latest versions of each approved method as regulations allow or require.

Other reference procedures for non-routine analyses may include methods established by specific states (e.g., Underground Storage Tank methods), ASTM or equipment manufacturers. Sample type, source, and the governing regulatory agency requiring the analysis will determine the method utilized.

The laboratory shall inform the client when a method proposed by the client may be inappropriate or out of date. After the client has been informed, and they wish to proceed contrary to the laboratory's recommendation, it will be documented.

19.4.2 Demonstration of Capability

Before the laboratory may institute a new method and begin reporting results, the laboratory shall confirm that it can properly operate the method. In general, this demonstration does not test the performance of the method in real world samples, but in an applicable and available clean matrix sample. If the method is for the testing of analytes that are not conducive to spiking, demonstration of capability may be performed on quality control samples.

A demonstration of capability (DOC, Lab SOP # HS-QA-001) is performed whenever there is a change in instrument type (e.g., new instrumentation), method or personnel (e.g., analyst hasn't performed the test within the last 12 months).

NOTE: The laboratory shall have a DOC for all analytes included in the methods that the laboratory performs, and proficiency DOCs for each analyst shall include all analytes that the laboratory routinely performs. Addition of non-routine analytes does not require new DOCs for

all analysts are already qualified for routine analytes tested using identical chemistry and instrument conditions.

The initial demonstration of capability must be thoroughly documented and approved by the Technical Director and QA Manager prior to independently analyzing client samples. All associated documentation must be retained in accordance with the laboratories archiving procedures.

The laboratory must have an approved SOP, demonstrate satisfactory performance, and conduct an MDL study (when applicable). There may be other requirements as stated within the published method or regulations (i.e., retention time window study).

Note: In some instances, a situation may arise where a client requests that an unusual analyte be reported using a method where this analyte is not normally reported. If the analyte is being reported for regulatory purposes, the method must meet all procedures outlined within this QA Manual (SOP, MDL, and Demonstration of Capability). If the client states that the information is not for regulatory purposes, the result may be reported as long as the following criteria are met:

- The instrument is calibrated for the analyte to be reported using the criteria for the method and ICV/CCV criteria are met (unless an ICV/CCV is not required by the method or criteria are per project DQOs).
- The laboratory's nominal or default reporting limit (RL) is equal to the quantitation limit (QL), must be at or above the lowest non-zero standard in the calibration curve and must be reliably determined. Project RLs are client specified reporting levels which may be higher than the QL. Results reported below the QL must be qualified as estimated values. Also see Section 19.6.1.3, Relationship of Limit of Detection (LOD) to Quantitation Limit (QL).
- The client request is documented and the lab informs the client of its procedure for working with unusual compounds. The final report must be footnoted: *Reporting Limit based on the low standard of the calibration curve.*

19.4.3 Initial Demonstration of Capability (IDOC) Procedures

19.4.3.1 The spiking standard used must be prepared independently from those used in instrument calibration.

19.4.3.2 The analyte(s) shall be diluted in a volume of clean matrix sufficient to prepare four aliquots at the concentration specified by a method or the laboratory SOP.

19.4.3.3 At least four aliquots shall be prepared (including any applicable clean-up procedures) and analyzed according to the test method (either concurrently or over a period of days).

19.4.3.4 Using all of the results, calculate the mean recovery in the appropriate reporting units and the standard deviations for each parameter of interest.

19.4.3.5 When it is not possible to determine the mean and standard deviations, such as for presence, absence and logarithmic values, the laboratory will assess performance against criteria described in the Method SOP.

19.4.3.6 Compare the information obtained above to the corresponding acceptance criteria for precision and accuracy in the test method (if applicable) or in laboratory generated acceptance criteria (LCS or interim criteria) if there is no mandatory criteria established. If any one of the parameters do not meet the acceptance criteria, the performance is unacceptable for that parameter.

19.4.3.7 When one or more of the tested parameters fail at least one of the acceptance criteria, the analyst must proceed according to either option listed below:

- Locate and correct the source of the problem and repeat the test for all parameters of interest beginning with 19.4.3.3 above.
- Beginning with 19.4.3.3 above, repeat the test for all parameters that failed to meet criteria. Repeated failure, however, will confirm a general problem with the measurement system. If this occurs, locate and correct the source of the problem and repeat the test for all compounds of interest beginning with 19.4.3.1 above.

Note: Results of successive LCS analyses can be used to fulfill the DOC requirement.

A certification statement (refer to Figure 19-1 as an example) shall be used to document the completion of each initial demonstration of capability. A copy of the certification is archived in the analyst's training folder.

Methods on line prior to the effective date of this Section shall be updated to the procedures outlined above as new analysts perform their demonstration of capability. A copy of the new record will replace that which was used for documentation in the past. At a minimum, the precision and accuracy of four mid-level laboratory control samples must have been compared to the laboratory's quality control acceptance limits.

19.5 Laboratory Developed Methods and Non-Standard Methods

Any new method developed by the laboratory must be fully defined in an SOP and validated by qualified personnel with adequate resources to perform the method. Method specifications and the relation to client requirements must be clearly conveyed to the client if the method is a non-standard method (not a published or routinely accepted method). The client must also be in agreement to the use of the non-standard method.

19.6 Validation of Methods

Validation is the confirmation by examination and the provision of objective evidence that the particular requirements for a specific intended use are fulfilled.
All non-standard methods, laboratory designed/developed methods, standard methods used outside of their scope, and major modifications to published methods must be validated to confirm they are fit for their intended use. The validation will be as extensive as necessary to meet the needs of the given application. The results are documented with the validation procedure used and contain a statement as to the fitness for use.

19.6.1 Method Validation and Verification Activities for All New Methods

While method validation can take various courses, the following activities can be required as part of method validation. Method validation records are designated QC records and are archived accordingly.

19.6.1.1 Determination of Method Selectivity

Method selectivity is the demonstrated ability to discriminate the analyte(s) of interest from other compounds in the specific matrix or matrices from other analytes or interference. In some cases to achieve the required selectivity for an analyte, a confirmation analysis is required as part of the method.

19.6.1.2 Determination of Method Sensitivity

Sensitivity can be both estimated and demonstrated. Whether a study is required to estimate sensitivity depends on the level of method development required when applying a particular measurement system to a specific set of samples. Where estimations and/or demonstrations of sensitivity are required by regulation or client agreement, such as the procedure in 40 CFR Part 136 Appendix B, under the Clean Water Act, these shall be followed.

19.6.1.3 Relationship of Limit of Detection (LOD) to the Quantitation Limit (QL)

An important characteristic of expression of sensitivity is the difference in the LOD and the QL. The LOD is the minimum level at which the presence of an analyte can be reliably concluded. The QL is the minimum concentration of analyte that can be quantitatively determined with acceptable precision and bias. For most instrumental measurement systems, there is a region where semi-quantitative data is generated around the LOD (both above and below the estimated MDL or LOD) and below the QL. In this region, detection of an analyte may be confirmed but quantification of the analyte is unreliable within the accuracy and precision guidelines of the measurement system. When an analyte is detected below the QL, and the presence of the analyte is confirmed by meeting the qualitative identification criteria for the analyte, the analyte can be reliably reported, but the amount of the analyte can only be estimated. If data is to be reported in this region, it must be done so with a qualification that denotes the semi-quantitative nature of the result.

19.6.1.4 Determination of Interferences

A determination that the method is free from interferences in a blank matrix is performed.

19.6.1.5 Determination of Range

Where appropriate to the method, the quantitation range is determined by comparison of the response of an analyte in a curve to established or targeted criteria. Generally the upper quantitation limit is defined by highest acceptable calibration concentration. The lower quantitation limit or QL cannot be lower than the lowest non-zero calibration level, and can be constrained by required levels of bias and precision.

19.6.1.6 Determination of Accuracy and Precision

Accuracy and precision studies are generally performed using replicate analyses, with a resulting percent recovery and measure of reproducibility (standard deviation, relative standard deviation) calculated and measured against a set of target criteria.

19.6.1.7 Documentation of Method

The method is formally documented in an SOP. If the method is a minor modification of a standard laboratory method that is already documented in an SOP, an SOP Attachment describing the specific differences in the new method is acceptable in place of a separate SOP.

19.6.1.8 Continued Demonstration of Method Performance

Continued demonstration of Method Performance is addressed in the SOP. Continued demonstration of method performance is generally accomplished by batch specific QC samples such as LCS, method blanks or PT samples.

19.7 Method Detection Limits (MDL) / Limits of Detection (LOD)

Method detection limits (MDL) are initially determined in accordance with 40 CFR Part 136, Appendix B or alternatively by other technically acceptable practices that have been accepted by regulators. MDL is also sometimes referred to as Limit of Detection (LOD). The MDL theoretically represents the concentration level for each analyte within a method at which the Analyst is 99% confident that the true value can be differentiated from blanks. The MDL is determined for each analyte initially during the method validation process and updated as required in the analytical methods, whenever there is a significant change in the procedure or equipment, or based on project specific requirements. Generally, the analyst prepares at least seven replicates of solution spiked at one to five times the estimated method detection limit (most often at the lowest standard in the calibration curve) into the applicable matrix with all the analytes of interest. Each of these aliquots is extracted (including any applicable clean-up procedures) and analyzed in the same manner as the samples. Where possible, the seven replicates should be analyzed over 2-4 days to provide a more realistic MDL.

Refer to the Corporate SOP No. CA-Q-S-006 or HS-QA-037 for details on the laboratory's MDL process.

19.8 Instrument Detection Limits (IDL)

The IDL is sometimes used to assess the reasonableness of the MDLs or in some cases required by the analytical method or program requirements. IDLs are most used in metals analyses but may be useful in demonstration of instrument performance in other areas.

IDLs are calculated to determine an instrument's sensitivity independent of any preparation method. IDLs are calculated either using 7 replicate spike analyses, like MDL but without sample preparation, or by the analysis of 10 instrument blanks and calculating 3 x the absolute value of the standard deviation.

If IDL is > than the MDL, it may be used as the reported MDL.

19.9 Verification of Detection and Reporting Limits

Once an MDL is established, it must be verified, on each instrument, by analyzing a quality control sample (prepared as a sample) at no more than 3 times the calculated MDL for single analyte analyses (e.g. most wet chemistry methods, Atomic Absorption, etc.) and no more than 4 times the calculated MDL for multiple analyte methods (e.g. GC, GCMS, ICP, etc.). The analytes must be qualitatively identified. This verification does not apply to methods that are not readily spiked (e.g. pH, turbidity, etc.) or where the lab does not report to the MDL. If the MDL does not verify, then the lab will not report to the MDL, or redevelop their MDL or use the level where qualitative identification is established. MDLs must be verified at least annually.

When the laboratory establishes a quantitation limit, it must be initially verified by the analysis of a low level standard or QC sample at 1-2 times the reporting limit and annually thereafter. The annual requirement is waived for methods that have an annually verified MDL. The laboratory will comply with any regulatory requirements.

19.10 Retention Time Windows

Most organic analyses and some inorganic analyses use chromatography techniques for qualitative and quantitative determinations. For every chromatography analysis or as specific in the reference method, each analyte will have a specific time of elution from the column to the detector. This is known as the analyte's retention time. The variance in the expected time of elution is defined as the retention time window. As the key to analyte identification in chromatography, retention time windows must be established on every column for every analyte used for that method. These records are kept with the files associated with an instrument for later quantitation of the analytes. Complete details are available in the laboratory SOPs.

19.11 Evaluation of Selectivity

The laboratory evaluates selectivity by following the checks within the applicable analytical methods, which include mass spectral tuning, second column confirmation, ICP interelement interference checks, chromatography retention time windows, sample blanks, spectrochemical, atomic absorption or fluorescence profiles, co-precipitation evaluations and specific electrode response factors.

19.12 Estimation of Uncertainty of Measurement

19.12.1 Uncertainty is "a parameter associated with the result of a measurement, that characterizes the dispersion of the values that could reasonably be attributed to the measurand" (as defined by the International Vocabulary of Basic and General Terms in Metrology, ISO Geneva, 1993, ISBN 92-67-10175-1). Knowledge of the uncertainty of a measurement provides additional confidence in a result's validity. Its value accounts for all the factors which could possibly affect the result, such as adequacy of analyte definition, sampling, matrix effects and interferences, climatic conditions, variances in weights, volumes, and standards, analytical procedure, and random variation. Some national accreditation organizations require the use of an "expanded uncertainty": the range within which the value of the measurand is believed to lie within at least a 95% confidence level with the coverage factor k=2.

19.12.2 Uncertainty is not error. Error is a single value, the difference between the true result and the measured result. On environmental samples, the true result is never known. The measurement is the sum of the unknown true value and the unknown error. Unknown error is a combination of systematic error, or bias, and random error. Bias varies predictably, constantly, and independently from the number of measurements. Random error is unpredictable, assumed to be Gaussian in distribution, and reducible by increasing the number of measurements.

19.12.3 The minimum uncertainty associated with results generated by the laboratory can be determined by using the Laboratory Control Sample (LCS) accuracy range for a given analyte. The LCS limits are used to assess the performance of the measurement system since they take into consideration all of the laboratory variables associated with a given test over time (except for variability associated with the sampling and the variability due to matrix effects). The percent recovery of the LCS is compared either to the method-required LCS accuracy limits or to the statistical, historical, in-house LCS accuracy limits.

19.12.4 To calculate the uncertainty for the specific result reported, multiply the result by the decimal of the lower end of the LCS range percent value for the lower end of the uncertainty range, and multiply the result by the decimal of the upper end of the LCS range percent value for the upper end of the uncertainty range. These calculated values represent a 99%-certain range for the reported result. As an example, suppose that the result reported is 1.0 mg/l, and the LCS percent recovery range is 50 to 150%. The uncertainty range would be 0.5 to 1.5 mg/l, which could also be written as 1.0 +/- 0.5 mg/l.

19.12.5 In the case where a well recognized test method specifies limits to the values of major sources of uncertainty of measurement (e.g., 524.2, 525, etc.) and specifies the form of presentation of calculated results, no further discussion of uncertainty is required.

19.13 Sample Reanalysis Guidelines

Because there is a certain level of uncertainty with any analytical measurement, a sample re-preparation (where appropriate) and subsequent analysis (hereafter referred to as 'reanalysis') may result in either a higher or lower value from an initial sample analysis. There are also variables that may be present (e.g., sample homogeneity, analyte precipitation over time, etc.) that may affect the results of a reanalysis. Based on the above comments, the laboratory will reanalyze samples at a client's request with the following caveats. **Client specific Contractual Terms & Conditions for reanalysis protocols may supersede the following items.**

- Homogenous samples: If a reanalysis agrees with the original result to within the RPD limits for MS/MSD or Duplicate analyses, or within $\pm$ 1 reporting limit for samples $\leq$ 5x the reporting limit, the original analysis will be reported. At the client's request, both results may be reported on the same report but not on two separate reports.

- If the reanalysis does not agree (as defined above) with the original result, then the laboratory will investigate the discrepancy and reanalyze the sample a third time for confirmation if sufficient sample is available.

- Any potential charges related to reanalysis are discussed in the contract terms and conditions or discussed at the time of the request. The client will typically be charged for reanalysis unless it is determined that the lab was in error.

- Due to the potential for increased variability, reanalysis may not be applicable to Non-homogenous, Encore, and Sodium Bisulfate preserved samples. See the Area Supervisor or Laboratory Director if unsure.

19.14 Control of Data

The laboratory has policies and procedures in place to ensure the authenticity, integrity, and accuracy of the analytical data generated by the laboratory.

19.14.1 Computer and Electronic Data Related Requirements

The three basic objectives of our computer security procedures and policies are shown below. The laboratory is currently running the TALS which is a custom in-house developed LIMS system that has been highly customized to meet the needs of the laboratory. It is referred to as LIMS for the remainder of this section. The LIMS utilizes Microsoft SQL Server which is an industry standard relational database platform. It is referred to as Database for the remainder of this section.

19.14.1.1 Maintain the Database Integrity: Assurance that data is reliable and accurate through data verification (review) procedures, password-protecting access, anti-virus protection, data change requirements, as well as an internal LIMS permissions procedure.

- LIMS Database Integrity is achieved through data input validation, internal user controls, and data change requirements.
- Spreadsheets and other software developed in-house must be verified with documentation through hand calculations prior to use. Cells containing calculations must be lock-protected and controlled.
- Instrument hardware and software adjustments are safeguarded through maintenance logs, audit trails and controlled access.

19.14.1.2 Ensure Information Availability: Protection against loss of information or service is ensured through scheduled back-ups, stable file server network architecture, secure storage of media, line filter, Uninterruptible Power Supply (UPS), and maintaining older versions of software as revisions are implemented.

19.14.1.3 Maintain Confidentiality: Ensure data confidentiality through physical access controls such as password protection or website access approval when electronically transmitting data.

19.14.2 Data Reduction

The complexity of the data reduction depends on the analytical method and the number of discrete operations involved (e.g., extractions, dilutions, instrument readings and concentrations). The analyst calculates the final results from the raw data or uses appropriate computer programs to assist in the calculation of final reportable values.

For manual data entry, e.g., Wet Chemistry, the data is reduced by the analyst and then verified by the Department Manager or alternate analyst prior to updating the data in LIMS. The spreadsheets, or any other type of applicable documents, are signed by both the analyst and alternate reviewer to confirm the accuracy of the manual entry(s).

Manual integration of peaks will be documented and reviewed and the raw data will be flagged in accordance with the TestAmerica Corporate SOP No. CA-Q-S-002, *Acceptable Manual Integration Practices*.

Analytical results are reduced to appropriate concentration units specified by the analytical method, taking into account factors such as dilution, sample weight or volume, etc. Blank correction will be applied only when required by the method or per manufacturer's indication; otherwise, it should not be performed. Calculations are independently verified by appropriate laboratory staff. Calculations and data reduction steps for various methods are summarized in the respective analytical SOPs or program requirements.

19.14.2.1 All raw data must be retained in the worklist folder, computer file (if appropriate), and/or runlog. All criteria pertinent to the method must be recorded. The documentation is recorded at the time observations or calculations are made and must be signed or initialed/dated (month/day/year). It must be easily identifiable who performed which tasks if multiple people were involved.

19.14.2.2 In general, concentration results are reported in milligrams per liter (mg/l) or micrograms per liter (µg/l) for liquids and milligrams per kilogram (mg/kg) or micrograms per kilogram (µg/kg) for solids. For values greater than 10,000 mg/l, results can be reported in percent, i.e., 10,000 mg/l = 1**%.** Units are defined in each lab SOP.

19.14.2.3 In reporting, the analyst or the instrument output records the raw data result using values of known certainty plus one uncertain digit. If final calculations are performed external to LIMS, the results should be entered in LIMS with at least three significant figures. In general, results are reported to 2 significant figures on the final report.

19.14.2.4 For those methods that do not have an instrument printout or an instrumental output compatible with the LIMS System, the raw results and dilution factors are entered directly into LIMS by the analyst, and the software calculates the final result for the analytical report. LIMS has a defined significant figure criterion for each analyte.

19.14.2.5 The laboratory strives to import data directly from instruments or calculation spreadsheets to ensure that the reported data are free from transcription and calculation errors. For those analyses with an instrumental output compatible with the LIMS, the raw results and dilution factors are transferred into LIMS electronically after reviewing the quantitation report, and removing unrequested or poor spectrally-matched compounds. The analyst prints a copy of what has been entered to check for errors. This printout and the instrument's printout of calibrations, concentrations, retention times, chromatograms, and mass spectra, if applicable, are retained with the data file. The data file is stored in a monthly folder on the instrument computer; periodically, this file is transferred to the server and, eventually, to a tape file.

19.14.3 Logbook / Worksheet Use Guidelines

Logbooks and worksheets are filled out 'real time' and have enough information on them to trace the events of the applicable analysis/task. (e.g. calibrations, standards, analyst, sample ID, date, time on short holding time tests, temperatures when applicable, calculations are traceable, etc.)

- Corrections are made following the procedures outlined in Section 12.
- Logbooks are controlled by the QA department. A record is maintained of all logbooks in the lab.
- Unused portions of pages must be "Z"'d out, signed and dated.
- Worksheets are created with the approval of the Technical Director/QA Manager at the facility. The QA Manager controls all worksheets following the procedures in Section 6.

19.14.4 Review / Verification Procedures

Review procedures are out lined in several SOPs to ensure that reported data are free from calculation and transcription errors, that QC parameters have been reviewed and evaluated before data is reported. The general review concepts are discussed below, more specific information can be found in the SOPs.

19.14.4.1 Log-In Review – The data review process starts at the sample receipt stage. Sample control personnel review chain-of-custody forms and project instructions from the project management group. This is the basis of the sample information and analytical instructions entered into LIMS. The log-in instructions are reviewed by the personnel entering the information, and a second level review is conducted by the project management staff.

19.14.4.2 First Level Data Review - The next level of data review occurs with the analysts. As data are generated, analysts review their work to ensure that the results meet project and SOP requirements. First level reviews include inspection of all raw data (e.g., instrument output for continuous analyzers, chromatograms, spectra, and manual integrations), evaluation of calibration/calibration verification data in the day's analytical run, evaluation of QC data, and reliability of sample results. The analyst transfers data into LIMS, data qualifiers are added as needed. All first level reviews are documented.

19.14.4.3 Second Level Data Review – All analytical data are subject to review by a second qualified analyst or supervisor. Second level reviews include inspection of all raw data (e.g., instrument output, chromatograms, and spectra) including 100% of data associated with any changes made by the primary analyst, such as manual integrations or reassignment of peaks to different analytes, or elimination of false negative analytes. The second review also includes evaluation of initial calibration/calibration verification data in the day's analytical run, evaluation of QC data, reliability of sample results, qualifiers and NCM narratives. Manual calculations are checked in second level review. All second level reviews are documented.

Issues that deem further review include the following:

- QC data are outside the specified control limits for accuracy and precision
- Reviewed sample data does not match with reported results
- Unusual detection limit changes are observed
- Samples having unusually high results
- Samples exceeding a known regulatory limit
- Raw data indicating some type of contamination or poor technique
- Inconsistent peak integration
- Transcription errors
- Results outside of calibration range

19.14.4.4 Unacceptable analytical results may require reanalysis of the samples. Any problems are brought to the attention of the Laboratory Director, Project Manager, Quality Assurance Manager, Technical Manager, or Supervisor for further investigation. Corrective action is initiated whenever necessary.

19.14.4.5 The results are then entered or directly transferred into the computer database and a .pdf is sent to the client or, upon request, hard copy is printed for the client.

19.14.4.6 As a final review prior to the release of the report, the Project Manager reviews the results for appropriateness and completeness. This review and approval ensures that client requirements have been met and that the final report has been properly completed. The process includes, but is not limited to, verifying that chemical relationships are evaluated, COC is followed, cover letters/ narratives are present, flags are appropriate, and project specific requirements are met. The following are some examples of chemical relationships that are reviewed (if data is available):

- Total Results are $\geq$ Dissolved results (e.g. metals)
- Total Solids (TS) $\geq$ TDS or TSS
- TKN $\geq$ Ammonia
- Total Phosphorus $\geq$ Orthophosphate
- COD $\geq$ TOC
- Total cyanide $\geq$ Amenable Cyanide
- TDS $\geq$ individual anions

19.14.4.7 Any project that requires a data package is subject to a tertiary data review for transcription errors and acceptable quality control requirements. The Project Manager then signs the final report. The Project Managers also check the report for any clerical or invoicing errors. When complete, the report is sent out to the client.

19.14.4.8 A visual summary of the flow of samples and information through the laboratory, as well as data review and validation, is presented in Figure 19-2.

19.14.5 Manual Integrations

Computerized data systems provide the analyst with the ability to re-integrate raw instrument data in order to optimize the interpretation of the data. Though manual integration of data is an invaluable tool for resolving variations in instrument performance and some sample matrix problems, when used improperly, this technique would make unacceptable data appear to meet quality control acceptance limits. Improper re-integrations lead to legally indefensible data, a poor reputation, or possible laboratory decertification. Because guidelines for re-integration of data are not provided in the methods and most methods were written prior to widespread implementation of computerized data systems, the laboratory trains all analytical staff on proper manual integration techniques using TestAmerica's Corporate SOP (CA-Q-S-002).

19.14.5.1 The analyst must adjust baseline or the area of a peak in some situations, for example when two compounds are not adequately resolved or when a peak shoulder needs to be separated from the peak of interest. The analyst must use professional judgment and common sense to determine when manual integrating is required. Analysts are encouraged to ask for assistance from a senior analyst or manager when in doubt.

19.14.5.2 Analysts shall not increase or decrease peak areas for the sole purpose of achieving acceptable QC recoveries that would have otherwise been unacceptable. The intentional recording or reporting of incorrect information (or the intentional omission of correct information) is against company principles and policy and is grounds for immediate termination.

19.14.5.3 Client samples, performance evaluation samples, and quality control samples are all treated equally when determining whether or not a peak area or baseline should be manually adjusted.

19.14.5.4 All manual integrations receive a second level review. Manual integrations must be indicated on an expanded scale "after" chromatograms such that the integration performed can be easily evaluated during data review. Expanded scale "before" chromatograms are also required for all manual integrations on QC parameters (calibrations, calibration verifications, laboratory control samples, internal standards, surrogates, etc.) unless the laboratory has another documented corporate approved procedure in place that can demonstrate an active process for detection and deterrence of improper integration practices.

Figure 19-1. Example - Demonstration of Capability Documentation

DEMONSTRATION OF CAPABILITIY (DOC)

Laboratory Name:_____
Laboratory Address:_____
Method:_____ Matrix:_____
Date:_____ Analyst(s):_____
Source of Analyte(s):_____

Analytical Results

Analyst	Conc. (Units)	Rep 1	Rep 2	Rep 3	Rep 4	Avg. % Recovery	% RSD
_____	_____	_____	_____	_____	_____	_____	_____

% RSD = Percent relative standard deviation = standard deviation divided by average % Recovery

Raw data reference: _____

Certification Statement:

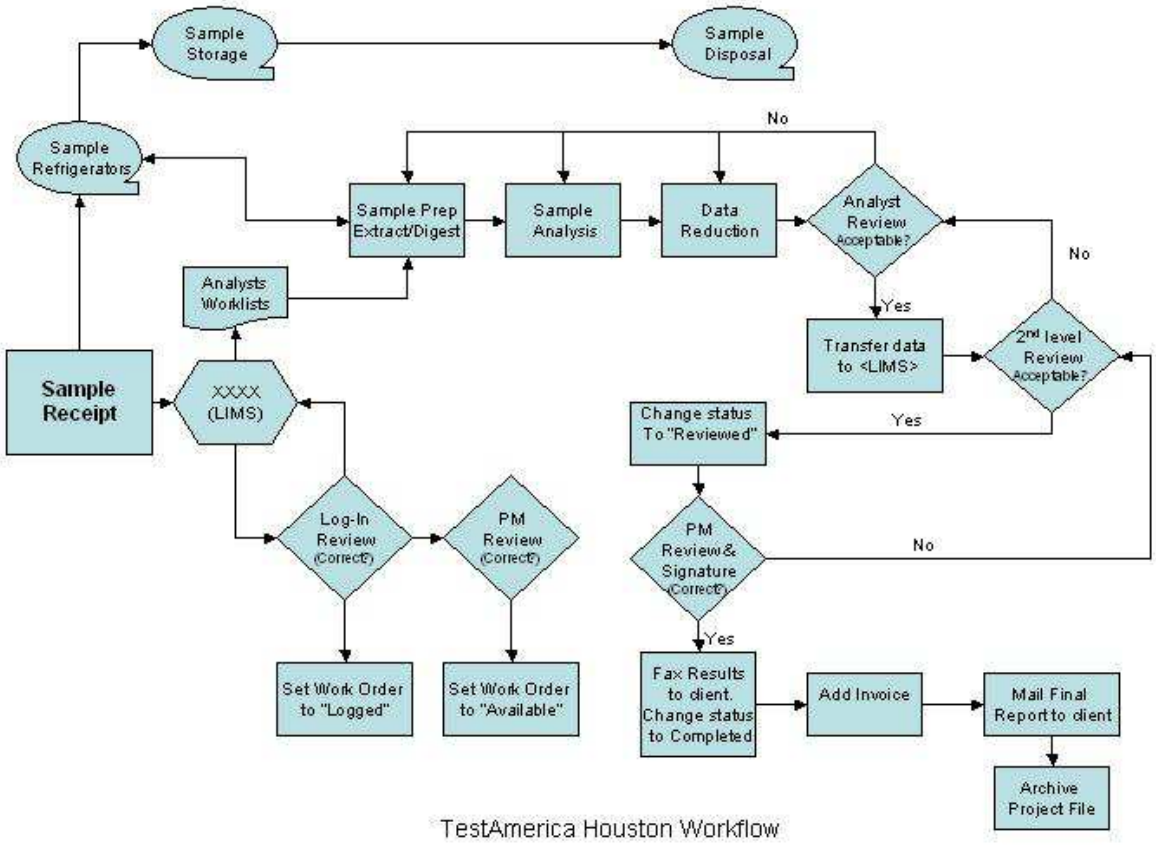
We, the undersigned, certify that:
1. The cited test method has met Demonstration of Capability requirements.
2. The test method was performed by the analyst(s) identified on this certification.
3. A copy of the test method and the laboratory-specific SOPs are available for all personnel on site.
4. The data associated with the method demonstration of capability are true, accurate, complete, and self-explanatory.
5. All raw data necessary to reconstruct and validate these analyses have been retained at the facility, and the associated information is well organized and available for review.
6.

_____ _____
Analyst Signature Date

_____ _____
Technical Managerr Signature Date

_____ _____
Quality Assurance Coordinator Signature Date

Figure 19-2. Example: Work Flow



SECTION 20. EQUIPMENT and CALIBRATIONS

20.1 Overview

The laboratory purchases the most technically advanced analytical instrumentation for sample analyses. Instrumentation is purchased on the basis of accuracy, dependability, efficiency and sensitivity. Each laboratory is furnished with all items of sampling, preparation, analytical testing and measurement equipment necessary to correctly perform the tests for which the laboratory has capabilities. Each piece of equipment is capable of achieving the required accuracy and complies with specifications relevant to the method being performed. Before being placed into use, the equipment (including sampling equipment) is calibrated and checked to establish that it meets its intended specification. The calibration routines for analytical instruments establish the range of quantitation. Calibration procedures are specified in laboratory SOPs. A list of laboratory instrumentation is presented in Table 20-1.

Equipment is only operated by authorized and trained personnel. Manufacturer's instructions for equipment use are readily accessible to all appropriate laboratory personnel.

20.2 Preventive Maintenance

The laboratory follows a well-defined maintenance program to ensure proper equipment operation and to prevent the failure of laboratory equipment or instrumentation during use. This program of preventive maintenance helps to avoid delays due to instrument failure.

Routine preventive maintenance procedures and frequency, such as cleaning and replacements, should be performed according to the procedures outlined in the manufacturer's manual. Qualified personnel must also perform maintenance when there is evidence of degradation of peak resolution, a shift in the calibration curve, loss of sensitivity, or failure to continually meet one of the quality control criteria.

Table 20-2 lists examples of scheduled routine maintenance. It is the responsibility of each Technical Manager to ensure that instrument maintenance logs are kept for all equipment in his/her department. Preventative maintenance procedures may be / are also outlined in analytical SOPs or instrument manuals. (Note: for some equipment, the log used to monitor performance is also the maintenance log. Multiple pieces of equipment may share the same log as long as it is clear as to which instrument is associated with an entry.)

Instrument maintenance logs are controlled and are used to document instrument problems, instrument repair and maintenance activities. Maintenance logs shall be kept for all major pieces of equipment. Instrument maintenance logs may also be used to specify instrument parameters.

- Documentation must include all major maintenance activities such as contracted preventive maintenance and service and in-house activities such as the replacement of electrical components, lamps, tubing, valves, columns, detectors, cleaning and adjustments.
- Each entry in the instrument log includes the Analyst's initials, the date, a detailed description of the problem (or maintenance needed/scheduled), a detailed explanation of the solution or maintenance performed, and a verification that the equipment is functioning properly (state what was used to determine a return to control. e.g. CCV run on *'date'* was acceptable, or

instrument recalibrated on 'date' with acceptable verification, etc.) must also be documented in the instrument records.

- When maintenance or repair is performed by an outside agency, service receipts detailing the service performed can be affixed into the logbooks adjacent to pages describing the maintenance performed. This stapled in page must be signed across the page entered and the logbook so that it is clear that a page is missing if only half a signature is found in the logbook.

If an instrument requires repair (subjected to overloading or mishandling, gives suspect results, or otherwise has shown to be defective or outside of specified limits) it shall be taken out of operation and tagged as out-of-service or otherwise isolated until such a time as the repairs have been made and the instrument can be demonstrated as operational by calibration and/or verification or other test to demonstrate acceptable performance. The laboratory shall examine the effect of this defect on previous analyses.

In the event of equipment malfunction that cannot be resolved, service shall be obtained from the instrument vendor manufacturer, or qualified service technician, if such a service can be tendered. If on-site service is unavailable, arrangements shall be made to have the instrument shipped back to the manufacturer for repair. Back up instruments, which have been approved, for the analysis shall perform the analysis normally carried out by the malfunctioning instrument. If the back up is not available and the analysis cannot be carried out within the needed timeframe, the samples shall be subcontracted.

At a minimum, if an instrument is sent out for service or transferred to another facility, it must be recalibrated and the laboratory MDL verified (using an MDLV) prior to return to lab operations.

20.3 Support Equipment

This section applies to all devices that may not be the actual test instrument, but are necessary to support laboratory operations. These include but are not limited to: balances, ovens, refrigerators, freezers, incubators, water baths, field sampling devices, temperature measuring devices, thermal/pressure sample preparation devices and volumetric dispensing devices if quantitative results are dependent on their accuracy, as in standard preparation and dispensing or dilution into a specified volume. All raw data records associated with the support equipment are retained to document instrument performance.

20.3.1 Weights and Balances

The accuracy of the balances used in the laboratory is checked every working day, before use. All balances are placed on stable counter tops.

Each balance is checked prior to initial serviceable use with at least two certified ASTM type 1 weights spanning its range of use (weights that have been calibrated to ASTM type 1 weights may also be used for daily verification). ASTM type 1 weights used only for calibration of other weights (and no other purpose) are inspected for corrosion, damage or nicks at least annually and if no damage is observed, they are calibrated at least every 5 years by an outside calibration laboratory. Any weights (including ASTM Type 1) used for daily balance checks or other purposes are recalibrated/recertified annually to NIST standards (this may be done internally if laboratory maintains "calibration only" ASTM type 1 weights).

All balances are serviced annually by a qualified service representative, who supplies the laboratory with a certificate that identifies traceability of the calibration to the NIST standards.

All of this information is recorded in logs, and the recalibration/recertification certificates are kept on file.

20.3.2 pH, Conductivity, and Turbidity Meters

The pH meters used in the laboratory are accurate to ± 0.1 pH units, and have a scale readability of at least 0.05 pH units. The meters automatically compensate for the temperature, and are calibrated with at least two working range buffer solutions before each use.

Conductivity meters are also calibrated before each use with a known standard to demonstrate the meters do not exceed an error of 1% or one umhos/cm.

Turbidity meters are also calibrated before each use. All of this information is documented in logs.

Consult pH and Conductivity, and Turbidity SOPs for further information.

20.3.3 Thermometers

All thermometers are calibrated on an annual basis with a NIST-traceable thermometer

- If the temperature measuring device is used over a range of 10℃ or less, then a single point verification within the range of use is acceptable;
- If the temperature measuring device is used over a range of greater than 10℃, then the verification must bracket the range of use.

IR thermometers, digital probes and thermocouples are calibrated quarterly. IR Thermometers should be calibrated over the full range of use, including ambient, iced (4^{o}C) and frozen (0^{o}C to -5^{o}C), per the Drinking Water Manual.

The mercury/digital NIST thermometer is recalibrated every five years (unless thermometer has been exposed to temperature extremes or apparent separation of internal liquid) by an approved outside service and the provided certificate of traceability is kept on file. The NIST thermometer(s) have increments of 1 degree (0.5 degree or less increments are required for drinking water microbiological laboratories), and have ranges applicable to method and certification requirements. The NIST traceable thermometer is used for no other purpose than to calibrate other thermometers.

All of this information is documented in logbooks. Monitoring method-specific temperatures, including incubators, heating blocks, water baths, and ovens, is documented in method-specific logbooks. More information on this subject can be found in the method SOPs.

20.3.4 Refrigerators/Freezer Units, Waterbaths, Ovens and Incubators

The temperatures of all refrigerator units and freezers used for sample and standard storage are monitored each working day.

Ovens, waterbaths and incubators are monitored on days of use.

All of this equipment has a unique identification number, and is assigned a unique thermometer for monitoring.

Sample storage refrigerator temperatures are kept between > 0ºC and ≤ 6 ºC.

Specific temperature settings/ranges for other refrigerators, ovens waterbaths, and incubators can be found in method specific SOPs.

All of this information is documented in Daily Temperature Logbooks and method-specific logbooks.

20.3.5 Autopipettors, Dilutors, and Syringes

Mechanical volumetric dispensing devices including burettes (except Class A Glassware and Glass microliter syringes) are given unique identification numbers and the delivery volumes are verified gravimetrically, at a minimum, on a quarterly basis.

For those dispensers that are not used for analytical measurements, a label is / can be applied to the device stating that it is not calibrated. Any device not regularly verified can not be used for any quantitative measurements. More information may be found in laboratory SOP# HS-QA-026.

Micro-syringes are purchased from Hamilton Company. Each syringe is traceable to NIST. The laboratory keeps on file an “Accuracy and Precision Statement of Conformance” from Hamilton attesting established accuracy.

20.3.6 Autoclaves

The performance of each autoclave shall be initially evaluated by establishing its functional properties and performance, for example heat distribution characteristics with respect to typical uses. Autoclaves shall meet specified temperature tolerances. Pressure cookers shall not be used for sterilization of growth media.

Demonstration of sterilization temperature shall be provided by use of continuous temperature recording device or by use of a maximum registering thermometer with every cycle. Appropriate biological indicators shall be used every run to determine effective sterilization. Temperature sensitive tape shall be used with the contents of each autoclave run to indicate that the autoclave contents have been processed.

Records of autoclave operations shall be maintained for every cycle. Records shall include: date, contents, maximum temperature reached, time in sterilization mode, total run time (may be recorded as time in and time out) and analyst’s initials.

Autoclave maintenance, by service contract, shall be performed annually or shall include a pressure check and calibration of temperature device. Records of the maintenance shall be maintained in equipment logs.

The autoclave mechanical timing device shall be checked monthly against a stopwatch and the actual time elapsed documented.

20.4 Instrument Calibrations

Calibration of analytical instrumentation is essential to the production of quality data. Strict calibration procedures are followed for each method. These procedures are designed to determine and document the method detection limits, the working range of the analytical instrumentation and any fluctuations that may occur from day to day.

Sufficient raw data records are retained to allow an outside party to reconstruct all facets of the initial calibration. Records contain, but are not limited to, the following: calibration date, method, instrument, analyst(s) initials or signatures, analysis date, analytes, concentration, response, type of calibration (Avg RF, curve, or other calculations that may be used to reduce instrument responses to concentration.)

Sample results must be quantitated from the initial calibration and may not be quantitated from any continuing instrument calibration verification unless otherwise required by regulation, method or program.

If the initial calibration results are outside of the acceptance criteria, corrective action is performed and any affected samples are reanalyzed if possible. If the reanalysis is not possible, any data associated with an unacceptable initial calibration will be reported with appropriate data qualifiers (refer to Section 12).

Note: Instruments are calibrated initially and as needed after that and at least annually.

20.4.1 Calibration Standards

Calibration standards are prepared using the procedures indicated in the Reagents and Standards section of the determinative method SOP. If a reference method does not specify the number of calibration standards, a minimum of 3 calibration points will be used.

Standards for instrument calibration are obtained from a variety of sources. All standards are traceable to national or international standards of measurement, or to national or international standard reference materials.

The lowest concentration calibration standard that is analyzed during an initial calibration must be at or below the stated reporting limit for the method based on the final volume of extract (or sample).

The other concentrations define the working range of the instrument/method or correspond to the expected range of concentrations found in actual samples that are also within the working range of the instrument/method. Results of samples not bracketed by initial instrument calibration standards (within calibration range to at least the same number of significant figures used to report the data) must be reported as having less certainty, e.g., defined qualifiers or flags (additional information may be included in the case narrative). The exception to these rules is ICP and ICPMS methods which define the working range with periodic linear dynamic range studies, rather than through the range of concentrations of daily calibration standards.

All initial calibrations are verified with a standard obtained from a second source and traceable to a national standard, when available (or vendor certified different lot if a second source is not available). For unique situations, such as air analysis where no other source or lot is available, a standard made by a different analyst at a different time or a different preparation would be considered a second source. This verification occurs immediately after the calibration curve has been analyzed, and before the analysis of any samples.

20.4.1.1 Calibration Verification

The calibration relationship established during the initial calibration must be verified initially and at least daily as specified in the laboratory method SOPs in accordance with the referenced analytical methods and in the 2009 TNI Standard. The process of calibration verification applies to both external standard and internal standard calibration techniques, as well as to linear and non-linear calibration models. Initial calibration verification is with a standard source secondary (second source standard) to the calibration standards, but continuing calibration verifications may use the same source standards as the calibration curve.

Note: The process of calibration verification referred to here is fundamentally different from the approach called "calibration" in some methods. As described in those methods, the calibration factors or response factors calculated during calibration are used to update the calibration factors or response factors used for sample quantitation. This approach, while employed in other EPA programs, amounts to a daily single-point calibration.

All target analytes and surrogates, including those reported as non-detects, must be included in periodic calibration verifications for purposes of retention time confirmation and to demonstrate that calibration verification criteria are being met, i.e., RPD, per 2009 TNI Std. EL-V1M4 Sec. 1.7.2.

All samples must be bracketed by periodic analyses of standards that meet the QC acceptance criteria (e.g., calibration and retention time). The frequency is found in the determinative methods or SOPs.

Note: If an internal standard calibration is being used then bracketing calibration verification are not required, only daily verifications are needed. The results from these verification standards must meet the calibration verification criteria and the retention time criteria (if applicable).

Generally, the initial calibrations must be verified at the beginning of each 12-hour analytical shift during which samples are analyzed. (Some methods may specify more or less frequent verifications). The 12-hour analytical shift begins with the injection of the calibration verification standard (or the MS tuning standard in MS methods). The shift ends after the completion of the analysis of the last sample, QC, or standard that can be injected within 12 hours of the beginning of the shift.

A continuing instrument calibration verification (CCV) must be repeated at the beginning and, for methods that have quantitation by external calibration models, at the end of each analytical batch. Some methods have more frequent CCV requirements see specific SOPs. Most

Inorganic methods require the CCV to be analyzed after ever 10 samples or injections, including matrix or batch QC samples.

Note: If an internal standard calibration is being used (basically GCMS) then bracketing standards are not required, only daily verifications are needed. The results from these verification standards must meet the calibration verification criteria and the retention time criteria (if applicable).

If the results of a CCV are outside the established acceptance criteria and analysis of a second consecutive (and immediate) CCV fails to produce results within acceptance criteria, corrective action shall be performed. Once corrective actions have been completed & documented, the laboratory shall demonstrate acceptable instrument / method performance by analyzing two consecutive CCVs, or a new initial instrument calibration shall be performed.

Sample analyses and reporting of data may not occur or continue until the analytical system is calibrated or calibration verified. However, data associated with an unacceptable calibration verification may be fully useable under the following special conditions: **and reported based upon discussion and approval of the client:**

a). when the acceptance criteria for the CCV are exceeded high (i.e., high bias) and the associated samples within the batch are non-detects, then those non-detects may be reported with a footnote or case narrative explaining the high bias. Otherwise the samples affected by the unacceptable CCV shall be re-analyzed after a new calibration curve has been established, evaluated and accepted; or

b). when the acceptance criteria for the CCV are exceeded low (i.e., low bias), those sample results may be reported if they exceed a maximum regulatory limit/decision level. Otherwise the samples affected by the unacceptable CCV shall be re-analyzed after a new calibration curve has been established, evaluated and accepted.

Samples reported by the 2 conditions identified above will be appropriately flagged.

20.4.1.2 Verification of Linear and Non-Linear Calibrations

Calibration verification for calibrations involves the calculation of the percent drift or the percent difference of the instrument response between the initial calibration and each subsequent analysis of the verification standard. (These calculations are available in the laboratory method SOPs. Verification standards are evaluated based on the % Difference from the average CF or RF of the initial calibration or based on % Drift or % Recovery if a linear or quadratic curve is used.

Regardless of whether a linear or non-linear calibration model is used, if initial verification criterion is not met, then no sample analyses may take place until the calibration has been verified or a new initial calibration is performed that meets the specifications listed in the method SOPs. If the calibration cannot be verified after the analysis of a single verification standard, then adjust the instrument operating conditions and/or perform instrument maintenance, and analyze another aliquot of the verification standard. If the calibration cannot be verified with the second standard, then a new initial calibration is performed.

- When the acceptance criteria for the calibration verification are exceeded high, i.e., high bias, and there are associated samples that are non-detects, then those non-detects may be reported. Otherwise, the samples affected by the unacceptable calibration verification shall be reanalyzed after a new calibration curve has been established, evaluated and accepted.

- When the acceptance criteria for the calibration verification are exceeded low, i.e., low bias, those sample results may be reported if they exceed a maximum regulatory limit/decision level. Otherwise, the samples affected by the unacceptable verification shall be reanalyzed after a new calibration curve has been established, evaluated and accepted. Alternatively, a reporting limit standard may be analyzed to demonstrate that the laboratory can still support non-detects at their reporting limit.

20.5 Tentatively Identified Compounds (TICs) – GC/MS Analysis

For samples containing components not associated with the calibration standards, a library search may be made for the purpose of tentative identification. The necessity to perform this type of identification will be determined by the purpose of the analyses being conducted. Data system library search routines should not use normalization routines that would misrepresent the library or unknown spectra when compared to each other.

Note: If the TIC compound is not part of the client target analyte list but is calibrated by the laboratory and is both qualitatively and/or quantitatively identifiable, it should not be reported as a TIC. If the compound is reported on the same form as true TICs, it should be qualified and/or narrated that the reported compound is qualitatively and quantitatively (if verification in control) reported compared to a known standard that is in control (where applicable).

For example, the RCRA permit or waste delisting requirements may require the reporting of non-target analytes. Only after visual comparison of sample spectra with the nearest library searches may the analyst assign a tentative identification.

20.6 GC/MS Tuning

Prior to any GCMS analytical sequence, including calibration, the instrument parameters for the tune and subsequent sample analyses within that sequence must be set.

Prior to tuning/auto-tuning the mass spec, the parameters may be adjusted within the specifications set by the manufacturer or the analytical method. These generally don't need any adjustment but it may be required based on the current instrument performance. If the tune verification does not pass it may be necessary to clean the source or perform additional maintenance. Any maintenance is documented in the maintenance log.

Table 20-1. Example: Instrumentation List

GC	GC/MS	ICP	ICPMS	AutoAnalyzer	IC	Automated Specs.	TOC
13	12	2	1	1	2	3	3

Table 20-2. Example: Schedule of Routine Maintenance

Instrument / Equipment Type	Maintenance	Frequency
Gas Chromatograph	Replace Gas line dryers and filters	Annually or As needed
	Replace Gas cylinders	As needed
	ECD Ni63 Foil wipe test	6 months
	Check or adjust column gas flow and/or detector make-up flow	As needed
	Replace Injection port Septa	As needeD
	Replace Injection port liners/re-silonize liners	As needed
	Replace injection port liner o-ring	As needed
	Replace inlet seal and ring	As needed
	Replace column ferrules	GC, As needed
	Clip column (injector and detector end)	As needed
	Replace syringes on autosamplers	As needed
	Replace heated-zones heaters and sensors	As needed
	Replace inlet assembly	As needed
	Empty solvent rinse and solvent rinse-waste vials (on autosampler tower)	Daily or as needed
	Replace column	As needed
Flame Ionization Detector (FID)	Clean/replace jet	As needed
	Clean collector	As needed
	Check and/or adjust gas flows	As needed
	Replace graphite ferrule	After each cleaning (OI detectors only)
Photoionization Detector (PID)	Clean window	As needed
	Replace o-ring seat	As needed
	Replace Lamp	As needed
	Check and/or adjust gas flows	As needed
	Adjust Lamp power supply intensity	As needed
Mass Spectrometer (MS)	Clean source, replace source parts, replace filaments	As needed
	Clean analyzer	As needed
	Replace electron multiplier	As needed
	Change rough pump oil	After each source cleaning or annually
	Refill calibration compound (PFTBA) vial	As needed
	Replace Peristaltic pump tubing	As needed

Instrument / Equipment Type	Maintenance	Frequency
	Clean autosampler, change tubing	As needed
	Clean nebulizer and torch assembly	Daily
	Replace nitrogen and argon tanks	As needed
	Check spray chamber for debris	Monthly
	Refill rinse water receptacle	Daily
	Empty waste receptacle	Daily
	Check for internal standard and sample flow through peristaltic pump tubing	As often as possible
	Replace internal standard solution receptacle	As needed
	Operate and check vents	Daily
	Perform Hg alignment	Daily
	Check water level and water filter on recirculating-cooling unit, refill and replace filter	Check daily, refill and replace as needed
	Check purge windows	Daily, replace as needed
	Replace nebulizer and o-rings	As needed
	Replace torch	As needed
	Drain air compressor	Weekly
	Replace mixing chambers	As needed
	Clean or replace air filters	Weekly
	Check pneumatic filters	Weekly, replace as needed
	Perform wave calibration (UV and Vis)	Quarterly
	Calibrate Detector	Quarterly
	Replace pre-column filter	As needed
	Refill Solvent reservoirs	Daily or as needed
	Reverse column and rinse with solvents	Daily or as needed
	Replace column	As needed
	Clean solvent reservoir filters	As needed
	UV Detector-check intensity	6 months or as needed
	Replace ball-valve cartridges on high pressure pump	As needed

Instrument / Equipment Type	Maintenance	Frequency
	Replace DAD flow cell windows	As needed
	Check system solvent pressure	Daily
	Clean or replace electrode	As needed
	Refill electrode electrolyte	As needed
	Clean or replace Column	As needed
	Replace Suppressor	As needed
	Replace seals/valves/lamps	As needed

SECTION 21. MEASUREMENT TRACEABILITY

21.1 Overview

Traceability of measurements shall be assured using a system of documentation, calibration, and analysis of reference standards. Laboratory equipment that are peripheral to analysis and whose calibration is not necessarily documented in a test method analysis or by analysis of a reference standard shall be subject to ongoing certifications of accuracy. At a minimum, these must include procedures for checking specifications of ancillary equipment: balances, thermometers, temperature, Deionized (DI) and Reverse Osmosis (RO) water systems, automatic pipettes and other volumetric measuring devices. (Refer to Section 20.3). With the exception of Class A Glassware and Glass microliter syringes, quarterly accuracy checks are performed for all mechanical volumetric devices. Microsyringes are verified at least semi-annually or disposed of after 6 months of use. Wherever possible, subsidiary or peripheral equipment is checked against standard equipment or standards that are traceable to national or international standards. Class A Glassware and Glass microliter syringes should be routinely inspected for chips, acid etching or deformity (e.g., bent needle). If the Class A glassware or syringe is suspect, the accuracy of the glassware will be assessed prior to use.

21.2 NIST-Traceable Weights and Thermometers

Reference standards of measurement shall be used for calibration only and for no other purpose, unless it can be shown that their performance as reference standards would not be invalidated.

For NIST-traceable weights and thermometers, the laboratory requires that all calibrations be conducted by a calibration laboratory accredited by A2LA, NVLAP (National Voluntary Laboratory Accreditation Program), or another accreditation organization that is a signatory to a MRA (Mutual Recognition Arrangement) of one or more of the following cooperations – ILCA (International Laboratory Accrediation Cooperation) or APLCA (Asia-Pacific Laboratory Accrediation Cooperation). A calibration certificate and scope of accreditation is kept on file at the laboratory.

21.3 Reference Standards / Materials

Reference standards/materials, where commercially available, are traceable to certified reference materials. Commercially prepared reference standards, to the extent available, are purchased from vendors that are accredited to ISO Guide 34 and ISO/IEC Guide 17025. All reference standards from commercial vendors shall be accompanied with a certificate that includes at least the following information:

- Manufacturer
- Analytes or parameters calibrated
- Identification or lot number
- Calibration method
- Concentration with associated uncertainties
- Purity

If a standard cannot be purchased from a vendor that supplies a Certificate of Analysis, the purity of the standard is documented by analysis. The receipt of all reference standards must be documented. Reference standards are labeled with a unique Standard Identification Number and expiration date. All documentation received with the reference standard is retained as a QC record and references the Standard Identification Number.

All reference, primary and working standards/materials, whether commercially purchased or laboratory prepared, must be checked regularly to ensure that the variability of the standard or material from the 'true' value does not exceed method requirements. The accuracy of calibration standards is checked by comparison with a standard from a second source. In cases where a second standard manufacturer is not available, a vendor certified different lot is acceptable for use as a second source. For unique situations, such as air analysis where no other source or lot is available, a standard made by a different analyst would be considered a second source. The appropriate Quality Control (QC) criteria for specific standards are defined in laboratory SOPs. In most cases, the analysis of an Initial Calibration Verification (ICV) or LCS (where there is no sample preparation) is used as the second source confirmation. These checks are generally performed as an integral part of the analysis method (e.g. calibration checks, laboratory control samples).

All standards and materials must be stored and handled according to method or manufacturer's requirements in order to prevent contamination or deterioration. Refer to the Corporate Environmental Health & Safety Manual or laboratory SOPs. For safety requirements, please refer to method SOPs and the laboratory Environmental Health and Safety Manual.

Standards and reference materials shall not be used after their expiration dates unless their reliability is verified by the laboratory and their use is approved by the Quality Assurance Manager. The laboratory must have documented contingency procedures for re-verifying expired standards.

21.4 Documentation and Labeling of Standards, Reagents, and Reference Materials

Reagents must be at a minimum the purity required in the test method. The date of reagent receipt and the expiration date are documented. The lots for most of the common solvents and

acids are tested for acceptability prior to company wide purchase. [Refer to TestAmerica's Corporate SOP (CA-Q-S-001), Solvent and Acid Lot Testing and Approval.]

All manufacturer or vendor supplied Certificate of Analysis or Purity must be retained, stored appropriately, and readily available for use and inspection. These records are maintained in the Department Manager's office and/or placed into TALS. Records must be kept of the date of receipt and date of expiration of standards, reagents and reference materials. In addition, records of preparation of laboratory standards, reagents, and reference materials must be retained, stored appropriately, and be readily available for use and inspection. For detailed information on documentation and labeling, please refer to method specific SOPs.

Commercial materials purchased for preparation of calibration solutions, spike solutions, etc.., are usually accompanied with an assay certificate or the purity is noted on the label. If the assay purity is 96% or better, the weight provided by the vendor may be used without correction. If the assay purity is less than 96% a correction will be made to concentrations applied to solutions prepared from the stock commercial material. Blended gas standard cylinders use a nominal concentration if the certified value is within +/-15%, otherwise the certified values is used for the canister concentration.

21.4.1 All standards, reagents, and reference materials must be labeled in an unambiguous manner. Standards are logged into the laboratory's LIMS system, and are assigned a unique identification number. The following information is typically recorded in the electronic database within the LIMS.

- Standard ID
- Description of Standard
- Department
- Preparer's name
- Final volume and number of vials prepared
- Solvent type and lot number
- Preparation Date
- Expiration Date
- Standard source type (stock or daughter)
- Standard type (spike, surrogate, other)
- Parent standard ID (if applicable)
- Parent Standard Analyte Concentration (if applicable)
- Parent Standard Amount used (if applicable)
- Component Analytes
- Final concentration of each analyte
- Comment box (text field)

Records are maintained electronically for standard and reference material preparation. These records show the traceability to purchased stocks or neat compounds. These records also include method of preparation, date of preparation, expiration date and preparer's name or initials. Preparation procedures are provided in the Method SOPs.

21.4.2 All standards, reagents, and reference materials must be clearly labeled with a minimum of the following information:

- Expiration Date (include prep date for reagents)
- Standard ID ***(from LIMS***)
- Special Health/Safety warnings if applicable

Records must also be maintained of the date of receipt for commercially purchased items or date of preparation for laboratory prepared items. Special Health/Safety warnings must also be available to the analyst. This information is maintained on the TestAmerica Intranet and the Local Area Network.

21.4.3 In addition, the following information may be helpful:

- Date opened (for multi-use containers, if applicable)
- Description of standard (if different from manufacturer's label or if standard was prepared in the laboratory)
- Recommended Storage Conditions
- Concentration (if applicable)
- Initials of analyst preparing standard or opening container

All containers of prepared reagents must include an expiration date and an ID number to trace back to preparation.

Procedures for preparation of reagents can be found in the Method SOPs.

Standard ID numbers must be traceable through associated logbooks, worksheets and preparation/analytical batch records.

All reagents and standards must be stored in accordance to the following priority: 1) with the manufacturer's recommendations; 2) with requirements in the specific analytical methods as specified in the laboratory SOP.

SECTION 22. SAMPLING

22.1 Overview

The laboratory only provides grab water sampling services only (SOP HS-FD-001). The laboratory's responsibility for all orther sample collection process lies in supplying the sampler with the necessary coolers, reagent water, sample containers, preservatives, sample labels, custody seals, COC forms, ice, and packing materials required to properly preserve, pack, and ship samples to the laboratory.

22.2 Sampling Containers

The laboratory offers clean sampling containers for use by clients. These containers are obtained from reputable container manufacturers and meet EPA specifications as required. Certificates of cleanliness for bottles and preservatives are provided by the supplier and are maintained at the laboratory. Alternatively, the certificates may be maintained by the supplier and available to the laboratory on-line.

22.2.1 Preservatives

Upon request, preservatives are provided to the client in pre-cleaned sampling containers. In some cases containers may be purchased pre-preserved from the container supplier. Whether prepared by the laboratory or bought pre-preserved, the grades of the preservatives are at a minimum:

- Hydrochloric Acid – Reagent ACS (Certified VOA Free) or equivalent
- Methanol – Purge and Trap grade
- Nitric Acid – Instra-Analyzed or equivalent
- Sodium Bisulfate – ACS Grade or equivalent
- Sodium Hydroxide – Instra-Analyzed or equivalent
- Sulfuric Acid – Instra-Analyzed or equivalent
- Sodium Thiosulfate – ACS Grade or equivalent
- Zinc Acetate – ACS Grade

22.3 Definition of Holding Time

The date and time of sampling documented on the COC form establishes the day and time zero. As a general rule, when the maximum allowable holding time is expressed in “days” (e.g., 14 days, 28 days), the holding time is based on calendar day measured. Holding times expressed in “hours” (e.g., 6 hours, 24 hours, etc.) are measured from date and time zero. Holding times for analysis include any necessary reanalysis. However, there are some programs that determine holding time compliance based on the date and specific time of analysis compared to the time of sampling regardless of how long the holding time is.

22.4 Sampling Containers, Preservation Requirements, Holding Times

The preservation and holding time criteria specified in the laboratory SOPs are derived from the source documents for the methods. If method required holding times or preservation requirements are not met, the reports will be qualified using a flag, footnote or case narrative. As soon as possible or “ASAP” is an EPA designation for tests for which rapid analysis is advised, but for which neither EPA nor the laboratory have a basis for a holding time.

22.5 Sample Aliquots / Subsampling

Taking a representative sub-sample from a container is necessary to ensure that the analytical results are representative of the sample collected in the field. The size of the sample container, the quantity of sample fitted within the container, and the homogeneity of the sample need

consideration when sub-sampling for sample preparation. It is the laboratory's responsibility to take a representative subsample or aliquot of the sample provided for analysis.

Analysts should handle each sample as if it is potentially dangerous. At a minimum, safety glasses, gloves, and lab coats must be worn when preparing aliquots for analysis.

Guidelines on taking sample aliquots & subsampling are located in SOP # HS-SA-017.

SECTION 23. HANDLING OF SAMPLES

Sample management procedures at the laboratory ensure that sample integrity and custody are maintained and documented from sampling/receipt through disposal.

23.1 Chain of Custody (COC)

The COC form is the written documented history of any sample and is initiated when bottles are sent to the field, or at the time of sampling. This form is completed by the sampling personnel and accompanies the samples to the laboratory where it is received and stored under the laboratory's custody. The purpose of the COC form is to provide a legal written record of the handling of samples from the time of collection until they are received at the laboratory. It also serves as the primary written request for analyses from the client to the laboratory. The COC form acts as a purchase order for analytical services when no other contractual agreement is in effect. An example of a COC form may be found in Figure 23-1.

23.1.1 Field Documentation

The information the sampler needs to provide at the time of sampling on the container label is:

- Sample identification
- Date and time
- Preservative

During the sampling process, the COC form is completed and must be legible (see Figure 23-1). This form includes information such as:

- Client name, address, phone number and fax number (if available)
- Project name and/or number
- The sample identification
- Date, time and location of sampling **(V1M2 5.7.4)**
- Sample collectors name
- The matrix description
- The container description
- The total number of each type of container
- Preservatives used
- Analysis requested
- Requested turnaround time (TAT)
- Any special instructions

- Purchase Order number or billing information (e.g. quote number) if available
- The date and time that each person received or relinquished the sample(s), including their signed name.

When the sampling personnel deliver the samples directly to TestAmerica personnel, the samples are stored in a cooler with ice, as applicable, and remain solely in the possession of the client's field technician until the samples are delivered to the laboratory personnel. The sample collector must assure that each container is in his/her physical possession or in his/her view at all times, or stored in such a place and manner to preclude tampering. The field technician relinquishes the samples in writing on the COC form to the sample control personnel at the laboratory or to a TestAmerica courier. When sampling personnel deliver the samples through a common carrier (Fed-Ex, UPS), the CoC relinquished date/time is completed by the field personnel and samples are released to the carrier. Samples are only considered to be received by lab when personnel at the fixed laboratory facility have physical contact with the samples.

Note: Independent couriers are not required to sign the COC form. The COC is usually kept in the sealed sample cooler. The receipt from the courier is stored in log-in by date; it lists all receipts each date.

23.1.2 Legal / Evidentiary Chain-of-Custody

If samples are identified for legal/evidentiary purposes on the COC, login will complete the custody seal retain the shipping record with the COC, and initiate an internal COC for laboratory use by analysts and a sample disposal record.

23.2 Sample Receipt

Samples are received at the laboratory by designated sample receiving personnel and a unique laboratory project identification number is assigned. Each sample container shall be assigned a unique sample identification number that is cross-referenced to the client identification number such that traceability of test samples is unambiguous and documented. Each sample container is affixed with a durable sample identification label. Sample acceptance, receipt, tracking and storage procedures are summarized in the following sections.

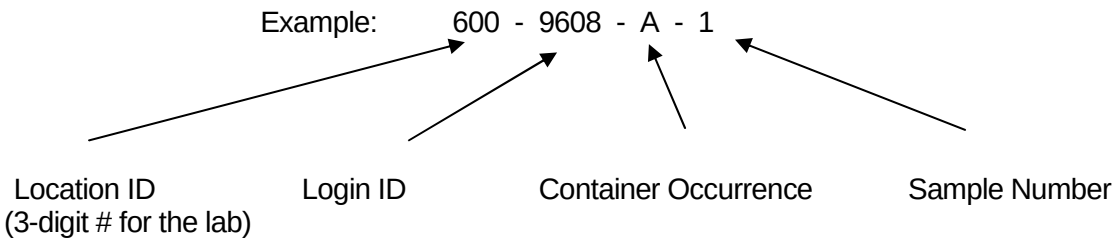
23.2.1 Laboratory Receipt

When samples arrive at the laboratory, sample receiving personnel inspect the coolers and samples. The integrity of each sample must be determined by comparing sample labels or tags with the COC and by visual checks of the container for possible damage. Any non-conformance, irregularity, or compromised sample receipt must be documented on a Sample Receipt Checklist, entered into the LIMS in an NCM, and brought to the immediate attention of the client. The COC, shipping documents, documentation of any non-conformance, irregularity, or compromised sample receipt, record of client contact, and resulting instructions become part of the project record.

23.2.1.1 Unique Sample Identification

All samples that are processed through the laboratory receive a unique sample identification to ensure that there can be no confusion regarding the identity of such samples at anytime. This system includes identification for all samples, subsamples and subsequent extracts and/or digestates.

The laboratory assigns a unique identification (e.g., Sample ID) code to each sample container received at the laboratory. This Primary ID is made up of the following information (consisting of 4 components):



The above example states that TestAmerica Houston Laboratory (Location 600). Login ID is 9608 (unique to a particular client/job occurrence). The container code indicates it is the first container ("A") of Sample #1.

If the primary container goes through a prep step that creates a "new" container, then the new container is considered secondary and gets another ID. An example of this being a client sample in a 1-Liter amber bottle is sent through a Liquid/Liquid Extraction and an extraction vial is created from this step. The vial would be a SECONDARY container. The secondary ID has 5 components.

Example: 600 - 9608 - A - 1 - **A** ←——**Secondary Container Occurrence**

Example: 600-9608-A-1-A, would indicate the PRIMARY container listed above that went through a step that created the 1st occurrence of a Secondary container.

With this system, a client sample can literally be tracked throughout the laboratory in every step from receipt to disposal.

23.3 Sample Acceptance Policy

The laboratory has a written sample acceptance policy (Figure 23-2) that clearly outlines the circumstances under which samples shall be accepted or rejected. These include:

- a COC filled out completely;
- samples must be properly labeled;
- proper sample containers with adequate volume for the analysis (Sampling Guide) and necessary QC;

- samples must be preserved according to the requirements of the requested analytical method (Sampling Guide);
- sample holding times must be adhered to (Sampling Guide);
- the project manager will be notified if any sample is received in damaged condition.

Data from samples which do not meet these criteria are flagged and the nature of the variation from policy is defined.

23.3.1 After inspecting the samples, the sample receiving personnel sign and date the COC form, make any necessary notes of the samples' conditions and store them in appropriate refrigerators or storage locations.

23.3.2 Any deviations from these checks that question the suitability of the sample for analysis, or incomplete documentation as to the tests required will be resolved by consultation with the client. If the sample acceptance policy criteria are not met, the laboratory shall either:

- Retain all correspondence and/or records of communications with the client regarding the disposition of rejected samples, or

- Fully document any decision to proceed with sample analysis that does not meet sample acceptance criteria.

Note: North Carolina requires that they be notified when samples are processed that do not meet sample acceptance criteria.

Once sample acceptance is verified, the samples are logged into the LIMS according SOP No. HS-SA-001.

23.4 Sample Storage

In order to avoid deterioration, contamination or damage to a sample during storage and handling, from the time of receipt until all analyses are complete, samples are stored in refrigerators, freezers or protected locations suitable for the sample matrix. Samples for metals analysis are stored unrefrigerated. In addition, samples to be analyzed for volatile organic parameters are stored in separate refrigerators designated for volatile organic parameters only. Samples are never to be stored with reagents, standards or materials that may create contamination.

To ensure the integrity of the samples during storage, refrigerator blanks are maintained in the volatile sample refrigerators and analyzed every two weeks.

Analysts and technicians retrieve the sample container allocated to their analysis from the designated refrigerator or storage location and place them on carts, analyze the sample, and return the remaining sample or empty container to the refrigerator or storage location from which it originally came. All unused portions of samples are returned to the secure sample control area. All samples are kept in the refrigerators or storage location for thirty days after invoice, which meets or exceeds most sample holding times. After this time they are disposed

of. Special arrangements may be made to store samples for longer periods of time. This extended holding period allows additional metal analyses to be performed on the archived sample and assists clients in dealing with legal matters or regulatory issues.

Access to the laboratory is controlled such that sample storage need not be locked at all times unless a project specifically demands it. Samples are accessible to laboratory personnel only. Visitors to the laboratory are prohibited from entering the refrigerator and laboratory areas unless accompanied by an employee of TestAmerica.

23.5 Hazardous Samples and Foreign Soils

To minimize exposure to personnel and to avoid potential accidents, hazardous and foreign soil samples are stored in an isolated area designated for hazardous waste only. For any sample that is known to be hazardous at the time of receipt or, if after completion of analysis the result exceeds the acceptable regulatory levels, a Hazardous Sample Notice must be completed by the analyst. This form may be completed by Sample Control, Project Managers, or analysts and must be attached to the report. The sample itself is clearly marked with a red stamp, stamped on the sample label reading “HAZARDOUS” or “FOREIGN SOIL” and placed in a colored and/or marked bag to easily identify the sample. The date, log number, lab sample number, and the result or brief description of the hazard are all written on the Hazardous & Foreign Soil Sample Notice. A copy of the form must be included with the original COC and Work Order and the original must be given to the Sample Control Custodian. Analysts will notify Sample Control of any sample determined to be hazardous after completion of analysis by completing a Hazardous Sample Notice. All hazardous samples are either returned to the client or disposed of appropriately through a hazardous waste disposal firm that lab-packs all hazardous samples and removes them from the laboratory. Foreign soil samples are sent out for incineration by a USDA-approved waste disposal facility.

23.6 Sample Shipping

In the event that the laboratory needs to ship samples, the samples are placed in a cooler with enough ice to ensure the samples remain just above freezing and at or below 6.0°C during transit. The samples are carefully surrounded by packing material to avoid breakage (yet maintain appropriate temperature). A trip blank is enclosed for those samples requiring water/solid volatile organic analyses (see Note). The chain-of-custody form is signed by the sample control technician and attached to the shipping paperwork. Samples are generally shipped overnight express or hand-delivered by a TestAmerica courier to maintain sample integrity. All personnel involved with shipping and receiving samples must be trained to maintain the proper chain-of-custody documentation and to keep the samples intact and on ice. The Environmental, Health and Safety Manual contains additional shipping requirements.

Note: If a client does not request trip blank analysis on the COC or other paperwork, the laboratory will not analyze the trip blanks that were supplied. However, in the interest of good client service, the laboratory will advise the client at the time of sample receipt that it was noted that they did not request analysis of the trip blank; and that the laboratory is providing the notification to verify that they are not inadvertently omitting a key part of regulatory compliance testing.

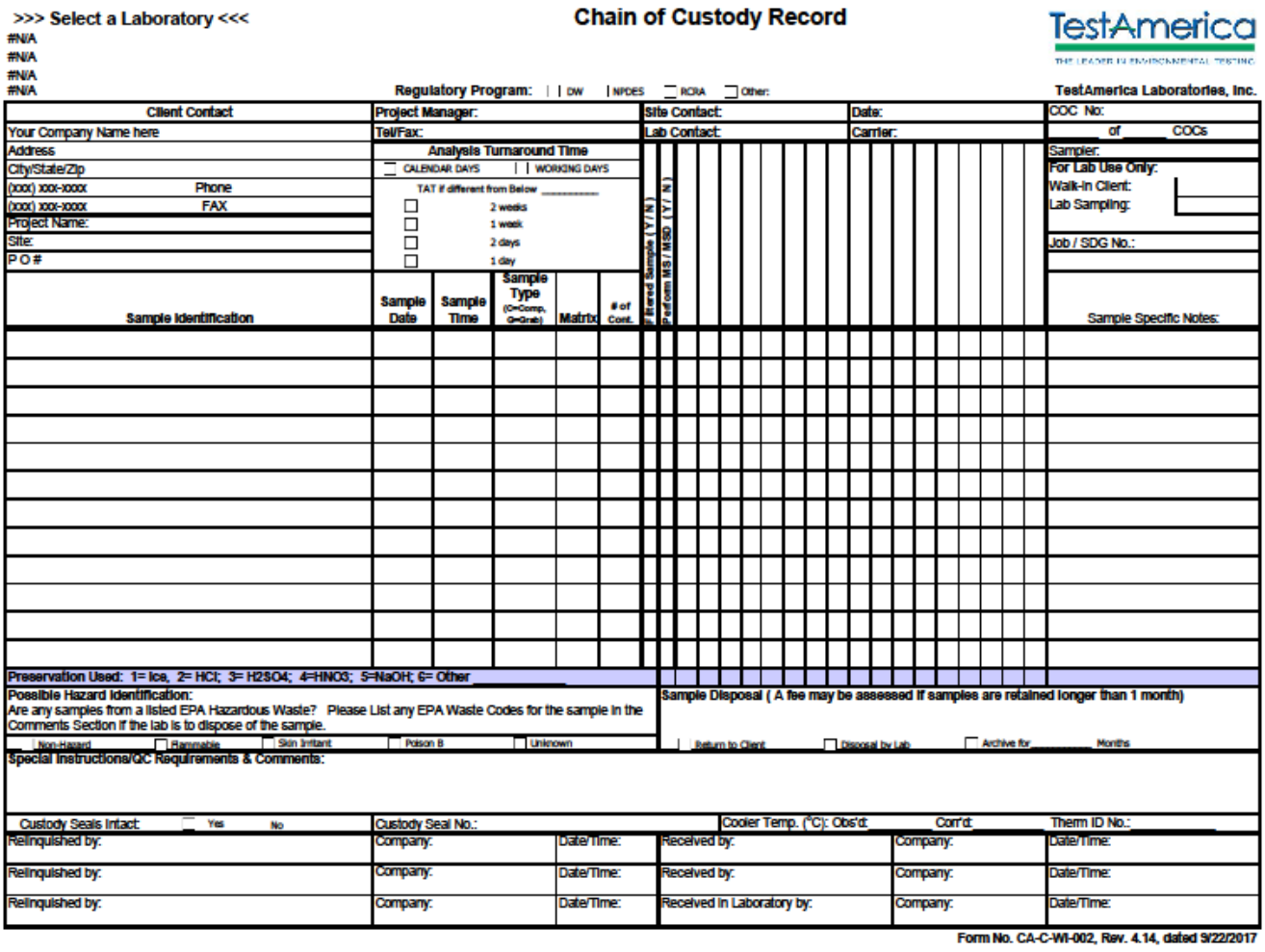
23.7 Sample Disposal

Samples should be retained for a minimum of 30 days after the project report is sent, however, provisions may be made for earlier disposal of samples once the holding time is exceeded. Some samples are required to be held for longer periods based on regulatory or client requirements (e.g., 60 days after project report is sent). The laboratory must follow the longer sample retention requirements where required by regulation or client agreement. Several possibilities for sample disposal exist: the sample may be consumed completely during analysis, the sample may be returned to the customer or location of sampling for disposal, or the sample may be disposed of in accordance with the laboratory's waste disposal procedures (SOP: HS-ST-014). All procedures in the laboratory Environmental, Health and Safety Manual are followed during disposal. Samples are normally maintained in the laboratory no longer than two months from receipt unless otherwise requested. Unused portions of samples found or suspected to be hazardous according to state or federal guidelines may be returned to the client upon completion of the analytical work.

If a sample is part of a known litigation, the affected legal authority, sample data user, and/or submitter of the sample must participate in the decision about the sample's disposal. All documentation and correspondence concerning the disposal decision process must be kept on file. Pertinent information includes the date of disposal, nature of disposal (such as sample depletion, hazardous waste facility disposal, return to client), names of individuals who conducted the arrangements and physically completed the task. The laboratory will remove or deface sample labels prior to disposal unless this is accomplished through the disposal method (e.g., samples are incinerated). A Waste Disposal Record should be completed.

Figure 23-1. Example: Chain of Custody's (COC)

TestAmerica Website COC



>>> Select a Laboratory <<<
#N/A
#N/A
#N/A
#N/A

Chain of Custody Record

TestAmerica
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Regulatory Program: | | DW | NPDES | RCRA | Other:

TestAmerica Laboratories, Inc.

Client Contact	Project Manager:	Site Contact:	Date:	COC No:
Your Company Name here	Tel/Fax:	Lab Contact:	Carrier:	of COCs
Address	Analysis Turnaround Time			Sampler:
City/State/Zip	CALENDAR DAYS | WORKING DAYS			For Lab Use Only:
(xxx) xxx-xxxx Phone	TAT if different from Below			Walk-in Client:
(xxx) xxx-xxxx FAX	2 weeks			Lab Sampling:
Project Name:	1 week			
Site:	2 days			Job / SDG No.:
PO #	1 day			

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Filtered Sample (Y / N)	Perform MS / MSD (Y / N)	Sample Specific Notes:

Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other

Possible Hazard Identification:
Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample.
Non-Hazard | Flammable | Skin Irritant | Poison B | Unknown

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
Return to Client | Disposal by Lab | Archive for Months

Special Instructions/QC Requirements & Comments:

Custody Seals Intact: Yes No	Custody Seal No.:	Cooler Temp. (°C): Obs'd: Corr'd:	Therm ID No.:

Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received in Laboratory by:	Company:	Date/Time:

Form No. CA-C-WI-002, Rev. 4.14, dated 9/22/2017

TestAmerica LIMS COC

TestAmerica Houston
6310 Rothway Street
Houston, TX 77040
Phone (713) 690-4444 Fax (713) 690-5646

Chain of Custody Record

TestAmerica
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Client Information	Sampler:	Lab PM:	Carrier Tracking No(s):	COC No:
Client Contact:	Phone:	E-Mail:		Page: Page 1 of 1
Company:		Analysis Requested		Job #:
Address:	Due Date Requested:			Preservation Codes:
City:	TAT Requested (days):			A - HCL, M - Hexane; B - NaOH, N - None; C - Zn Acetate, O - AsNaO2; D - Nitric Acid, P - Na2O4S; E - NaHSO4, Q - Na2SO3; F - MeOH, R - Na2S2O3; G - Amchlor, S - H2SO4; H - Ascorbic Acid, T - TSP Dodecahydrate; I - Ice, U - Acetone; J - DI Water, V - MCAA; K - EDTA, W - pH 4-5; L - EDA, Z - other (specify)
State, Zip:				
Phone:	PO #:			
Email:	WO #:			
Project Name:	Project #:			
Site:	SSOW#:			Other:

Sample Identification	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)														Total Number of containers	Special Instructions/Note:
			Preservation Code:																		

Possible Hazard Identification ☐ *Non-Hazard* ☐ *Flammable* ☐ *Skin Irritant* ☐ *Poison B* ☐ *Unknown* ☐ *Radiological*	*Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)* ☐ *Return To Client* ☐ *Disposal By Lab* ☐ *Archive For ________ Months*
Deliverable Requested: I, II, III, IV, Other (specify)	Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:

Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company

Custody Seals Intact: Δ Yes Δ No	Custody Seal No.:	Cooler Temperature(s) °C and Other Remarks:

Ver: 08/04/2016

Figure 23-2. Example: Sample Acceptance Policy

All incoming work will be evaluated against the criteria listed below. Where applicable, data from any samples that do not meet the criteria listed below will be noted on the laboratory report defining the nature and substance of the variation. In addition the client will be notified either by telephone, fax or e-mail ASAP after the receipt of the samples.

Per State and/or Federal Regulation, the client is responsible to ensure that samples are shipped in accordance with DOT/IATA requirements, and that radioactive materials may only be delivered to licensed facilities. Any samples containing (or suspected to contain) Source, Byproduct, or Special Nuclear Material as defined by 10 CFR should be delivered directly to facilities licensed to handle such radioactive material. Natural material or ores containing naturally occurring radionuclides may be delivered to any TestAmerica facility or courier as long as the activity concentration of the material does not exceed 270 pCi/g alpha or 2700 pCi/g beta (49 CFR Part 173).

1) Samples must arrive with labels intact with a Chain of Custody filled out completely. The following information must be recorded.
   - *Client name, address, phone number and fax number (if available)*
   - *Project name and/or number*
   - *The sample identification*
   - *Date, time and location of sampling* **(V1M2 5.7.4)**
   - *The collectors name*
   - *The matrix description*
   - *The container description*
   - *The total number of each type of container*
   - *Preservatives used*
   - *Analysis requested*
   - *Requested turnaround time (TAT)*
   - *Any special instructions*
   - *Purchase Order number or billing information (e.g. quote number) if available*
   - *The date and time that each person received or relinquished the sample(s), including their signed name.*
   - *The date and time of receipt must be recorded between the last person to relinquish the samples and the person who receives the samples in the lab, and they must be exactly the same.*
   - Information must be legible

2) Samples must be properly labeled.
   - Use durable labels (labels provided by TestAmerica are preferred)
   - Include a unique identification number
   - Include sampling date and time & sampler ID
   - Include preservative used.
   - Use indelible ink
   - Information must be legible

3) Proper sample containers with adequate volume for the analysis and necessary QC are required for each analysis requested. See Lab Sampling Guide.

4) Samples must be preserved according to the requirements of the requested analytical method (See Sampling Guide**.**

5) Most analytical methods require chilling samples to 4^{o} C (other than water samples for metals analysis). For these methods, the criteria are met if the samples are chilled to below 6^{o} C and above freezing (0^{o}C). For methods with other temperature criteria (e.g. some bacteriological methods require $\leq$ 10 ^{o}C), the samples must arrive within $\pm$ 2^{o} C of the required temperature or within the method specified range. **Note:** Samples that are hand delivered to the laboratory immediately after collection may not have had time to cool sufficiently. In this case the samples will be considered acceptable as long as there is evidence that the chilling process has begun (arrival on ice).

5i.) Samples that are delivered to the laboratory on the same day they are collected may not meet the requirements of Section 5. In these cases, the samples shall be considered acceptable if the samples were received on ice.

5ii.) If sample analysis is begun within fifteen (15) minutes of collection, thermal preservation is not required.

5iii.)Thermal preservation is not required in the field if the laboratory receives and refrigerates the sample within fifteen (15) minutes of collection.

- Chemical preservation (pH) will be verified prior to analysis and documented, either in sample control or at the analyst's level. The project manager will be notified immediately if there is a discrepancy. If analyses will still be performed, all affected results will be flagged to indicate improper preservation.

- **FOR WATER SAMPLES TESTED FOR CYANIDE (by Standard Methods or EPA 335)**
  - In the Field: Samples are to be tested for Sulfide using lead acetate paper prior to the addition of Sodium Hydroxide (NaOH). If sulfide is present, the sample must be treated with Cadmium Chloride and filtered prior to the addition of NaOH.
    - If the sulfide test and treatment is not performed in the field, the lab will test the samples for sulfide using lead acetate paper at the time of receipt and if sulfide is present in the sample, the client will be notified and given the option of retaking the sample and treating in the field per the method requirements or the laboratory can analyze the samples as delivered and qualify the results in the final report.
  - It is the responsibility of the client to notify the laboratory if thiosulfate, sulfite, or thiocyanate are known or suspected to be present in the sample. This notification may be on the chain of custody. The samples may need to be subcontracted to a laboratory that performs a UV digestion. If the lab does not perform the UV digestion on samples that contain these compounds, the results must be qualified in the final report.
  - The laboratory must test the sample for oxidizing agents (e.g. Chlorine) prior to analysis and treat according to the methods prior to distillation. (ascorbic acid or sodium arsenite are the preferred choice).

6) Sample Holding Times
- TestAmerica will make every effort to analyze samples within the regulatory holding time. Samples must be received in the laboratory with enough time to perform the sample analysis. Except for short holding time samples (< 48hr HT) sample must be received with at least 48 hrs (working days) remaining on the holding time for us to ensure analysis.

- Analyses that are designated as "field" analyses (Odor, pH, Dissolved Oxygen, Disinfectant Residual; a.k.a. Residual Chlorine, and Redox Potential) should be analyzed ASAP by the field sampler prior to delivering to the lab (within 15 minutes). However, if the analyses are to be performed in the laboratory, TestAmerica will make every effort to analyze the samples within 24 hours from receipt of the samples in the testing laboratory. Samples for "field" analyses received

after 4:00 pm on Friday or on the weekend will be analyzed no later than the next business day after receipt (Monday unless a holiday). Samples will remain refrigerated and sealed until the time of analysis. The actual times of all "field" sample analyses are noted on the "Short Hold Time Detail Report" in the final report. Samples analyzed in the laboratory will be qualified on the final report with an 'H' to indicate holding time exceedance.

7) All samples submitted for Volatile Organic analyses must have a Trip Blank submitted at the same time. TestAmerica will supply a blank with the bottle order.

8) The project manager will be notified if any sample is received in damaged condition. TestAmerica will request that a sample be resubmitted for analysis.

9) Recommendations for packing samples for shipment.

   - Pack samples in Ice rather than "Blue" ice packs.
   - Soil samples should be placed in plastic zip-lock bags. The containers often have dirt around the top and do not seal very well and are prone to intrusion from the water from melted ice.
   - Water samples would be best if wrapped with bubble-wrap or paper (newspaper, or paper towels work) and then placed in plastic zip-lock bags.
   - Fill extra cooler space with bubble wrap.

Figure 23-3. Example: Cooler Receipt Form (request for current copy)

TestAmerica Houston

TestAmerica
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Sample Receipt Checklist

Date/Time Received: _____

JOB NUMBER: _____ CLIENT: _____

UNPACKED BY: _____ CARRIER/DRIVER: _____

Custody Seal Present: ☐ YES ☐ NO Number of Coolers Received: _____

Cooler ID	Temp Blank	Trip Blank	Observed Temp (°C)	Therm ID	Therm CF	Corrected Temp (°C)
	Y / N	Y / N				
	Y / N	Y / N				
	Y / N	Y / N				
	Y / N	Y / N				
	Y / N	Y / N				
	Y / N	Y / N				
	Y / N	Y / N				
	Y / N	Y / N				
	Y / N	Y / N				

CF = correction factor

Samples received on ice? ☐ YES ☐ NO

LABORATORY PRESERVATION OF SAMPLES REQUIRED: ☐ NO ☐ YES

Base samples are>pH 12: ☐ YES ☐ NO Acid preserved are<pH 2: ☐ YES ☐ NO

pH paper Lot #_____

VOA headspace acceptable (5-6mm): ☐ YES ☐ NO ☐ NA

	YES	NO
Did samples meet the laboratory's standard conditions of sample acceptability upon receipt?		

COMMENTS:

HS-SA-WI-013 Rev. 3; 07/01/2014

SECTION 24. ASSURING THE QUALITY OF TEST RESULTS

24.1 Overview

In order to assure our clients of the validity of their data, the laboratory continuously evaluates the quality of the analytical process. The analytical process is controlled not only by instrument calibration as discussed in Section 20, but also by routine process quality control measurements (e.g. Blanks, Laboratory Control Samples (LCS), Matrix Spikes (MS), duplicates (DUP), surrogates, Internal Standards (IS)). These quality control checks are performed as required by the method or regulations to assess precision and accuracy. Quality control samples are to be treated in the exact same manner as the associated field samples being tested. In addition to the routine process quality control samples, Proficiency Testing (PT) Samples (concentrations unknown to laboratory) are analyzed to help ensure laboratory performance.

24.2 Controls

Sample preparation or pre-treatment is commonly required before analysis. Typical preparation steps include homogenization, grinding, solvent extraction, sonication, acid digestion, distillation, reflux, evaporation, drying and ashing. During these pre-treatment steps, samples are arranged into discreet manageable groups referred to as preparation (prep) batches. Prep batches provide a means to control variability in sample treatment. Control samples are added to each prep batch to monitor method performance and are processed through the entire analytical procedure with investigative/field samples.

24.3 Negative Controls

Table 24-1. Example – Negative Controls

Control Type	Details
Method Blank (MB)	are used to assess preparation and analysis for possible contamination during the preparation and processing steps.
	The specific frequency of use for method blanks during the analytical sequence is defined in the specific standard operating procedure for each analysis. Generally it is 1 for each batch of samples; not to exceed 20 environmental samples.
	The method blank is prepared from a clean matrix similar to that of the associated samples that is free from target analytes (e.g., Reagent water, Ottawa sand, glass beads, etc.) and is processed along with and under the same conditions as the associated samples. The method blank goes through all of the steps of the process (including as necessary: filtration, clean-ups, etc.).
	Reanalyze or qualify associated sample results when the concentration of a targeted analyte in the blank is at or above the reporting limit as established by the method or by regulation, AND is greater than 1/10 of the amount measured in the sample.
Calibration Blanks	are prepared and analyzed along with calibration standards where applicable. They are prepared using the same reagents that are used to prepare the standards. In some analyses the calibration blank may be included in the calibration curve.
Instrument Blanks	are blank reagents or reagent water that may be processed during an analytical sequence in order to assess contamination in the analytical system. In general, instrument blanks are used to differentiate between contamination caused by the analytical system and that caused by the sample handling or sample prep process. Instrument blanks may also be inserted throughout the analytical sequence to minimize the effect of carryover from samples with high analyte content.

Table 24-1. Example – Negative Controls

Control Type	Details
Trip Blank [1]	are required to be submitted by the client with each shipment of samples requiring aqueous and solid volatiles analyses (or as specified in the client's project plan). Additionally, trip blanks may be prepared and analyzed for volatile analysis of air samples, when required by the client. A trip blank may be purchased (certified clean) or is prepared by the laboratory by filling a clean container with pure deionized water that has been purged to remove any volatile compounds. Appropriate preservatives are also added to the container. The trip blank is sent with the bottle order and is intended to reflect the environment that the containers are subjected to throughout shipping and handling and help identify possible sources if contamination is found. The field sampler returns the trip blank in the cooler with the field samples.
Field Blanks [1]	are sometimes used for specific projects by the field samplers. A field blank prepared in the field by filling a clean container with pure reagent water and appropriate preservative, if any, for the specific sampling activity being undertaken. (EPA OSWER)
Equipment Blanks [1]	are also sometimes created in the field for specific projects. An equipment blank is a sample of analyte-free media which has been used to rinse common sampling equipment to check effectiveness of decontamination procedures. (**TNI**)
Holding Blanks	also referred to as refrigerator or freezer blanks, are used to monitor the sample storage units for volatile organic compounds during the storage of VOA samples in the laboratory

[1] When known, these field QC samples should not be selected for matrix QC as it does not provide information on the behavior of the target compounds in the field samples. Usually, the client sample ID will provide information to identify the field blanks with labels such as "FB", "EB", or "TB."

Evaluation criteria and corrective action for these controls are defined in the specific standard operating procedure for each analysis.

24.4 Positive Controls

Control samples (e.g., QC indicators) are analyzed with each batch of samples to evaluate data based upon (1) Method Performance (Laboratory Control Sample (LCS) or Blank Spike (BS)), which entails both the preparation and measurement steps; and (2) Matrix Effects (Matrix Spike (MS) or Sample Duplicate (MD, DUP), which evaluates field sampling accuracy, precision, representativeness, interferences, and the effect of the matrix on the method performed. Each regulatory program and each method within those programs specify the control samples that are prepared and/or analyzed with a specific batch

Note that frequency of control samples vary with specific regulatory, methodology and project specific criteria. Complete details on method control samples are as listed in each analytical SOP.

24.4.1 Method Performance Control - Laboratory Control Sample (LCS)

The LCS measures the accuracy of the method in a blank matrix and assesses method performance independent of potential field sample matrix affects in a laboratory batch.

The LCS is prepared from a clean matrix similar to that of the associated samples that is free from target analytes (for example: Reagent water, Ottawa sand, glass beads, etc.) and is processed along with and under the same conditions as the associated samples. The LCS is spiked with verified known amounts of analytes or is made of a material containing known and verified amounts of analytes, taken through all preparation and analysis steps along with the

field samples. Where there is no preparation taken for an analysis (such as in aqueous volatiles), or when all samples and standards undergo the same preparation and analysis process (such as Phosphorus), a calibration verification standard is reported as the LCS. In some instances where there is no practical clean solid matrix available, aqueous LCS's may be processed for solid matrices; final results may be calculated as mg/kg or ug/kg, assuming 100% solids and a weight equivalent to the aliquot used for the corresponding field samples, to facilitate comparison with the field samples.

Certified pre-made reference material purchased from a NIST/A2LA accredited vendor may also be used for the LCS when the material represents the sample matrix or the analyte is not easily spiked (e.g. solid matrix LCS for metals, TDS, etc.).

The specific frequency of use for LCS during the analytical sequence is defined in the specific standard operating procedure for each analysis. It is generally 1 for each batch of samples; not to exceed 20 environmental samples.

If the mandated or requested test method, or project requirements, do not specify the spiking components, the laboratory shall spike all reportable components to be reported in the Laboratory Control Sample (and Matrix Spike) where applicable (e.g. no spike of pH). However, in cases where the components interfere with accurate assessment (such as simultaneously spiking chlordane, toxaphene and PCBs in Method 608), the test method has an extremely long list of components or components are incompatible, at a minimum, a representative number of the listed components (see below) shall be used to control the test method. The selected components of each spiking mix shall represent all chemistries, elution patterns and masses, permit specified analytes and other client requested components. However, the laboratory shall ensure that all reported components are used in the spike mixture within a two-year time period.

- For methods that have 1-10 target analytes, spike all components.
- For methods that include 11-20 target analytes, spike at least 10 or 80%, whichever is greater.
- For methods with more than 20 target analytes, spike at least 16 components.
- Exception: Due to analyte incompatibility in pesticides, Toxaphene and Chlordane are only spiked at client request based on specific project needs.
- Exception: Due to analyte incompatibility between the various PCB aroclors, aroclors 1016 and 1260 are used for spiking as they cover the range of all of the aroclors. Specific aroclors may be used by request on a project specific basis.

24.5 Sample Matrix Controls

Table 24-3. Sample Matrix Control

Control Type	Details	
Matrix Spikes (MS)	Use	used to assess the effect sample matrix of the spiked sample has on the precision and accuracy of the results generated by the method used;
	Typical Frequency [1]	At a minimum, with each matrix-specific batch of samples processed, an MS is carried through the complete analytical procedure. Unless specified by the client, samples used for spiking are randomly selected and rotated between different client projects.If the mandated or requested test method does not specify the spiking components, the laboratory shall spike all reportable components to be reported in the Laboratory Control Sample and Matrix Spike. Refer to the method SOP for complete details
	Description	essentially a sample fortified with a known amount of the test analyte(s).
Surrogate	Use	Measures method performance to sample matrix (organics only).
	Typical Frequency [1]	Are added to all samples, standards, and blanks, for all organic chromatography methods except when the matrix precludes its use or when a surrogate is not available. The recovery of the surrogates is compared to the acceptance limits for the specific method. Poor surrogate recovery may indicate a problem with sample composition and shall be reported, with data qualifiers, to the client whose sample produced poor recovery.
	Description	Are similar to matrix spikes except the analytes are compounds with properties that mimic the analyte of interest and are unlikely to be found in environment samples.
Duplicates[2]	Use	For a measure of analytical precision, with each matrix-specific batch of samples processed, a matrix duplicate (MD or DUP) sample, matrix spike duplicate (MSD), or LCS duplicate (LCSD) is carried through the complete analytical procedure.
	Typical Frequency [1]	Duplicate samples are usually analyzed with methods that do not require matrix spike analysis.
	Description	Performed by analyzing two aliquots of the same field sample independently or an additional LCS.
Internal Standards	Use	Are spiked into all environmental and quality control samples (including the initial calibration standards) to monitor the qualitative aspect of organic and some inorganic analytical measurements.
	Typical Frequency [1]	All organic and ICP methods as required by the analytical method.
	Description	Used to correct for matrix effects and to help troubleshoot variability in analytical response and are assessed after data acquisition. Possible sources of poor internal standard response are sample matrix, poor analytical technique or instrument performance.

[1] See the specific analytical SOP for type and frequency of sample matrix control samples.

[2] LCSD's are normally not performed except when regulatory agencies or client specifications require them. The recoveries for the spiked duplicate samples must meet the same laboratory established recovery limits as the accuracy QC samples. If an LCSD is analyzed both the LCS and LCSD must meet the same recovery criteria and be included in the final report. The precision measurement is reported as "Relative Percent Difference" (RPD). Poor precision between duplicates (except LCS/LCSD) may indicate non-homogeneous matrix or sampling.

24.6 Acceptance Criteria (Control Limits)

As mandated by the test method and regulation, each individual analyte in the LCS, MS, or Surrogate Spike is evaluated against the control limits published in the test method. Where there are no established acceptance criteria, the laboratory calculates in-house control limits with the use of control charts or, in some cases, utilizes client project specific control limits. When this occurs, the regulatory or project limits will supersede the laboratory's in-house limits.

Note: For methods, analytes and matrices with very limited data (e.g., unusual matrices not analyzed often), interim limits are established using available data or by analogy to similar methods or matrices.

Once control limits have been established, they are verified, reviewed, and updated if necessary on an annual basis unless the method requires more frequent updating. Control limits are established per method (as opposed to per instrument) regardless of the number of instruments utilized.

Laboratory generated % Recovery acceptance (control) limits are generally established by taking $\pm$ 3 Standard Deviations (99% confidence level) from the average recovery of a minimum of 20-30 data points (more points are preferred).

- Regardless of the calculated limit, the limit should be no tighter than the Calibration Verification (ICV/CCV). (Unless the analytical method specifies a tighter limit).
- In-house limits cannot be any wider than those mandated in a regulated analytical method. Client or contract required control limits are evaluated against the laboratory's statistically derived control limits to determine if the data quality objectives (DQOs) can be achieved. If laboratory control limits are not consistent with DQOs, then alternatives must be considered, such as method improvements or use of an alternate analytical method.
- The lowest acceptable recovery limit will be 10% (the analyte must be detectable and identifiable). Exception: The lowest acceptable recovery limit for Benzidine will be 5% and the analyte must be detectable and identifiable.
- The maximum acceptable recovery limit will be 150%.
- The maximum acceptable RPD limit will be 35% for waters and 40% for soils. The minimum RPD limit is 10%.
- If either the high or low end of the control limit changes by $\leq$ 5% from previous, the control chart is visually inspected and, using professional judgment, they may be left unchanged if there is no affect on laboratory ability to meet the existing limits.

24.6.1 The lab must be able to generate a current listing of their control limits and track when the updates are performed. In addition, the laboratory must be able to recreate historical control limits. The LIMS maintains a record of the historical control limits including the dates and times that updates were made.

24.6.2 A LCS that is within the acceptance criteria establishes that the analytical system is in control and is used to validate the process. Samples that are analyzed with an LCS with recoveries outside of the acceptance limits may be determined as out of control and should be reanalyzed if possible. If reanalysis is not possible, then the results for all affected analytes for samples within the same batch must be qualified when reported. The internal corrective action process (see Section 12) is also initiated if an LCS exceeds the acceptance limits. Sample results may be qualified and reported without reanalysis if:

- Analyte results are below the reporting limit and the LCS is above the upper control limit.
- If the analytical results are above the relevant regulatory limit and the LCS is below the lower control limit.

For TNI and Department Of Defense (DOD) work, there are an allowable number of Marginal Exceedances (ME):

<11 analytes	0 marginal exceedances are allowed.
11 – 30 Analytes	1 marginal exceedance is allowed
31-50 Analytes	2 marginal exceedances are allowed
51-70 Analytes	3 marginal exceedances are allowed
71-90 Analytes	4 marginal exceedances are allowed
> 90 Analytes	5 marginal exceedances are allowed

- Marginal exceedances are recovery exceedances between 3 SD and 4 SD from the mean recovery limit (TNI).

- Marginal exceedances must be random. If the same analyte exceeds the LCS control limit repeatedly, it is an indication of a systematic problem. The source of the error must be located and corrective action taken. The laboratory has a system to monitor marginal exceedances to ensure that they are random.

Though marginal exceedences may be allowed, the data must still be qualified to indicate it is outside of the normal limits.

24.6.3 If the MS/MSDs do not meet acceptance limits, the MS/MSD and the associated spiked sample is reported with a qualifier for those analytes that do not meet limits. If obvious preparation errors are suspected, or if requested by the client, unacceptable MS/MSDs are reprocessed and reanalyzed to prove matrix interference. A more detailed discussion of acceptance criteria and corrective action can be found in the lab's method SOPs and in Section 12.

24.6.4 If a surrogate standard falls outside the acceptance limits, if there is not obvious chromatographic matrix interference, reanalyze the sample to confirm a possible matrix effect. If the recoveries confirm or there was obvious chromatographic interference, results are reported from the original analysis and a qualifier is added. If the reanalysis meets surrogate recovery criteria, the second run is reported (or both are reported if requested by the client). Under certain circumstances, where all of the samples are from the same location and share similar chromatography, the reanalysis may be performed on a single sample rather than all of the samples and if the surrogate meets the recovery criteria in the reanalysis, all of the affected samples would require reanalysis.

24.7 Additonal Procedures to Assure Quality Control

The laboratory has written and approved method SOPs to assure the accuracy of the test method including calibration (see Section 20), use of certified reference materials (see Section 21) and use of PT samples (see Section 15).

A discussion regarding MDLs, Limit of Detection (LOD) and Limit of Quantitation (LOQ) can be found in Section 19.

- Use of formulae to reduce data is discussed in the method SOPs and in Section 20.
- Selection of appropriate reagents and standards is included in Section 9 and 21.
- A discussion on selectivity of the test is included in Section 5.
- Constant and consistent test conditions are discussed in Section 18.
- The laboratories sample acceptance policy is included in Section 23.

SECTION 25. REPORTING RESULTS

25.1 Overview

The results of each test are reported accurately, clearly, unambiguously, and objectively in accordance with State and Federal regulations as well as client requirements. Analytical results are issued in a format that is intended to satisfy customer and laboratory accreditation requirements as well as provide the end user with the information needed to properly evaluate the results. Where there is conflict between client requests and laboratory ethics or regulatory requirements, the laboratory's ethical and legal requirements are paramount, and the laboratory will work with the client during project set up to develop an acceptable solution. Refer to Section 7.

A variety of report formats are available to meet specific needs.

In cases where a client asks for simplified reports, there must be a written request from the client. There still must be enough information that would show any analyses that were out of conformance (QC out of limits) and there should be a reference to a full report that is made available to the client. Review of reported data is included in Section 19.

25.2 Test Reports

Analytical results are reported in a format that is satisfactory to the client and meets all requirements of applicable accrediting authorities and agencies. A variety of report formats are available to meet specific needs. The report is printed on laboratory letterhead, reviewed, and signed by the appropriate project manager. At a minimum, the standard laboratory report shall contain the following information:

25.2.1 A report title (e.g. Analytical Report For Samples) with a "sample results" column header.

25.2.2 Each report cover page printed on company letterhead, which includes the laboratory name, address and telephone number.

25.2.3 A unique identification of the report (e.g. work order number) and on each page an identification in order to ensure the page is recognized as part of the report and a clear identification of the end.
Note: Page numbers of report are represented as page # of ##. Where the first number is the page number and the second is the total number of pages.

25.2.4 A copy of the chain of custody (COC).

- Any COCs involved with Subcontracting are included.
- The applicable COC is paginated as part of the report. A .pdf of the COC is created and attached to the job number in the LIMS to become part of the report as it is generated.
- Any additional addenda to the report must be treated in a similar fashion so it is a recognizable part of the report and cannot accidentally get separated from the report (e.g., Sampling information).

25.2.5 The name and address of client and a project name/number, if applicable.

25.2.6 Client project manager or other contact

25.2.7 Description and unambiguous identification of the tested sample(s) including the client identification code.

25.2.8 Date of receipt of sample, date and time of collection, and date(s) of test preparation and performance, and time of preparation or analysis if the required holding time for either activity is less than or equal to 72 hours.

25.2.9 Date reported or date of revision, if applicable.

25.2.10 Method of analysis including method code (EPA, Standard Methods, etc).

25.2.11 Practical quantization limits or reporting limit.

25.2.12 Method detection limits (if requested)

25.2.13 Definition of Data qualifiers and reporting acronyms (e.g. ND).

25.2.14 Sample results.

25.2.15 QC data consisting of method blank, surrogate, LCS, and MS/MSD recoveries and control limits.

25.2.16 Condition of samples at receipt including temperature. This may be accomplished in a narrative or by attaching sample login sheets (Refer to Sec. 25.2.4 – Item 3 regarding additional addenda).

25.2.17 A statement expressing the validity of the results, that the source methodology was followed and all results were reviewed for error.

25.2.18 A statement to the effect that the results relate only to the items tested and the sample as received by the laboratory.

25.2.19 A statement that the report shall not be reproduced except in full, without prior express written approval by the laboratory coordinator.

25.2.20 A signature and title of the person(s) accepting responsibility for the content of the report and date of issue. Authorized signatories are qualified Project Managers appointed by the Manager of Project Managers.

25.2.21 When TNI accreditation is required, the lab shall certify that the test results meet all requirements of TNI or provide reasons and/or justification if they do not.

25.2.22 The laboratory includes a cover letter.

25.2.23 Where applicable, a narrative to the report that explains the issue(s) and corrective action(s) taken in the event that a specific accreditation or certification requirement was not met.

25.2.24 When soil samples are analyzed, a specific identification as to whether soils are reported on a “wet weight” or “dry weight” basis.

25.2.25 Appropriate laboratory certification number for the state of origin of the sample, if applicable.

25.2.26 If only part of the report is provided to the client (client requests some results before all of it is complete), it must be clearly indicated on the report (e.g., partial report, or how your lab identifies it). A complete report must be sent once all of the work has been completed.

25.2.27 Any non-TestAmerica subcontracted analysis results are provided as a separate report on the official letterhead of the subcontractor. All TestAmerica subcontracting is clearly identified on the report as to which laboratory performed a specific analysis.

25.2.28 A Certification Summary Report, where required, will document that, unless otherwise noted, all analytes tested and reported by the laboratory were covered by the noted certifications.

Note: Refer to the Corporate SOP on Electronic Reporting and Signature Policy (No. CA-I-P-002) for details on internally applying electronic signatures of approval.

25.3 Reporting Level or Report Type

The laboratory offers four levels of quality control reporting. Each level, in addition to its own specific requirements, contains all the information provided in the preceding level. The packages provide the following information in addition to the information described above:

- Level I is a report with the features described in Section 25.2 above.

- Level II is a Level I report plus summary information, including results for the method blank reported to the laboratory detection limits, percent recovery for laboratory control samples and matrix spike samples, and the RPD values for all MSD and sample duplicate analyses.
- Level III contains all the information supplied in Level II, but presented on the CLP-like summary forms, and copies of raw data that includes calibration data only (tunes, ICV, CCV, internal standards) and a case narrative.
- Level IV is the same as Level III with the addition of all raw supporting data

In addition to the various levels of QC packaging, the laboratory also provides reports in diskette deliverable form. TRRP reports can also be produce upon request. Initial reports may be provided to clients by facsimile or e-mail. The emailed copy is a signed PDF copy of the report. Upon request a hardcopy can be mailed to the client. They may also be posted to TotalAccess. Procedures used to ensure client confidentiality are outlined in Section 25.6.

25.3.1 Electronic Data Deliverables (EDDs)

EDDs are routinely offered as part of TestAmerica's services in addition to the test report as described in section 25.2. When NELAP accreditation is required and both a test report and EDD are provided to the client, the official version of the test report will be the combined information of the report and the EDD. Houston offers a variety of EDD formats including Environmental Restoration Information Management System (ERPIMS), New Agency Standard (NAS), Format A, Excel, Dbase, GISKEY, and Text Files.

EDD specifications are submitted to the IT department by the PM for review and undergo the contract review process. Once the facility has committed to providing data in a specific electronic format, the coding of the format may need to be performed. This coding is documented and validated. The validation of the code is retained by the IT staff coding the EDD.

EDDs shall be subject to a review to ensure their accuracy and completeness. If EDD generation is automated, review may be reduced to periodic screening if the laboratory can demonstrate that it can routinely generate that EDD without errors. Any revisions to the EDD format must be reviewed until it is demonstrated that it can routinely be generated without errors. If the EDD can be reproduced accurately and if all subsequent EDDs can be produced error-free, each EDD does not necessarily require a review.

25.4 Supplemental Information for Test

The lab identifies any unacceptable QC analyses or any other unusual circumstances or observations such as environmental conditions and any non-standard conditions that may have affected the quality of a result. This is typically in the form of a footnote or a qualifier and/or a narrative explaining the discrepancy in the front of the report.

Numeric results with values outside of the calibration range, either high or low are qualified as 'estimated'.

Where quality system requirements are not met, a statement of compliance/non-compliance with requirements and/or specifications is required, including identification of test results derived

from any sample that did not meet TNI sample acceptance requirements such as improper container, holding time, or temperature.

Where applicable, a statement on the estimated uncertainty of measurements; information on uncertainty is needed when a client's instructions so require.

Opinions and Interpretations - The test report contains objective information, and generally does not contain subjective information such as opinions and interpretations. If such information is required by the client, the Laboratory Director will determine if a response can be prepared. If so, the Laboratory Director will designate the appropriate member of the management team to prepare a response. The response will be fully documented, and reviewed by the Laboratory Director, before release to the client. There may be additional fees charged to the client at this time, as this is a non-routine function of the laboratory.

Note: Review of data deliverable packages for submittal to regulatory authorities requires responses to non-conforming data concerning potential impact on data quality. This necessitates a limited scope of interpretation, and this work is performed by the QA Department. This is the only form of "interpretation" of data that is routinely performed by the laboratory.

When opinions or interpretations are included in the report, the laboratory provides an explanation as to the basis upon which the opinions and interpretations have been made. Opinions and interpretations are clearly noted as such and where applicable, a comment should be added suggesting that the client verify the opinion or interpretation with their regulator.

25.5 Environmental Testing Obtained From Subcontractors

If the laboratory is not able to provide the client the requested analysis, the samples would be subcontracted following the procedures outlined in the Corporate SOP on Subcontracting (SOP No. CA-L-S-002).

Data reported from analyses performed by a subcontractor laboratory are clearly identified as such on the analytical report provided to the client. Results from a subcontract laboratory outside of TestAmerica are reported to the client on the subcontract laboratory's original report stationary and the report includes any accompanying documentation.

25.6 Client Confidentiality

In situations involving the transmission of environmental test results by telephone, facsimile or other electronic means, client confidentiality must be maintained.

TestAmerica will not intentionally divulge to any person (other than the Client or any other person designated by the Client in writing) any information regarding the services provided by TestAmerica or any information disclosed to TestAmerica by the Client. Furthermore, information known to be potentially endangering to national security or an entity's proprietary rights will not be released.

Note: This shall not apply to the extent that the information is required to be disclosed by TestAmerica under the compulsion of legal process. TestAmerica will, to the extent feasible, provide reasonable notice to the client before disclosing the information.

Note: Authorized representatives of an accrediting authority are permitted to make copies of any analyses or records relevant to the accreditation process, and copies may be removed from the laboratory for purposes of assessment.

25.6.1 Report deliverable formats are discussed with each new client. If a client requests that reports be faxed or e-mailed, the reports are to meet all requirements of this document, include cover letter.

25.7 Format of Reports

The format of reports is designed to accommodate each type of environmental test carried out and to minimize the possibility of misunderstanding or misuse.

25.8 Amendments to Test Reports

Corrections, additions, or deletions to reports are only made when justification arises through supplemental documentation. Justification is documented using the laboratory's corrective action system (refer to Section 12).

The revised report is retained in LIMS server, as is the original report. The revised report is stored in LIMS with revision #. The revised report will have the word "revision 1" is under the signature of the report.

When the report is re-issued, a notation of "report re-issue "is placed on the cover/signature page of the report *or at the top of the narrative page* with a brief explanation of reason for the re-issue and a reference back to the last final report generated. *For Example*: *Report was revised on 11/3/08 to include toluene in sample NQA1504 per client's request. This final report replaces the final report generated on 10/27/08 at 10:47am.*

25.9 Policies on Client Requests for Amendments

25.9.1 Policy on Data Omissions or Reporting Limit Increases

Fundamentally, our policy is simply to not omit previously reported results (including data qualifiers) or to not raise reporting limits and report sample results as ND. This policy has few exceptions. Exceptions are:

- Laboratory error.
- Sample identification is indeterminate (confusion between COC and sample labels).
- An incorrect analysis (not analyte) was requested (e.g., COC lists 8315 but client wanted 8310). A written request for the change is required.
- Incorrect limits reported based on regulatory requirements.
- The requested change has absolutely *no possible* impact on the interpretation of the analytical results and there is *no possibility* of the change being interpreted as misrepresentation by anyone inside or outside of our company.

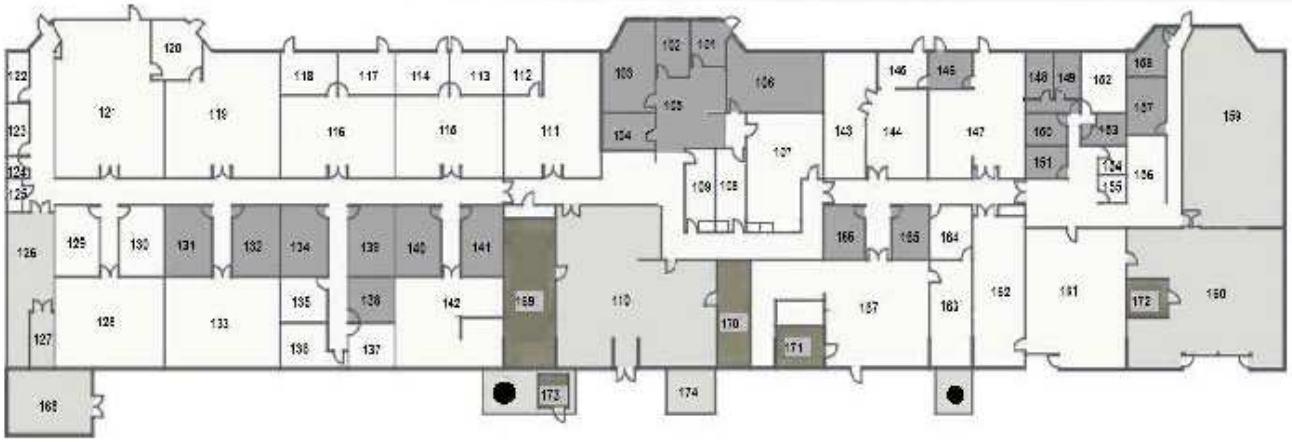
25.9.2 Multiple Reports

TestAmerica does not issue multiple reports for the same work order where there is different information on each report (this does not refer to copies of the same report) unless required to meet regulatory needs and approved by QA.

Appendix 1. Laboratory Floor Plan

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

TestAmerica Houston Floor Plan



- **Key Areas**
- **110 – Sample Administration**
- **111 – GC VOA**
- **115 – GC/MS VOA**
- **116 – GC/MS SVOA**
- **119 – Extractions Room 1**
- **121 – Extractions Room 2**
- **129 – 130 – QA Offices**
- **133 – GC SVOA**
- **134 – 141 – Project Management**
- **144 – Metals Preparation**
- **147 – Metals Analysis**
- **156 – Bottle Preparation**
- **159 – Data Archives**
- **160 – Bottle / Supply Storage**
- **161 – Wet Chemistry Room 4**
- **162 – Wet Chemistry Room 3**
- **163 – Wet Chemistry Room 2**
- **167 – Wet Chemistry Room 1**
- **169 – 173 – Temperature Controlled Walk-in**

Appendix 2. Glossary/Acronyms (EL-V1M2 Sec. 3.1)

Glossary:

Acceptance Criteria: Specified limits placed on characteristics of an item, process, or service defined in requirement documents. (ASQC)

Accreditation: The process by which an agency or organization evaluates and recognizes a laboratory as meeting certain predetermined qualifications or standards, thereby accrediting the laboratory.

Accuracy: The degree of agreement between an observed value and an accepted reference value. Accuracy includes a combination of random error (precision) and systematic error (bias) components which are due to sampling and analytical operations; a data quality indicator. (QAMS)

Analyst: The designated individual who performs the "hands-on" analytical methods and associated techniques and who is the one responsible for applying required laboratory practices and other pertinent quality controls to meet the required level of quality.

Analytical Uncertainty: A subset of Measurement Uncertainty that includes all laboratory activities performed as part of the analysis. (TNI)

Anomaly: A condition or event, other than a deficiency, that may affect the quality of the data, whether in the laboratory's control or not.

Assessment: The evaluation process used to measure or establish the performance, effectiveness, and conformance of an organization and/or its systems to defined criteria (to the standards and requirements of laboratory accreditation). (TNI)

Audit: A systematic and independent examination of facilities, equipment, personnel, training, procedures, record-keeping, data validation, data management, and reporting aspects of a system to determine whether QA/QC and technical activities are being conducted as planned and whether these activities will effectively achieve quality objectives. (TNI)

Batch: Environmental samples that are prepared and/or analyzed together with the same process and personnel, using the same lot(s) of reagents. A **preparation batch** is composed of one (1) to twenty (20) environmental samples of the same quality systems matrix, meeting the above mentioned criteria and with a maximum time between the start of processing of the first and last sample in the batch to be twenty-four (24) hours. An **analytical batch** is composed of prepared environmental samples (extracts, digestates or concentrates) which are analyzed together as a group. An analytical batch can include prepared samples originating from various quality system matrices and can exceed twenty (20) samples. (TNI)

Bias: The systematic or persistent distortion of a measurement process, which causes errors in one direction (i.e., the expected sample measurement is different from the sample's true value). (TNI)

Blank: A sample that has not been exposed to the analyzed sample stream in order to monitor contamination during sampling, transport, storage or analysis. The blank is subjected to the usual analytical and measurement process to establish a zero baseline or background value and is sometimes used to adjust or correct routine analytical results. (ASQC)

Calibration: A set of operations that establish, under specified conditions, the relationship between values of quantities indicated by a measuring instrument or measuring system, or values represented by a material measure or a reference material, and the corresponding values realized by standards. (TNI)

1) In calibration of support equipment the values realized by standards are established through the use of reference standards that are traceable to the International System of Units (SI).

2) In calibration according to methods, the values realized by standards are typically established through the use of Reference Materials that are either purchased by the laboratory with a certificate of analysis or purity, or prepared by the laboratory using support equipment that has been calibrated or verified to meet specifications.

Calibration Curve: The mathematical relationship between the known values, such as concentrations, of a series of calibration standards and their instrument response. (TNI)

Calibration Standard: A substance or reference material used to calibrate an instrument (QAMS)

Certified Reference Material (CRM): A reference material accompanied by a certificate, having a value, measurement uncertainty, and stated metrological traceability chain to a national metrology institute. (TNI)

Chain of Custody (COC) Form: Record that documents the possession of the samples from the time of collection to receipt in the laboratory. This record generally includes: the number and types of containers; the mode of collection; the collector; time of collection; preservation; and requested analyses. (TNI)

Compromised Samples: Those samples which are improperly sampled, insufficiently documented (chain of custody and other sample records and/or labels), improperly preserved, collected in improper containers, or exceeding holding times when delivered to a laboratory. Under normal conditions, compromised samples are not analyzed. If emergency situation require analysis, the results must be appropriately qualified.

Confidential Business Information (CBI): Information that an organization designates as having the potential of providing a competitor with inappropriate insight into its management, operation or products. TNI and its representatives agree to safeguarding identified CBI and to maintain all information identified as such in full confidentiality.

Confirmation: Verification of the identity of a component through the use of an approach with a different scientific principle from the original method. These may include, but are not limited to Second Column Confirmation; Alternate wavelength; Derivatization; Mass spectral interpretation; Alternative detectors or Additional Cleanup procedures. (TNI)

Conformance: An affirmative indication or judgment that a product or service has met the requirements of the relevant specifications, contract, or regulation; also the state of meeting the requirements. (ANSI/ASQC E4-1994)

Correction: Actions necessary to correct or repair analysis specific non-conformances. The acceptance criteria for method specific QC and protocols as well as the associated corrective actions. The analyst will most frequently be the one to identify the need for this action as a result of calibration checks and QC sample analysis**.** No significant action is taken to change behavior, process or procedure.

Corrective Action: The action taken to eliminate the causes of an existing nonconformity, defect or other undesirable situation in order to prevent recurrence. (ISO 8402)

Data Audit: A qualitative and quantitative evaluation of the documentation and procedures associated with environmental measurements to verify that the resulting data re of acceptable quality (i.e., that they meet specified acceptance criteria).

Data Reduction: The process of transforming the number of data items by arithmetic or statistical calculations, standard curves, and concentration factors, and collation into a more useable form. (TNI)

Deficiency: An unauthorized deviation from acceptable procedures or practices, or a defect in an item. (ASQC), whether in the laboratory's control or not.

Demonstration of Capability: A procedure to establish the ability of the analyst to generate analytical results of acceptable accuracy and precision. (TNI)

Document Control: The act of ensuring that documents (and revisions thereto) are proposed, reviewed for accuracy, approved for release by authorized personnel, distributed properly, and controlled to ensure use of the correct version at the location where the prescribed activity if performed. (ASQC)

Duplicate Analyses: The analyses or measurements of the variable of interest performed identically on two subsamples of the same sample. The results from duplicate analyses are used to evaluate analytical or measurement precision but not the precision of sampling, preservation or storage internal to the laboratory. (EPA-QAD)

Equipment Blank: Sample of analyte-free media which has been used to rinse common sampling equipment to check effectiveness of decontamination procedures.

External Standard Calibration: Calibrations for methods that do not utilize internal standards to compensate for changes in instrument conditions.

Field Blank: Blank prepared in the field by filing a clean container with pure de-ionized water and appropriate preservative, if any, for the specific sampling activity being undertaken (EPA OSWER)

Field of Accreditation: Those matrix, technology/method, and analyte combinations for which the accreditation body offers accreditation.

Holding Times: The maximum time that samples may be held prior to analyses and still be considered valid or not compromised. (40 CFR Part 136)

Internal Standard: A known amount of standard added to a test portion of a sample as a reference for evaluating and controlling the precision and bias of the applied analytical test method. (TNI)

Internal Standard Calibration: Calibrations for methods that utilize internal standards to compensate for changes in instrument conditions.

Instrument Blank: A clean sample (e.g., distilled water) processed through the instrumental steps of the measurement process; used to determine instrument contamination. (EPA-QAD)

Instrument Detection Limit (IDL): The minimum amount of a substance that can be measured with a specified degree of confidence that the amount is greater than zero using a specific instrument. The IDL is associated with the instrumental portion of a specific method only, and sample preparation steps are not considered in its derivation. The IDL is a statistical estimation at a specified confidence interval of the concentration at which the relative uncertainty is $\pm$ 100%. The IDL represents a range where qualitative detection occurs on a specific instrument. Quantitative results are not produced in this range.

Laboratory Control Sample (however named, such as laboratory fortified blank, spiked blank, or QC check sample): A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes, taken through all preparation and analysis steps of the procedure unless otherwise noted in a reference method. It is generally used to establish intra-laboratory or analyst specific precision and bias or to assess the performance of all or a portion of the measurement system.

An LCS shall be prepared at a minimum of 1 per batch of 20 or less samples per matrix type per sample extraction or preparation method except for analytes for which spiking solutions are not available such as total suspended solids, total dissolved solids, total volatile solids, total solids, pH, color, odor, temperature, dissolved oxygen or turbidity. The results of these samples shall be used to determine batch acceptance.

Least Squares Regression (1st Order Curve): The least squares regression is a mathematical calculation of a straight line over two axes. The y axis represents the instrument response (or Response ratio) of a standard or sample and the x axis represents the concentration. The regression calculation will generate a correlation coefficient (r) that is a measure of the "goodness of fit" of the regression line to the data. A value of 1.00 indicates a perfect fit. In order to be used for quantitative purposes, r must be greater than or equal to 0.99 for organics and 0.995 for inorganics.

Limit(s) of Detection (LOD) [a.k.a., Method Detection Limit (MDL)]: A laboratory's estimate of the minimum amount of an analyte in a given matrix that an analytical process can reliably detect in their facility. (TNI)

LOD Verification [a.k.a., MDL Verification]: A processed QC sample in the matrix of interest, spiked with the analyte at no more than 3X the LOD for single analyte tests and 4X the LOD for multiple analyte tests and processed through the entire analytical procedure.

Limit(s) of Quantitation (LOQ) [a.k.a., Reporting Limit]: The minimum levels, concentrations, or quantities of a target variable (e.g., target analyte) that can be reported with a specified degree of confidence. (TNI)

(QS) Matrix: The component or substrate that contains the analyte of interest. For purposes of batch and QC requirement determinations, the following matrix distinctions shall be used:

Aqueous: Any aqueous sample excluded from the definition of Drinking Water or Saline/Estuarine. Includes surface water, groundwater, effluents, and TCLP or other extracts.

Drinking Water: Any aqueous sample that has been designated as a potable or potential potable water source.

Saline/Estuarine: Any aqueous sample from an ocean or estuary, or other salt water source such as the Great Salt Lake.

Non-Aqueous Liquid: Any organic liquid with <15% settleable solids.

Biological Tissue: Any sample of a biological origin such as fish tissue, shellfish, or plant material. Such samples shall be grouped according to origin.

Solids: Includes soils, sediments, sludges, and other matrices with >15% settleable solids.

Chemical Waste: A product or by-product of an industrial process that results in a matrix not previously defined.

Air & Emissions: Whole gas or vapor samples including those contained in flexible or rigid wall containers and the extracted concentrated analytes of interest from a gas or vapor that are collected with a sorbant tube, impinger solution, filter, or other device. (TNI)

Matrix Spike (spiked sample or fortified sample): A sample prepared, taken through all sample preparation and analytical steps of the procedure unless otherwise noted in a referenced method, by adding a known amount of target analyte to a specified amount of sample for which an independent test result of target analyte concentration is available. Matrix spikes are used, for example, to determine the effect of the matrix on a method's recovery efficiency.

Matrix Spike Duplicate (spiked sample or fortified sample duplicate): A replicate matrix spike prepared and analyzed to obtain a measure of the precision of the recovery for each analyte.

Method Blank: A sample of a matrix similar to the batch of associated samples (when available) that is free from the analytes of interest and is processed simultaneously with and under the same conditions as samples through all steps of the analytical procedures, and in which no target analytes or interferences are present at concentrations that impact the analytical results for sample analyses.

Method Detection Limit: The minimum concentration of a substance (an analyte) that can be measured and reported with 99% confidence that the analyte concentration is greater than zero and is determined from analysis of a sample in a given matrix containing the analyte. (40 CFR Part 136, Appendix B)

Negative Control: Measures taken to ensure that a test, its components, or the environment do not cause undesired effects, or produce incorrect test results.

Non-conformance: An indication, judgment, or state of not having met the requirements of the relevant specifications, contract, or regulation.

Observation: A record of phenomena that (1) may assist in evaluation of the sample data; (2) may be of importance to the project manager and/or the client, and yet not at the time of the observation have any known effect on quality.

Performance Audit: The routine comparison of independently obtained qualitative and quantitative measurement system data with routinely obtained data in order to evaluate the proficiency of an analyst or laboratory.

Positive Control: Measures taken to ensure that a test and/or its components are working properly and producing correct or expected results from positive test subjects.

Precision: The degree to which a set of observations or measurements of the same property, obtained under similar conditions, conform to themselves; a data quality indicator. Precision is usually expressed as standard deviation, variance or range, in either absolute or relative terms. (TNI)

Preservation: Any conditions under which a sample must be kept in order to maintain chemical and/or biological integrity prior to analysis. (TNI)

Proficiency Testing: A means of evaluating a laboratory's performance under controlled conditions relative to a given set of criteria through analysis of unknown samples provided by an external source. (TNI)

Proficiency Testing Program: The aggregate of providing rigorously controlled and standardized environmental samples to a laboratory for analysis, reporting of results, statistical evaluation of the results and the collective demographics and results summary of all participating laboratories. (TNI)

Proficiency Test Sample (PT): A sample, the composition of which is unknown to the laboratory and is provided to test whether the laboratory can produce analytical results within specified acceptance criteria. (TNI)

Quality Assurance: An integrated system of management activities involving planning, implementation, assessment, reporting and quality improvement to ensure that a process, item, or service is of the type of quality needed and expected by the client. (TNI)

Quality Assurance [Project] Plan (QAPP): A formal document describing the detailed quality control procedures by which the quality requirements defined for the data and decisions pertaining to a specific project are to be achieved. (EAP-QAD)

Quality Control: The overall system of technical activities that measures the attributes and performance of a process, item, or service against defined standards to verify that they meet the stated requirements established by the customer; operational techniques and activities that are used to fulfill requirements for quality; also the system of activities and checks used to ensure that measurement systems are maintained within prescribed limits, providing protection against "out of control" conditions and ensuring that the results are of acceptable quality. (TNI)

Quality Control Sample: A sample used to assess the performance of all or a portion of the measurement system. One of any number of samples, such as Certified Reference Materials, a quality system matrix fortified by spiking, or actual samples fortified by spiking, intended to demonstrate that a measurement system or activity is in control. (TNI)

Quality Manual: A document stating the management policies, objectives, principles, organizational structure and authority, responsibilities, accountability, and implementation of an agency, organization, or laboratory, to ensure the quality of its product and the utility of its product to its users. (TNI)

Quality System: A structured and documented management system describing the policies, objectives, principles, organizational authority, responsibilities, accountability, and implementation plan of an organization for ensuring quality in its work processes, products (items), and services. The quality system provides the framework for planning, implementing, and assessing work performed by the organization and for carrying out required QA and QC activities. (TNI)

Raw Data: The documentation generated during sampling and analysis. This documentation includes, but is not limited to, field notes, electronic data, magnetic tapes, untabulated sample results, QC sample results, print outs of chromatograms, instrument outputs, and handwritten records. (TNI)

Record Retention: The systematic collection, indexing and storing of documented information under secure conditions.

Reference Material: Material or substance one or more properties of which are sufficiently homogeneous and well established to be used for the calibration of an apparatus, the assessment of a measurement method, or for assigning values to materials. (TNI)

Reference Standard: Standard used for the calibration of working measurement standards in a given organization or a given location. (TNI)

Sampling: Activity related to obtaining a representative sample of the object of conformity assessment, according to a procedure.

Second Order Polynomial Curve (Quadratic): The 2^{nd} order curves are a mathematical calculation of a slightly curved line over two axis. The y axis represents the instrument response (or Response ratio) of a standard or sample and the x axis represents the concentration. The 2^{nd} order regression will generate a

coefficient of determination (COD or r^2) that is a measure of the "goodness of fit" of the quadratic curvature the data. A value of 1.00 indicates a perfect fit. In order to be used for quantitative purposes, r^2 must be greater than or equal to 0.99.

Selectivity: The ability to analyze, distinguish, and determine a specific analyte or parameter from another component that may be a potential interferent or that may behave similarly to the target analyte or parameter within the measurement system. (TNI)

Sensitivity: The capability of a method or instrument to discriminate between measurement responses representing different levels (e.g., concentrations) of a variable of interest. (TNI)

Spike: A known mass of target analyte added to a blank, sample or sub-sample; used to determine recovery efficiency or for other quality control purposes.

Standard: The document describing the elements of laboratory accreditation that has been developed and established within the consensus principles of standard setting and meets the approval requirements of standard adoption organizations procedures and policies. (TNI)

Standard Operating Procedures (SOPs): A written document which details the method for an operation, analysis, or action, with thoroughly prescribed techniques and steps. SOPs are officially approved as the methods for performing certain routine or repetitive tasks. (TNI)

Storage Blank: A blank matrix stored with field samples of a similar matrix (volatiles only) that measures storage contribution to any source of contamination.

Surrogate: A substance with properties that mimic the analyte of interest. It is unlikely to be found in environment samples and is added to them for quality control purposes.

Surrogate compounds must be added to all samples, standards, and blanks, for all organic chromatography methods except when the matrix precludes its use or when a surrogate is not available. Poor surrogate recovery may indicate a problem with sample composition and shall be reported to the client whose sample produced poor recovery. (QAMS)

Systems Audit (also Technical Systems Audit): A thorough, systematic, qualitative on-site assessment of the facilities, equipment, personnel, training, procedures, record keeping, data validation, data management, and reporting aspects of a total measurement system. (EPA-QAD)

Technical Manager: A member of the staff of an environmental laboratory who exercises actual day-to-day supervision of laboratory operations for the appropriate fields of accreditation and reporting of results

Technology: A specific arrangement of analytical instruments, detection systems, and/or preparation techniques.

Traceability: The ability to trace the history, application, or location of an entity by means of recorded identifications. In a calibration sense, traceability relates measuring equipment to national or international standards, primary standards, basic physical constants or properties, or reference materials. In a data collection sense, it relates calculations and data generated throughout the project back to the requirements for the quality of the project. (TNI)

Trip Blank: A blank matrix placed in a sealed container at the laboratory that is shipped, held unopened in the field, and returned to the laboratory in the shipping container with the field samples.

Uncertainty: A parameter associated with the result of a measurement that characterizes the dispersion of the value that could reasonably be attributed to the measured value.

Acronyms:

CAR – Corrective Action Report
CCV – Continuing Calibration Verification
CF – Calibration Factor
CFR – Code of Federal Regulations
COC – Chain of Custody
DOC – Demonstration of Capability
DQO – Data Quality Objectives
DUP - Duplicate
EHS – Environment, Health and Safety
EPA – Environmental Protection Agency
GC - Gas Chromatography
GC/MS - Gas Chromatography/Mass Spectrometry
HPLC - High Performance Liquid Chromatography
ICP - Inductively Coupled Plasma Atomic Emission Spectroscopy
ICP/MS – ICP/Mass Spectrometry
ICV – Initial Calibration Verification
IDL – Instrument Detection Limit
IH – Industrial Hygiene
IS – Internal Standard
LCS – Laboratory Control Sample
LCSD – Laboratory Control Sample Duplicate
LIMS – Laboratory Information Management System
LOD – Limit of Detection
LOQ – Limit of Quantitation
MDL – Method Detection Limit
MDLCK – MDL Check Standard
MDLV – MDL Verification Check Standard
MRL – Method Reporting Limit Check Standard
MS – Matrix Spike
MSD – Matrix Spike Duplicate
SDS - Safety Data Sheet
NELAP - National Environmental Laboratory Accreditation Program
PT – Performance Testing
TNI – The NELAC Institute
QAM – Quality Assurance Manual
QA/QC – Quality Assurance / Quality Control
QAPP – Quality Assurance Project Plan
RF – Response Factor
RPD – Relative Percent Difference
RSD – Relative Standard Deviation
SD – Standard Deviation
SOP – Standard Operating Procedure
TAT – Turn-Around-Time
VOA – Volatiles
VOC – Volatile Organic Compound

Appendix 3. Laboratory Certifications, Accreditations, Validations

TestAmerica Houston maintains accreditations, certifications, and approvals with numerous state and national entities. Programs vary but may include on-site audits, reciprocal agreements with other entities, performance testing evaluations, review of the QA Manual, Standard Operating Procedures, Method Detection Limits, training records, etc. At the time of this QA Manual revision, the laboratory has accreditation / certification / licensing with the following organizations:

TestAmerica

TestAmerica Certifications

Laboratory	Program	Authority	Identification	Expiration Date
TestAmerica Houston	Federal	USDA	P330-17-00132	04/20/2020
TestAmerica Houston	NELAP	Louisiana	01967	06/30/2018
TestAmerica Houston	NELAP	Texas	T104704223-17-22	10/31/2018
TestAmerica Houston	State Program	Arkansas DEQ	17-051-0	08/04/2018
TestAmerica Houston	State Program	Oklahoma	2017-138	08/31/2018

Page 1 of 1 1/23/18

* Certification Valid - Laboratory is Pending Renewal with the Program Authority

For more information, or to contact a local TestAmerica representative nearest you, please visit our website at www.testamericainc.com

The certificates and accredited parameter lists are available for each State/Program at www.testamericainc.com under Analytical Services Search – Certifications.

Appendix E

Field Forms

Daily Report

Grim Hotel
301 North State Line Avenue
Texarkana Texas 77501

Date: S M T W Th F S	**Supervisor:**	**Weather:**
Activities		
Safety Meeting:		
Time Start:	**Time End:**	RP:
Regulated Area:		
Time Established:	**Time End:**	RP:
Entry Time:	**Exit Time:**	RP:
Staff:		
Inspectors:		
Other:		
Pre-Abatement air sampling:		
Work activities (include areas and amount of abatement):		
Sampling (include sampling equipment, locations, samples collected):		
Unusual occurances or items to note:		
Waste removed from the site:		
RP: initials of person responsible		
	Signed:	Date:

Air Sampling Signed:

Date	Location Name	Sample #	Pump Start Time	Pump End Time	Pump ID	Notes

Low Flow Well Purging-Field Water Quality Measurements Form

Sampling Organization: ______________________ Site Name: ______________________ Page___of____

Measuring Point(MP): ______________________ Well Number: ______________________

Depth to screen: top _________bottom_____ Date: ______________________

Purging Device: ______________________ Field Personnell: ______________________

Pump intake (ft below MP):

Clock Time (24 HR)	Water Depth below MP (ft)	Temp (°C)	Spec. Cond. (mS/cm)	DO mg/L	pH	ORP	Turbidity NTU	Pump dial	Purge rate (ml/min)	Cum. Volume purged (gallons)	Comments
Stability	0.3'		± 0.3%	± 10%	± 0.1 unit	± 10 mv	± 10% for values greater than 1 NTU				

Soil Boring Log and Monitoring Well Diagram

Boring/Well Number:	Facility Name	Facility Street Address
Boring Location:	Northing:	Easting:
Boring Depth (ft) X Diameter (in):		Drilling Method:
Certified Well Contractor Name:		Logged by:
Start Date:	End Date:	Ground Surface Elevation (ASL):
Start Time:	End Time:	Top of Casing Elevation (ASL):

Depth (FT)	Soil Boring/Well Construction	Blow Count If Applicable (6" interval)	recovery	Field Screening Results (PID/FID)	Laboratory Sample	USCS Group	Rock Formations, Soil, Color and Classifications, Observations (moisture, odor, etc.)

Notes:

SS (split spoon) HS (hollow stem auger) Static Water Level Symbol (v)

Static Water Levels

Date															
Elevation															

Well Development Data Collection Form

Well ID: _____ Page of

Project Name: _____ Name: _____

Project Number: _____ Weather: _____ Well Volume Calc.:

Project Location: _____ Well Type: _____ Length of water col. (ft.)_____ X 2-inch 0.163

Well Diameter: _____ Stickup: _____ gal./ft. = _____gal.

Reference Point: _____ Well Depth: _____

Depth to Water: _____ Screen interval: _____ Length of water col. (ft.)_____ X 4-inch 0.653

Data Type: _____ Development method: _____ gal./ft. = _____gal.

Date	Time		Flow Rate	Water Level	Imhoff Cone Readings			Water Quality					Gallons	Comments
	Clock	Lapsed		Tape	Sand	Silt	Clay	Temp (°C)	Cond. (µS/cm)	DO (mg/L)	pH	Turb		

Groundwater sample collected for laboratory analysis - Time _____ Total gallons removed: _____

Signature: _____

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Asbestos Chain of Custody

EMSL Order Number (*Lab Use Only*):

PHONE:
FAX:

Company Name :		**EMSL Customer ID:**	
Street:		**City:**	**State/Province:**
Zip/Postal Code:	**Country:**	**Telephone #:**	**Fax #:**
Report To (Name):		**Please Provide Results:** ☐ **Fax** ☐ **Email**	
Email Address:		**Purchase Order:**	
Project Name/Number:		**EMSL Project ID** (*Internal Use Only):*	
U.S. State Samples Taken:		**CT Samples:** ☐ **Commercial/Taxable** ☐ **Residential/Tax Exempt**	

EMSL-Bill to: ☐ Same ☐ Different - If Bill to is Different note instructions in Comments**
Third Party Billing requires written authorization from third party

Turnaround Time (TAT) Options* – Please Check

☐ **3 Hour**	☐ **6 Hour**	☐ **24 Hour**	☐ **48 Hour**	☐ **72 Hour**	☐ **96 Hour**	☐ **1 Week**	☐ **2 Week**

**For TEM Air 3 hr through 6 hr, please call ahead to schedule.*There is a premium charge for 3 Hour TEM AHERA or EPA Level II TAT. You will be asked to sign an authorization form for this service. Analysis completed in accordance with EMSL's Terms and Conditions located in the Analytical Price Guide.*

PCM - Air ☐ Check if samples are from NY
☐ NIOSH 7400
☐ w/ OSHA 8hr. TWA

PLM - Bulk (reporting limit)
☐ PLM EPA 600/R-93/116 (<1%)
☐ PLM EPA NOB (<1%)
Point Count
☐ 400 (<0.25%) ☐ 1000 (<0.1%)
Point Count w/Gravimetric
☐ 400 (<0.25%) ☐ 1000 (<0.1%)
☐ NYS 198.1 (friable in NY)
☐ NYS 198.6 NOB (non-friable-NY)
☐ NYS 198.8 SOF-V
☐ NIOSH 9002 (<1%)

TEM – Air ☐ **4-4.5hr TAT (AHERA only)**
☐ AHERA 40 CFR, Part 763
☐ NIOSH 7402
☐ EPA Level II
☐ ISO 10312

TEM - Bulk
☐ TEM EPA NOB
☐ NYS NOB 198.4 (non-friable-NY)
☐ Chatfield SOP
☐ TEM Mass Analysis-EPA 600 sec. 2.5

TEM – Water: EPA 100.2
Fibers >10µm ☐ Waste ☐ Drinking
All Fiber Sizes ☐ Waste ☐ Drinking

TEM- Dust
☐ Microvac - ASTM D 5755
☐ Wipe - ASTM D6480
☐ Carpet Sonication (EPA 600/J-93/167)

Soil/Rock/Vermiculite
☐ PLM EPA 600/R-93/116 with milling prep (<1%)
☐ PLM EPA 600/R-93/116 with milling prep (<0.25%)
☐ TEM EPA 600/R-93/116 with milling prep (<0.1%)
☐ TEM Qualitative via Filtration Prep
☐ TEM Qualitative via Drop Mount Prep
☐ Cincinnati Method EPA 600/R-04/004 – PLM/TEM (BC only)

Other:
☐

☐ **Check For Positive Stop – Clearly Identify Homogenous Group**

Filter Pore Size (Air Samples): ☐ **0.8µm** ☐ **0.45µm**

Samplers Name:

Samplers Signature:

Sample #	Sample Description	Volume/Area (Air) HA # (Bulk)	Date/Time Sampled

Client Sample # (s): - **Total # of Samples:**

Relinquished (Client): **Date:** **Time:**

Received (Lab): **Date:** **Time:**

Comments/Special Instructions:

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Asbestos Chain of Custody

EMSL Order Number (*Lab Use Only*):

PHONE:
FAX:

Additional Pages of the Chain of Custody are only necessary if needed for additional sample information

Sample #	Sample Description	Volume/Area (Air) HA # (Bulk)	Date/Time Sampled

***Comments/Special Instructions:**

Page _____ of _____ pages

Asbestos Bulk Building Material Chain of Custody

EMSL Order Number (*Lab Use Only*):

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 786-5974

Company :		**EMSL-Bill to:** ☐ Same ☐ Different If Bill to is Different note instructions in Comments** *Third Party Billing requires written authorization from third party*	
Street:			
City:	**State/Province:**	**Zip/Postal Code:**	**Country:**
Report To (Name):		**Telephone #:**	
Email Address:		**Fax #:**	**Purchase Order:**
Project Name/Number:		**Please Provide Results:** ☐ **Fax** ☐ **Email**	
U.S. State Samples Taken:		**CT Samples:** ☐ **Commercial/Taxable** ☐ **Residential/Tax Exempt**	

Turnaround Time (TAT) Options* – Please Check

☐ **3 Hour**	☐ **6 Hour**	☐ **24 Hour**	☐ **48 Hour**	☐ **72 Hour**	☐ **96 Hour**	☐ **1 Week**	☐ **2 Week**

**For TEM Air 3 hr through 6 hr, please call ahead to schedule.*There is a premium charge for 3 Hour TEM AHERA or EPA Level II TAT. You will be asked to sign an authorization form for this service. Analysis completed in accordance with EMSL's Terms and Conditions located in the Analytical Price Guide.*

PLM - Bulk (reporting limit)	**TEM – Bulk**
☐ PLM EPA 600/R-93/116 (<1%)	☐ TEM EPA NOB – EPA 600/R-93/116 Section 2.5.5.1
☐ PLM EPA NOB (<1%)	☐ NY ELAP Method 198.4 (TEM)
Point Count ☐ 400 (<0.25%) ☐ 1000 (<0.1%)	☐ Chatfield Protocol (semi-quantitative)
Point Count w/Gravimetric ☐ 400 (<0.25%) ☐ 1000 (<0.1%)	☐ TEM % by Mass – EPA 600/R-93/116 Section 2.5.5.2
☐ NIOSH 9002 (<1%)	☐ TEM Qualitative via Filtration Prep Technique
☐ NY ELAP Method 198.1 (friable in NY)	☐ TEM Qualitative via Drop Mount Prep Technique
☐ NY ELAP Method 198.6 NOB (non-friable-NY)	**Other**
☐ OSHA ID-191 Modified	☐
☐ Standard Addition Method	

☐ **Check For Positive Stop – Clearly Identify Homogenous Group**	**Date Sampled:**
Samplers Name:	**Samplers Signature:**

Sample #	**HA #**	**Sample Location**	**Material Description**

Client Sample # (s):	**-**	**Total # of Samples:**
Relinquished (Client):	**Date:**	**Time:**
Received (Lab):	**Date:**	**Time:**
Comments/Special Instructions:		

Asbestos Bulk Building Material Chain of Custody

EMSL Order Number (*Lab Use Only)*:

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 786-5974

Additional Pages of the Chain of Custody are only necessary if needed for additional sample information

Sample #	HA #	Sample Location	Material Description

***Comments/Special Instructions:**

TestAmerica Dallas / Fort Worth
3226 Commander Drive

Carrollton, TX 75006-2507
phone 214.218.1894 fax

Chain of Custody Record

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

TestAmerica Laboratories, Inc.

Regulatory Program: ☐ DW ☐ NPDES ☐ RCRA ☐ Other:

Client Contact	**Project Manager:**	**Site Contact:**	**Date:**	COC No:
	Tel/Fax:	**Lab Contact:**	**Carrier:**	_____ of _____ COCs
Address	**Analysis Turnaround Time**			Sampler:
City/State/Zip	☐ CALENDAR DAYS ☐ WORKING DAYS			**For Lab Use Only:**
Phone	TAT if different from Below _____			Walk-in Client:
FAX	☐ 2 weeks			Lab Sampling:
Project Name:	☐ 1 week			
Site:	☐ 2 days			Job / SDG No.:
P O #	☐ 1 day			

Sample Identification	**Sample Date**	**Sample Time**	**Sample Type (C=Comp, G=Grab)**	**Matrix**	**# of Cont.**	**Filtered Sample (Y / N)**	**Perform MS / MSD (Y / N)**																Sample Specific Notes:

Preservation Used: 1= Ice, 2= HCl; 3= H_2SO_4; 4=HNO_3; 5=NaOH; 6= Other _____

Possible Hazard Identification:
Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample.

☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)

☐ Return to Client ☐ Disposal by Lab ☐ Archive for _____ Months

Special Instructions/QC Requirements & Comments:

Custody Seals Intact: ☐ Yes ☐ No	Custody Seal No.:	Cooler Temp. (°C): Obs'd:_____ Corr'd:_____	Therm ID No.:_____

Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received in Laboratory by:	Company:	Date/Time:

Appendix F

Cleanup Plans

BRADY
Environmental Services, Inc.
Consulting - Engineering - Inspections - Remediation

TECHNICAL SPECIFICATIONS
ASBESTOS AND LEAD HAZARD ABATEMENT

of the

Hotel Grim
301 North State Line Avenue
Texarkana, Texas 75501

Prepared for:

Sari and Company
406 4th Street
Winston Salem, NC 27101

Prepared by:

J. Mark Swinnea, P.E.
Consultant License # 105066

Fredy Polanco, MS, CSP
CSP # 25028

May 24, 2017

P.O. Box 2623 • Lindale, TX 75771
Office (903) 882-6865 • Toll Free (866) 882-6865 • Fax (903) 882-6867

TECHNICAL SPECIFICATIONS
ASBESTOS AND LEAD HAZARD ABATEMENT

Hotel Grim
301 North State Line Avenue
Texarkana, Texas 75501

SECTION 2 - ASBESTOS

SECTION 3 - LEAD HAZARD ABATEMENT

3.18 Medical Surveillance
3.19 Hazard Communications
3.20 Training
3.21 Signs
3.22 Record Keeping
3.23 Certification of Visual Inspection

ATTACHMENTS:
Certificate of Worker's Acknowledgement
Asbestos Inspection Records, 2015
Lead Paint Report, 2015

INFORMATION FOR CONTRACTORS

GENERAL These instructions apply to proposals for the asbestos and lead hazard abatement services for the Hotel Grim Building Project in Texarkana, Texas.

CONTRACT DOCUMENTS The contract documents for the work proposed will include:

1. The specifications and documents including the drawings and attachments included in this request for proposal, together with changes, if any, based on the contractor's proposal or other submittals to the extent incorporated in this document prior to its execution.
2. All engineering information and other data submitted by the contractor and reviewed by owner.
3. Contractor's proposal.
4. The owner's purchase orders and other supplemental written documents which may be issued as amendments to the contract.

These documents collectively shall form the contract between the owner and the successful contractor for the contract duration.

DOCUMENTS FOR PROPOSAL Prospective contractors invited to make a direct proposal to owner will be furnished one copy of the contract documents.

Site Location	Hotel Grim Building 301 North State Line Road Texarkana, Texas
Owner of Record	Sari and Company 406 4th Street Winston Salem, NC 27101
Owner's Representative	Swift Creek Environmental Mr. Tom Houghton 8201 County Drive Disputanta, VA 23842 Office 804-991-3213 Fax: 804-991-2194 Email: swiftcreekinc@aol.com
Consultant of Record/ Consulting Agency	Brady Environmental Services, Inc. Mr. J. Mark Swinnea, P.E. P.O. Box 2623 Lindale, Texas 75771 Office: 903-882-6865 Fax: 903-882-6867 Email: mark@bradyenvironmental.com

PROPOSALS Contractors shall prepare and submit four (4) identical proposals. Each proposal shall contain a complete bound copy of the required supplemental data. Proposals which are not prepared and submitted in accordance with these instructions will be considered irregular and may be rejected at the discretion of the owner.

1. Preparation - Each proposal shall be carefully prepared using identical proposal forms bound herewith. Entries on the proposal forms shall be typed or legibly written in black ink. All prices shall be stated in words and figures except where the forms provide figures only.

   The contractor shall bind, with each proposal copy submitted, a signed copy of each addendum issued for the contract documents during the proposal period. The contractor shall assemble all supplementary information required and shall attach such information to the proposal.

2. Signatures - Contractor shall sign each proposal with contractor's usual signature and shall give contractor's full business address. Proposals by partnerships shall be signed with the partnership name followed by the signature and designation of one of the partners or other authorized representative.

   Proposals by a corporation shall be signed in the name of the corporation followed by the signature and designation of the president, secretary, or other person authorized to offer a proposal for the corporation. The names of all persons signing should also be typed or printed below the signature.

   When requested, satisfactory evidence of the authority of the officer signing on behalf of the corporation shall be furnished. Proposing corporations shall designate the state in which they are incorporated and the address of their principal office.

3. Submittal - Proposals shall be submitted in sealed envelopes each endorsed on the outside with the contractor's name, the owner's contract number, and the title of the project.

   Contractor's four (4) signed identical proposals, complete with four (4) copies of all required supplemental information, shall be submitted at the time and place named in these contract documents. These proposals shall be addressed to Owner of Record, at the address as indicated.

4. Firm Proposal - Each proposal shall be firm, not subject to escalation. Proposals may not be withdrawn for ninety (90) days after the date of submission.

TAXES The owner may qualify as exempt from federal, state and municipal sales taxes. Upon request, the successful contractor will be furnished the certification necessary to obtain the tax exemption.

TIME OF COMPLETION The contractor understands that the work under this Agreement shall be performed as directed by owner. The time set for completion of the work scope is a critical element of the project. The Contractor shall do everything within his power to complete the work within the agreed time period. It will be necessary that the contractor satisfy owner of contractor's ability to complete the work within the stipulated time.

INTERPRETATION OF CONTRACT DOCUMENTS If any prospective contractor is in doubt as to the true meaning of any part of the proposed contract documents, contractor may submit to owner a written request for an interpretation thereof. The person submitting the request will be responsible for its prompt delivery, and all requests must be received by owner at least five (5) working days before the scheduled proposal opening. Any interpretation of the contract documents will be made only by addendum duly issued, and a copy of such addendum will be mailed or delivered to each person receiving a set of the contract documents. The owner will not be responsible for any other explanations or interpretations of the proposed documents.

It shall be the responsibility of the contractor to advise the owner of conflicting requirements or omissions of information which are necessary for a clear understanding of the work, before the date set for opening proposals. Those questions not resolved by addenda shall be listed in the contractor's proposal, together with statements of the basis upon which the proposal is made as affected by each question.

PERFORMANCE AND PAYMENT BONDS The contractor may be required to furnish good and sufficient Performance and Payment Bonds prior to performance of services. A cost line item on the Contractor's proposal documents shall indicate bonding costs. All provisions of the bonds shall be complete and in full accordance with statutory requirements including Vernon's Texas Government Code Title 10, Chapter 2253. The bonds shall be executed with the proper sureties through a company or companies licensed and qualified to operate in the State of Texas and acceptable to the owner. The cost of the bonds shall be included on the proposal.

ACCEPTANCE AND REJECTION OF PROPOSALS A contract will be awarded to a responsible contractor after analysis and evaluation of the proposals by the owner. The owner reserves the right to accept the proposal which, in its judgment, is the evaluated best proposal, to reject any and all proposals, and to waive irregularities and informalities in any proposal that is submitted. It is agreed that the contract between the owner and the successful contractor shall not come into existence until the actual signing of the contract.

OWNERSHIP OF DRAWINGS AND SPECIFICATIONS Title to all Specifications and other contract documents are here with the Consultant and Owner. All contractors and the successful contractor awarded the contract agree that these documents and/or materials will not be used in any manner other than for the preparation of proposals and for the services covered by the contract documents. Documents referred to other firms for proposals on subcontracts will be subject to the same provisions.

METHOD OF EVALUATION In addition to cost considerations, award of the contract to perform this work will be based upon the owner's evaluation of the following:

a.) Contractor's ability to prove strict compliance to contract specifications.

b.) Previous asbestos and lead abatement/installation experience of the contractor and its employees.

c.) The number, seriousness and resolution of any citations/terminations issued to contractor or its personnel.

d.) Contractor's ability to perform the majority of the work with contractor's own forces and under the management of contractor's own organization.

e.) Quality of contractor's Asbestos and Lead Hazard Abatement Plan.

f.) Quality of contractor's compliance record program.

g.) Quality of Contractor's safety program and resulting safety record.

h.) Quality of contractor's safety program and safety record as indicated by Workman's Compensation modification ratings.

i.) Quality of contractor's drug screening program.

j.) Quality of contractor's proposed work methods.

k.) Qualifications of proposed Subcontractors and the specific job roles of each.

CONTRACTOR QUALIFICATIONS AND SUBMITTALS

GENERAL Each contractor shall submit with its proposal, information for owner's use in evaluating the contractor's proposal and its ability to satisfactorily perform the work. Contractors not meeting the minimum qualifications are subject to rejection of proposal.

The information submitted with the contractor's proposal will become part of the contract documents if the contractor's proposal is accepted. Any changes or substitutions shall be made only with the written acceptance of the owner, and such change or substitution shall not be cause for additional financial compensation nor shall they invalidate the contract in any way.

QUALIFICATIONS The minimum qualifications necessary for eligibility to perform services under this contract are stated within the following information to be submitted.

INFORMATION TO BE SUBMITTED The following information shall be submitted:

a.) Licenses - The number and description of any licenses for asbestos and lead abatement-related work (including Texas Department of State Health Services) held by the firm, any subcontractor to the firm, or any employee of the firm, or of a subcontractor who shall perform services under this contract. The firm must hold all necessary licenses and training for asbestos and lead related work (including Texas Department of State Health Services) as well as subcontractors to the firm and employees of a subcontractor who shall perform abatement-related work under this contract.

b.) Experience - The firm must have performed asbestos and lead abatement work for a minimum of three (3) years on large and small scale projects including city/county/school/commercial/retail/office facilities. Similar project references with contract names and man hours worked shall be listed. Company management and job supervisory personnel must show abatement experience of at least five (5) years with two (2) of the years in a supervisory capacity with contractor and must meet the state licensing requirements. Organizational charts showing corporate and intended jobsite supervisory personnel shall be submitted with resumes of each individual.

c.) Citations/Terminations - The Contractor and all subcontractors shall submit a statement, signed by an officer of the company, containing a record of any citations issued by Federal, State or local regulatory agencies relating to asbestos and lead activities (including projects, dates, and resolutions); a list of penalties incurred through non-compliance with asbestos and/or lead project specifications, including liquidated damages, overruns in scheduled time limitations and resolutions; and situations in which an asbestos/lead-

related contract has been terminated (including projects, dates, and reasons for terminations). If there are none, a negative declaration signed by an officer of the company shall be provided. The firm must be free of any active claims or civil citations, notices of violations, legal proceedings, and project terminations from any federal, state, or local regulatory agency or department issued to or served upon the firm.

d.) Subcontractors – A list of all proposed Subcontractors anticipated.

e.) Organization Report - The Contractor shall submit a qualification and organization report. The report shall describe the qualifications of the certified supervisor, and certified abatement workers. Include in the report an organization chart showing the Contractor's personnel by name and title and project specific responsibilities and authorities. The report shall be signed by the Contractor and the certified abatement supervisor to indicate that all personnel comply with certification and experience requirements of this section and that project personnel have been given the authority to complete the tasks assigned to them.

f.) Safety Record and Program - The contractor shall supply Workman's Compensation modification ratings for the last three (3) years and a log of accident reports showing any injuries occurring on all jobs in the last three (3) years. Proposals must also include detailed descriptions of safety and safety training programs. A well-established safety program and clean safety record are required to be considered an acceptable contractor for this contract. The contractor must have an effective, well established safety program and clean safety record.

g.) Drug Screening Program - The contractor shall have an established drug screening program for all workers to be employed on the Hotel Grim job site. Description and evidence of this program shall be included in the proposal.

h.) Asbestos and Lead Hazard Abatement Plan (ALHAP) – Contractor's shall prepare a work plan detailing Contractor's planned approach for completing abatement activities. This plan shall address means and methods including containment areas and sequencing of abatement and clearance.

ADDITIONAL INFORMATION TO BE SUBMITTED

a.) Surety – A letter of certification from a surety company to confirm that the contractor is qualified to execute a valid performance bond and a valid payment bond for the project.

b.) Exceptions – Any exception to the specifications, requirements or the terms and conditions of this contract must be clearly acknowledged and explained on a separate page and must accompany the proposal.

REJECTION OF PROPOSAL Failure to submit information detailed in this section under Qualifications, Information to be submitted, and Additional Information to be submitted may be cause for rejection of contractor's proposal. Contractor's submittals will be used, at the sole discretion of the owner, in determining whether the contractor's proposal is accepted or rejected.

PROJECT ADMINISTRATION

The Prime Contractor, also identified as the Abatement Contractor, shall be identified in these documents as "Contractor". The Prime Contractor is responsible for assuring that all site personnel under their authority adhere to the Contractor's Project Safety & Health Programs, job specifications and all local, state and federal rules, regulations and procedures.

Project administration is one of the key elements in communicating and coordinating site activities and Safety & Health obligations. The Contractor shall develop a site specific written "Project Safety and Health Program: to ensure all persons on site shall work in a safe environment where job tasks are coordinated and organized.

Weekly project coordination and safety meetings will be held at the Contractor's job trailer. Representatives from each active Subcontractor, building Owner Representative and Consultant's Representative shall attend.

All work site personnel, including Owner's Representatives, Contractor's Project Superintendent, Environmental Consultant's Personnel, Abatement Contractor Competent Person and Subcontractors, will familiarize themselves with these specifications, and the Prime Contractor's Accident Prevention Plan.

Visitor(s) accessing the site for less than an eight (8) hour period shall be accompanied by an authorized person - one who has been trained on the project hazards and who is familiar with the project throughout the entirety of his/her visit.

The Prime Contractor and all lower tier Subcontractors shall take all necessary precautions to protect all on-site personnel from any hazards involving safety & health arising from the scope of work and/or in the course of completing the scope of work.

Any person on site may shut down a work operation that poses imminent danger or a situation arises which is immediately dangerous to life or health on site. When such precautions must be immediately taken, the Project Superintendent and/or Competent Person shall be immediately notified and actions to remedy the situation shall be implemented.

The Prime Contractor shall hold Subcontractors responsible and accountable for safety compliance on the project site with the Project Safety & Health Program.

The Prime Contractor shall assure all onsite personnel have in the possession at the job site, the necessary safety equipment such as fall protection safety harnesses and lanyards, hard hats, respirators, safety glasses, safety shoes and other safety equipment and require their use as needed.

All incidents / accidents shall be immediately communicated to the Contractor's Project Superintendent and Consultant's Project Manager. An incident / accident investigation report shall be submitted within twenty-four (24) hours of the incident. A copy of any supportive material utilized in the investigation shall also be submitted along with the report (i.e. photographs, drawings and witness statements).

All "recordable" accidents, incidents or fatalities as per OSHA 29 CFR 1904 Subpart C should be immediately communicated to the Consultant and Owner's Representative.

For compliance with applicable state and federal regulatory requirements, a state notification should be filed with the Texas Department of State Health Services. This notification should be filed at least ten working days prior to commencement of abatement.

JOB SITE FACILITIES

The Prime Contractor shall set up a temporary job site trailer for the project duration. These facilities shall have electric service and include heating and air conditioning. The job trailer shall have a minimum of two work stations and a meeting area to accommodate weekly project site coordination meetings. One full work station will be available to the Environmental Consultant's Project Manager, for daily on-site analysis of PCM air samples.

Utilities, including electricity and water are not presently available at the site. The Contractor shall arrange such services at his expense and pay for the use. The Contractor shall set up GFCI distribution panels to provide distribution for the project.

KEY PERSONNEL

The term "Contractor" as referred to in these contract documents and specifications shall apply to the Prime Contractor, and/or any and all Subcontractors in the performance of their scope of services. The Prime Contractor shall hold Subcontractors accountable and responsible for compliance with the project specifications and regulatory standards as may be applicable to the Subcontractor's scope of services. The following information defines the obligations and requirements of key personnel for Owner Representatives, Abatement Contractor and all Subcontractor personnel who play a vital role in the Project Execution and Safety.

The Project Superintendent is the on-site coordinator and overseer of Primer Contractor's operations. It is the duty of the Project Superintendent to see to the maintenance of site security, the coordination of activities by all Subcontractors, and to verify that all activities are performed in a safe manner. The Project Superintendent is responsible for adherence to the plans and specification and the safety & health practices and conditions on site.

The Project Superintendent's responsibilities shall also include the following:

1. The Project Superintendent shall ensure all personnel of Subcontractors are in compliance with safe work practices and attend all weekly safety meetings.

2. Give on-going input into necessary changes to the Project Safety & Health Program.

3. Hold Subcontractors responsible and accountable for compliance with project specifications as well as their own Project Specific Safety & Health Program.

4. Schedule and direct weekly Safety & Health meetings.

5. Require submittal of a written plan from all Subcontractors regarding how work processes will be safely performed.

6. Maintain copies of all safety data sheets (SDS) and start job specific files for SDS' and provide access of such to all Subcontractors.

7. Take immediate action to correct unsatisfactory conditions and work practices personally observed or brought to his attention arising from Subcontractor activities. Immediately discontinue work around the unsafe area until concerns are properly addressed.

8. Assure that all injuries are reported and treated.

9. Assure that OSHA recordkeeping requirements are maintained.

10. Complete weekly job safety walk-through assessments.

OSHA defines a Competent Person as "one who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous or dangerous to employees and who has authorization to take prompt corrective measures to eliminate them". This individual must have an OSHA 30-hour training for the construction industry under the outreach program.

The Designated Competent Persons for the Prime Contractor and all lower tier Subcontractors shall be submitted by each Contractor prior to the start of project site activities.

Job site employees of Prime Contractor as well as Subcontractors shall have Stop Work Authority. Any person on site may shut down a work operation that poses imminent danger or a situation arises which in immediately dangerous to life or health on site. When such precautions must be immediately taken, the Project Superintendent and / or Competent Persons shall be immediately notified and actions to correct the situation shall be implemented. All employees of any Contractor must take the OSHA 10-hour training for the Construction Industry under the outreach program.

The Project Consultant as referred to in the specifications refers to the Texas licensed Consultant retained by the Owner to provide oversight and testing services. The Consultant will designate licensed Project Managers and Air Monitoring Technicians (AMT) to provide daily monitoring of contractor's abatement activities. These individuals are referred to in these documents as Project Manager and/or AMT.

SUB-CONTRACTORS

Subcontractors are responsible for the training of workers, safety inspections, necessary safety documentation and coordinating of work for safe means through the Prime Contractor.

Copies of the Project Safety & Health Program will be included in the Subcontractor's pre-construction submittals. Each Subcontractor shall keep a copy of the Project Safety & Health Program in their company's on-site facilities. Each contractor is responsible for training and familiarization of their workers with the minimum requirements set forth in this manual and any changes which are made to it.

All Subcontractors to the Prime Abatement Contractor are responsible for administering project orientation training for their workers. Safety is the responsibility of everyone on site, requiring everyone to work together to achieve a safe workplace.

INTRODUCTION

The Hotel Grim building, constructed in 1925, consists of eight floors and a full basement. Current plans call for extensive repairs and renovations to the structure. During March 2015, an asbestos survey was conducted by HEC Environmental Group. During May 2015, lead based paint sampling was performed by Terracon. These inspections identified asbestos and lead hazards are present throughout the building. Brady Environmental Services was retained by Swift Creek Environmental in March 2017 to review asbestos and lead inspection records and reassess materials and site conditions.

Scope of Work

Work covered by these specifications shall include the following:

1) Remove and dispose all identified asbestos-containing materials.
2) Remove and dispose all asbestos-containing debris and furnishings.
3) Decontaminate all remaining interior surfaces from asbestos fibers.
4) Obtain final clearance air levels by PCM and/or TEM in accordance with these specifications.
5) Remove and dispose all lead contaminated debris and furnishings.
6) Remove and dispose all damaged and flaking lead based paints.
7) Remove and dispose all lead painted components not scheduled for reuse. Components to include doors, door trim, trim work, molding, window components, wanes coating and other damaged components having lead based paints.
8) Remove and dispense of non-structural ceiling and walls as lead contaminated where specified for removal in architectural demolition plans.
9) Obtain final HUD level clearance for lead dust from each room equivalent space.
10) Partial stripping of lead based paints from remaining surfaces as needed to facilitate general building repairs and renovations.
11) Apply prime coat of paint to seal all remaining walls and ceilings where lead paints are not removed in their entirety.
12) Removal of all damaged structural components and damaged sub-structural components as needed to complete asbestos and lead hazard abatement.

Asbestos Containing Materials

The asbestos inspection records identify floor tile and mastics, TSI on piping and boiler systems, and asphaltic roofing as asbestos containing materials. In addition to the 2015 asbestos inspection, transite boards were identified on the upper levels during the 2017 reassessment. Current site conditions reveal significant damage to asbestos containing materials that are present on every level of the building.

Lead Based Paint Hazards

The paint testing performed in 2015 involved the sampling of seven predominate paints found throughout the structure. Analytical results indicated lead content was greater than the 300-ppm level set by the Consumer Product Safety Commission for all samples. Five of the seven samples were in excess of 5,000-ppm. Lead based paints are found on each floor of the building and were applied to walls, ceilings, columns, pillars, trim, doors, windows and railing. All lead based paints are in poor condition with extensive flaking, peeling and chalking throughout the entire structure.

Other Job Site Hazards

Water damage from compromised roofing and open doors/windows has led to significant damage to interior finishes. Vandalism has led to a large amount of asbestos piping insulation being exposed and displaced. The building contains a large amount of debris on each level resulting from contents and furnishings left in place.
These conditions have resulted in the wide spread distribution of asbestos and lead contaminants throughout the building.

These technical specifications address safeguards and procedures to be followed during the abatement of the asbestos and lead hazards. The scope of work shall include removal of all debris, contents and damaged building finishes as asbestos and lead containing. Exceptions shall be limited to hard non-porous surface items which can be cleaned for disposal as general construction debris.

Water damage and general deterioration has resulted in a partial collapse of the roof system on the top level, and first floor kitchen areas. This damage has compromised portions of the stairways.

Work Plan

The Contractor shall first establish a first-floor safe zone as an access and staging area for the project. This zone must be in a structurally sound area and shall be abated to remove asbestos and lead hazards. This safe zone shall be large enough to accommodate workers egress and project supplies. Following the establishment of the safe zone, the Contractor shall begin shoring, railing installations and sign placement as required to secure and properly mark hazards and provide safe egress throughout the structure.

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN SOCIETY OF SANITARY ENGINEERING (ASSE)

ASSE Z9.2	(2012) Fundamentals Governing the Design and Operation of Local Exhaust Ventilation Systems

ASTM INTERNATIONAL (ASTM)

ASTM D4397	(2016) Standard Specification for Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications
ASTM E1368	(2014) Visual Inspection of Asbestos Abatement Projects
ASTM E1727	(2016) Standard Practice for Field Collection of Soil Samples for Subsequent Lead Determination
ASTM E1728	(2016) Collection of Settled Dust Samples Using Wipe Sampling Methods for Subsequent Lead Determination
ASTM E1792	(2003; R 2016) Standard Specification for Wipe Sampling Materials for Lead in Surface Dust

INTERNATIONAL SAFETY EQUIPMENT ASSOCIATION (ISEA)

ANSI/ISEA Z87.1	(2015) Occupational and Educational Personal Eye and Face Protection Devices

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 701	(2015) Standard Methods of Fire Tests for Flame Propagation of Textiles and Films

NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH (NIOSH)

NIOSH NMAM	(2016; 5th Ed) NIOSH Manual of Analytical Methods
29 CFR 1910.134	Respiratory Protection

29 CFR 1910.141	Sanitation
29 CFR 1910.147	Control of Hazardous Energy (Lock Out/Tag Out)
29 CFR 1926.1101	Asbestos
29 CFR 1926.62	Lead Construction Standard
40 CFR 61	National Emission Standards for Hazardous Air Pollutants
40 CFR 745	Lead-Based Paint Poisoning Prevention in Certain Residential Structures
40 CFR 763	Asbestos
42 CFR 84	Approval of Respiratory Protective Devices
49 CFR 107	Hazardous Materials Program Procedures
49 CFR 171	General Information, Regulations, and
49 CFR 172	Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements

UNDERWRITERS LABORATORIES (UL)

UL 586	(2009; Reprint Sep 2014) Standard for High-Efficiency Particulate, Air Filter Units

U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT (HUD)

(1995; Errata Aug 1996; Rev Ch. 7 - 1997) Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

Lead-Based Paint Poisoning Prevention in Certain Residential Structures

Texas Environmental Lead Reduction Rules

Toxic Substances Control Act (15 United States Code §2681 et seq.) Title IV, and the rules adopted by the EPA under that law for authorization of state programs.

Title X, Residential Lead-Based Paint Hazard Reduction Act of 1992.

SECTION I – SAFETY

1.1 Safety Management

The Contractor shall be required to provide, maintain, and implement various safety related requirement including submittal of a site-specific Accident Prevention Plan (APP) that will be utilized for all abatement related activities at the Hotel Grim site. This plan shall include all Contractor personnel, as well as Subcontractors and Subcontractor personnel under his direction. The APP shall be in accordance with the format and requirements of all applicable OSHA standards for the anticipated job site hazards.

Activity Hazard Analyses

AHAs for each major phase of work, shall be submitted and updated during the project. The analysis shall define the activities to be performed for a major phase of work, identify the sequence of work, the specific hazard anticipated, and the control measures to be implemented to eliminate or reduce each hazard to an acceptable level. Work shall not proceed on that phase until the AHA has been accepted and a preparatory meeting has been conducted by the Contractor to discuss its contents with everyone engaged in the activities, including the onsite owner's representatives. The AHAs shall be continuously reviewed and, when appropriate, modified to address changing site conditions or operations.

Asbestos and Lead Hazard Abatement Plan

The Contractor shall prepare and maintain an asbestos and lead abatement plan that conforms to these specifications and shall at a minimum contain and address the following elements:

a) The personal protective equipment to be used;
b) The location and description of each regulated area including clean and dirty areas, access tunnels, and decontamination unit (clean room, shower room, equipment room, storage areas such as load-out unit);
c) Initial exposure assessment in accordance with 29 CFR 1926.1101;
d) Initial exposure assessment in accordance with 29 CFR 1926.62;
e) Level of supervision;
f) Method of notification of other employers at the worksite;
g) Abatement method to include containment and control procedures;
h) Interface of trades;
i) Sequencing of asbestos and lead related work;
j) Storage and disposal procedures and plan;
k) Type of wetting agent and asbestos encapsulant;
l) Type of chemical stripper and application plan for lead removal;
m) Location of local exhaust equipment;

n) Air monitoring methods and records (personal, environmental and clearance);
o) Bulk sampling and analytical methods and results;
p) A detailed description of the method to be employed in order to control the spread of ACM wastes and airborne fiber;
q) Detailed description of method to be employed to minimize lead dust hazards;
r) Detailed description of lead waste containment and TCLP testing and hazardous materials disposal plan;
s) Fire and medical emergency response procedures;
t) The security procedures to be used for all regulated areas.

1.2 Job Site Safety and Environmental Requirements

The Contractor will be solely and completely responsible for conditions on the Job Site, including safety of all persons and property during performance of Contractor's work. This requirement will apply continuously and not be limited to normal working hours.

The Contractor shall assign a designated, competent person as "Safety Manager", for all phases of Contractor's services. The Safety Manager must have the training and experience to recognize unsafe conditions whenever contractor's work is in progress. The Safety Manager shall also be responsible for implementing, maintaining, and recording of Site Specific Safety Plan. The designated Safety Manager shall have and executive oversite for all Subcontractors under prime Contractor's control.

The Contractor shall conduct on-site safety meetings and provide the Consultant's Project Manager with appropriate documentation.

The Owner may hire a third-party safety audit of the job site and work in progress at any time and on as many occasions as deemed necessary by the Owner. Any deficiencies discovered may subject the Contractor to a work shut down until such matters are properly addressed and corrected. The Owner shall not be responsible for effects and financial impact to the Contractor of safety related shut downs.

The Contractor shall maintain an adequately stocked first aid kit in a convenient and accessible location at the premises.

1.3 **Emergency Response**

In the event of a jobsite EMERGENCY the Contractor's Competent Person will call 911 and give the details of an EMERGENCY and provide assistance as needed to Emergency Responders.

EMERGENCY SERVICES NOTIFICATION

It will be the Competent Person responsibility to notify by telephone the local fire department, emergency medical service (or ambulance company), and police department prior to start of construction / abatement activities at the Hotel Grim project.

The responsibility of the Contractor's Competent Person during emergency and/or potential emergency situations shall include the following:

a) Assessing the situation and determining whether an emergency exists that requires activating the emergency procedures.
b) Directing the efforts in the area including personnel to minimize injury and property loss.
c) Ensuring that outside emergency services such as medical aid and local fire departments are called in when necessary.
d) Directing the shutdown of operations and building evaluation when necessary.

1.4 Unsafe and Hazardous Conditions, Housekeeping

The Contractor shall instruct each employee in the recognition and avoidance of unsafe conditions and the regulations applicable to his work environment to control or eliminate any hazards or other exposure to illness or injury.

1.4.2 During the course of construction, alteration, or repairs, debris, glass and lumber with protruding nails shall be kept cleared from work areas, passageways, and stairs. 29 CFR 1926.25 (a)

1.4.2 Construction areas, aisles, stairs, ramps, runways, corridors, offices, shops, and storage areas where work is in progress shall be lighted with either natural or artificial illumination. The minimum illumination requirements for work areas shall meet or exceed the OSHA construction Industry Standards. 29 CFR 1926.56 (a) Table D-3

1.4.3 Good housekeeping is essential for creating a safe work place and is the responsibility of each person on the construction site. Removal of trash slipping, and tripping hazards will be on-going throughout each day. Materials will be disposed of in their designated receptacles places throughout the construction site. Electrical cords, hoses, tools and supplies will be placed so as not to create a tripping or overhead hazard. 29 CFR 1926.25

1.5 Personal Protective Equipment – 29 CFR 1926 Subpart E

The Contractor is responsible for requiring the wearing of appropriate personal protective equipment in all operations where there is an exposure to hazardous conditions.

1.5.1 “Application”
Protective equipment, including personal protective equipment for eyes, face, head, and extremities, protective clothing, respiratory devices, and protective shields and barriers, shall be provided, used, and maintained in a sanitary and reliable condition wherever it is necessary by reason of hazards encountered in a manner capable of causing injury or impairment in the function of any part of the body through absorption, inhalation or physical contact. – 29 CFR 1926.95 (a)

1.5.2 "Design."
All personal protective equipment shall be of safe design and construction for the work to be performed. - 29 CFR 1926.95 (c)

1.5.3 Head Protection - 29 CFR 1926.100
Employees working in areas where there is a possible danger of head injury from impact, or from falling or flying objects, or from electrical shock and burns, shall be protected by protective helmets. The Contractor must provide each employee with head protection that meets the specifications contained in any of the following consensus standards:

American National Standards Institute (ANSI) Z89.1-2009, "American National Standard for Industrial Head Protection.

American National Standards Institute (ANSI) Z89.1-2003, "American National Standard for Industrial Head Protection,"

American National Standards Institute (ANSI) Z89.1-1997, "American National Standard for Personnel Protection-Protective Headwear for Industrial Workers-Requirements."

1.5.4 Hearing Protection 29 CFR 1926.101
Wherever it is not feasible to reduce the noise levels or duration of exposures to those specified in Table D-2, Permissible Noise Exposures, in 1926.52, ear protective devices shall be provided and used. Ear protective devices inserted in the ear shall be fitted or determined individually by competent persons.

1.5.5 Eye and Face Protection 29 CFR 1926.102
The Contractor shall ensure that each affected employee uses appropriate eye and face protection throughout all phases of cleaning, debris removal, construction of temporary barriers and abatement / stabilization work.

The Contractor shall ensure that each affected employee who wears prescription lenses while engaged in operations that involve eye hazards wears eye protection that incorporates the prescription in its design, or wears eye protection that can be worn over the prescription lenses without disturbing the proper position of the prescription lenses or the protective lenses.

Protective eye and face protection devices must comply with any of the following consensus standards:

ANSI/ISEA Z87.1-2010, Occupational and Educational Personal Eye and Face Protection Devices.

ANSI Z87.1-2003, Occupational and Educational Personal Eye and Face Protection Devices.

ANSI Z87.1-1989 (R-1998), Practice for Occupational and Educational Eye and Face Protection.

1.5.6 Hand Protection

The Contractor / Subcontractor employees shall be required to use appropriate hand protection at all times while on the project site. Appropriate hand protection shall be selected based upon the task(s) to be performed, conditions present, duration of use, as well as the hazards and potential hazards identified.

1.5.7 "Employee-Owned Equipment"

Where employees provide their own protective equipment, the Contractor shall be responsible to assure its adequacy, including proper maintenance, and sanitation of such equipment.

1.6 Lifelines, Safety Belts, and Lanyards 29 CFR 1926.104

Lifelines, safety belts, and lanyards shall be used only for employee safeguarding. Lifelines shall be secured above the point of operation to an anchorage or structural member capable of supporting a minimum dead weight of 5,400 pounds. Safety belt lanyard shall be a minimum of 1/2-inch nylon, or equivalent, with a maximum length to provide for a fall of no greater than 6 feet. The rope shall have a nominal breaking strength of 5,400 pounds.

1.7 Safety Nets 29 CFR 1926.105

Safety nets shall be provided where site conditions include working more than 25 feet above ground, or other surfaces where the use of ladders, scaffolds, catch platforms, temporary floors, safety lines, or safety belts is impractical. Where these conditions exist, all netting shall comply with 29 CFR 1926.105.

1.8 Fire Protection and Prevention

a) The contractor shall comply with and utilize all fire protection and prevention stands of the 29 CFR 126 Subpart F.

b) The Contractor shall be responsible for the development of a fire protection program to be followed throughout all phases of abatement work. As fire hazards occur, there shall be no delay in providing the necessary equipment.
c) Access to all available firefighting equipment shall be maintained at all times.
d) All firefighting equipment shall be conspicuously located.
e) All firefighting equipment shall be periodically inspected and maintained in operating condition. Defective equipment shall be immediately replaced.
f) Fire extinguishers, rated not less than 2A, shall be provided for each 3,000 square feet of the building area. Travel distance from any point of the protected area to the nearest fire extinguisher shall not exceed 100 feet.

1.9 Signs and Barricades

1.9.1 Signs and Symbols

Signs and symbols for the Grim Project shall be visible at all times when work is being performed, and shall be removed or covered promptly when the hazards no longer exist.

a) Danger signs shall be used only where an immediate hazard exists, and shall follow the specifications illustrated in Figure 1 of ANSI Z35.1-1968 or in Figures 1 to 13 of ANSI Z535.2-2011.
b) Danger signs shall have red as the predominating color for the upper panel; black outline on the borders; and a white lower panel for additional sign wording.
c) Caution signs shall be used only to warn against potential hazards or to caution against unsafe practices, and shall follow the specifications illustrated in Figure 4 of ANSI Z35.1-1968 or in Figures 1 to 13 of ANSI Z535.2-2011.
d) Caution signs shall have yellow as the predominating color; black upper panel and borders, yellow lettering of "caution" on the black panel; and the lower yellow panel for additional sign wording. Black lettering shall be used for additional wording.

1.9.2 Barricades

a) Barricades must be erected to prevent or limit access to an area where a temporary hazard exists or to warn personnel of a temporary hazard in an area.
b) Barricades must be located at all points of possible entry into the area in which the hazard exists for as long as the hazard exists.
c) Warning tags shall be attached to the barricade material and must be visible for all normal approaches to the protected area.
d) All personnel must identify the hazard and ensure safety before passing through a “caution” barricade.

1.10 Material Handling, Wastes and Disposal 29 CFR 1926.250

Whenever materials are dropped more than 20 feet to any point lying outside the exterior walls of the building, an enclosed chute of wood, or equivalent material, shall be used. For the purpose of these specifications, an enclosed chute is a slide, closed in on all sides, through which material is moved from a high place to a lower one.

When debris is dropped through holes in the floor without the use of chutes, the area onto which the material is dropped shall be completely enclosed with barricades not less than 42 inches high and not less than 6 feet back from the projected edge of the opening above. Signs warning of the hazard of falling materials shall be posted at each level. Removal shall not be permitted in this lower area until debris handling ceases above.

All scrap lumber, waste material, and rubbish shall be removed from the immediate work area as the work progresses.

Asbestos and lead containing materials shall be placed in air tight disposal containers and properly labeled as per the specific requirements of sections 2 and 3 of these Specifications. At no time shall these waste containers be allowed to free fall.

1.11 Hand and Power Tools

All hand and power tools and similar equipment, whether furnished by the Contractor or the employee, shall be maintained in a safe condition. All hand and power tools shall be operated in accordance with the manufacturer's precautions and directions. Use of guards, shields and electrical safety equipment shall be utilized as appropriate. Contractor shall review all applicable OSHA Stands of 29 CFR 1926 Subpart I.

a) All power tools and associated cords or hoses must be inspected prior to each use and removed from service if found to be defective.
b) All portable powered tools must be used for their intended purpose only.
c) Portable powered tools cannot be modified in any way.
d) Users of all tools must maintain positive control of the tool at all times and must assume a safe working position so as not to cause an injury to themselves or a co-worker.

1.12 Welding and Cutting

Where welding or torch-cutting operations are utilized the contractor shall incorporate a hot works permit system. Contractor shall follow all safety precautions and procedures and conform with all provisions of Subpart J of the OSHA Construction Standards. 29 CFR 1926

1.13 Electrical Safety Requirements

This subpart addresses electrical safety requirements that are necessary for the practical safeguarding of employees involved in construction, demolition and abatement work at the Hotel Grim project. All requirements of 29 CFR 1926.402 through section 29 CFR 1926.408 shall apply.

1.14 Scaffolding and Platforms

Scaffolding shall comply with Subpart L of the OSHA Construction Standard. Make shift platforms, such as stacked materials, boxes, drums, etc. shall not be allowed.

1.14.1 Rolling platforms shall be utilized according to the manufacturer's recommendations, not altered in any way and not ridden while being moved.

1.14.2 Scaffolds must be inspected by the user prior to each use.
Inspections for Contractor personnel must be conducted and documented on the scaffold tag by a Competent Person prior to use for each shift the scaffold is used.

1.14.3 Rolling tower scaffolds must be free material and equipment before being moved. Caster brakes on rolling tower scaffold must be locked while in use.

1.15 Fall Protection 29 CFR 1926 Subpart M

This subpart sets forth requirements and criteria for fall protection in construction workplaces covered under 29 CFR part 1926. Exception: The provisions of this subpart do not apply when employees are making an inspection, investigation, or assessment of workplace conditions prior to the actual start of construction work or after all construction work has been completed.

1.15.1 Fall protection must be used for elevated work and must be used 100% of the time when there is danger of employees falling from a distance of 6 feet or greater. The distance is based on the elevation where the person is standing or sitting. In order to achieve the 100% tie-off requirement, double lanyards must be used.

1.16 Demolition

The Hotel Grim Abatement Project will involve partial demolition in various areas of the building to accomplish abatement work and lead stabilization. Demolition work is anticipated within the basement level, first floor kitchen, compromised stairwells, upper level roof structure, upper level auditorium area, and various wall and ceiling finishes that have become compromised and require removal.

1.16.1 Engineering Survey

Prior to permitting employees to start demolition operations, the Owner shall provide an engineering survey to determine the condition of the framing, floors, and walls, and possibility of unplanned collapse of any portion of the structure.

1.16.2 Shoring and Bracing

Work within the structure may require shoring or bracing to ensure safe work areas. The contractor shall review structural reports and consult with the structural engineer as needed to identify structurally compromised areas. The contractor bears all responsibility for proper installation and use of shoring and bracing materials and equipment as needed the complete the project.

1.16.3 Utilities

All electric, gas, water, steam, sewer, and other service lines shall be located, shut off, capped, or otherwise disconnected. Temporary services may be utilized as needed, but must be connected as directed by a service provider and appropriately licensed electricians and plumbers for distribution at the project site. If it is necessary to maintain any power, water or other utilities during demolition, such lines shall be temporarily relocated, as necessary, and protected.

1.16.4 Hazardous Chemicals, Gases, Explosives

The Contractor shall make the Owner aware of hazardous chemicals, gases, explosives, flammable materials, or similarly dangerous substances where they are suspected in pipes, tanks, or other equipment on the property. When the presence of any such substances is apparent or suspected, testing and purging shall be performed, and the hazard eliminated.

1.16.5 Glass Hazards

Where a hazard exists from fragmentation of glass, such hazards shall be removed.

1.16.6 Falling Hazards

Where a hazard exists to employees falling through wall openings, the opening shall be protected to a height of approximately 42 inches.

1.16.7 Falling Material

When debris is dropped through holes in the floor without the use of chutes, the area onto which the material is dropped shall be completely enclosed with barricades not less than 42 inches high and not less than 6 feet back from the projected edge of the opening above. Signs, warning of the hazard of falling materials, shall be posted at each level. Removal shall not be permitted in this lower area until debris handling ceases above.

a) All floor openings, not used as material drops, shall be covered over with material substantial enough to support the weight of any load which may be imposed. Such material shall be properly secured to prevent its accidental movement.

1.17 Stairways and Ladders 29 CFR 1926 Subpart X

1.17.1 A stairway or ladder shall be provided at all personnel points of access where there is a break in elevation of 19 inches (48 cm) or more, and no ramp, runway, sloped embankment, or personnel hoist is provided.

1.17.2 A double-cleated ladder or two or more separate ladders shall be provided when ladders are the only mean of access or exit from a working area for 25 or more employees, or when a ladder is to serve simultaneous two-way traffic.

1.17.3 During abatement work, should the building be limited to only one point of access between levels, that point of access shall be kept clear to permit free passage of employees. When work must be performed or equipment must be used such that free passage at that point of access is restricted, a second point of access shall be provided and used. When a building or structure has two or more points of access between levels, at least one point of access shall be kept clear to permit free passage of employees.

1.17.4 Contractors shall provide and install all stairway and ladder fall protection systems required by subpart X of the OSHA Construction Industry Standards before employees begin the work that necessitates the installation and use of stairways, ladders, and their respective fall protection systems.

1.18 Heat Injury and Illness Prevention Plan

In areas where heat stress may impact employees' health and safety, acclimatization and heat stress shall be assessed to establish proper work / rest regimens and fluid replacement. Heat Stress and heat strain are conditions resulting from environmental factors including temperature, relative humidity, radiant heat transfer, and air movement, as they are affected by clothing.

1.18.1 Toolbox Safety Training

During hot environments, toolbox safety training will include recognizing, preventing, and treating the signs and symptoms of heat stress. During potential heat stress conditions, ice shall be readily available to rapidly cool victims.

1.18.2 Body Fluid Replacement

When heat stress is determined to be a concern, water will be made available at the Site for employee fluid replacement. Balanced, electrolyte solutions to replace fluid and electrolyte loss may be present but should not be substitute for water. Employees will be provided with replacement fluids at a minimum rate of 8 ounces each half hour per person.

SECTION II - ASBESTOS

2.1 General

These specifications cover the requirements for removal, encapsulation, enclosure encasement, and/or repair of friable and non-friable asbestos-containing material (ACM) which will be encountered during the demolition, alteration, renovation of the Hotel Grim building. These specifications include transportation, disposal, storage, containment of; and housekeeping activities on the site at which these activities are performed.

This specification includes asbestos abatement activities and requirements in accordance with 40 CFR Part 61, Subpart M (USEPA); Class I, Class II, Class III, and Class IV abatement operations per 29 CFR 1926.1101 (OSHA); training requirements in accordance with OSHA 29 CFR 1926.1101.

Asbestos abatement work tasks shall be performed following all applicable OSHA and TDSHS asbestos industry standards. Use the engineering controls and work practices required in 29 CFR 1926.1101(g) in all operations regardless of the levels of exposure. Personnel shall wear and utilize protective clothing and equipment. Do not permit eating, smoking, drinking, chewing or applying cosmetics in the regulated area. Personnel of other trades, shall not be exposed at any time to airborne concentrations of asbestos unless all the administrative and personal protective provisions of the Contractor's APP are complied with. Power to the regulated area shall be locked-out and tagged in accordance with 29 CFR 1910.147, and temporary electrical service with ground fault circuit interrupters shall be provided as needed. Temporary electrical service shall be disconnected when necessary for wet removal. Stop abatement work in the regulated area immediately when the airborne total fiber concentration: (1) equals or exceeds 0.01 f/cc, or the pre-abatement concentration, whichever is greater, outside the regulated area; or (2) equals or exceeds 1.0 f/cc inside the regulated area. Correct the condition to the satisfaction of the Consultant’s Project Manager, including visual inspection and air sampling. Work shall resume only upon notification by the Project Manager. All such corrective actions shall be documented.

2.2 Definitions

Abatement: Procedures to control fiber release from asbestos-containing materials, i.e., removal, encapsulation, or enclosure.

Aerosol: A system consisting of particles, solid or liquid, suspended in air.

Air Cell: Insulation normally used on pipes and duct work that is comprised of corrugated cardboard which is frequently made of asbestos combined with cellulose or refractory binders.

Air Lock: A system for permitting ingress and egress without permitting air movement between a contaminated area or an uncontaminated area, typically consisting of two contained doorways at least 6 feet (2 meters) apart.

Air Monitoring: The process of measuring the fiber content of a specific volume of air in a stated period of time. Phase-contrast microscopy in accordance with NIOSH method No. 7400 is the prescribed method of sampling and analysis.

Air Sampling Technician: A person trained and experienced in air sampling techniques and schemes who performs air sampling under the direction of the asbestos project manager or certified industrial hygienist.

Amended Water: Water to which a surfactant has been added.

Asbestos: The asbestiform varieties of serpentinite (chrysotile), riebeckite (crocidolite), cummingtonite-grunerite, anthophyllite, and actinolite-tremolite. For purposes of determining respiratory and worker protection both the asbestiform and non-materials that have been chemically treated and/or altered shall be considered as asbestos.

Asbestos-containing Material (ACM): Any material containing more than 1% by weight of asbestos of any type or mixture of types.

Asbestos-containing Waste Material: Any material which is or is suspected of being or any material contaminated with an asbestos-containing material which is to be removed from a work area for disposal.

Asbestos Project Manager: An individual qualified by virtue of experience and education, designated, as the Owner's representative and responsible for supervising the air sampling technician and helping to ensure compliance with the job specifications.

Authorized Person: Any person authorized by the Contractor and required by work duties to be present in the regulated areas.

Authorized Visitor: The building owner or his representatives, air sampling technician, asbestos project manager, consultant, or a representative of any regulatory or other agency having jurisdiction over the project.

Barrier: Plastic sheeting and/or other materials used along with the floors, ceilings, and walls of a structure to form an isolated work environment that separates the contaminated work area from the uncontaminated area.

Breathing Zone: A hemisphere forward of the shoulders with a radius of approximately 6 to 9 inches.

Building Inspector: Individual who inspects buildings for asbestos and has EPA Model

Accreditation Plan (MAP) "Building Inspector" training; accreditation required by 40 CFR 763, Subpart E, Appendix C, has EPA/State certification/license as a "Building Inspector".

Building Owner: The owner or his authorized representative.

Ceiling Concentration: The concentration of an airborne substance that shall not be exceeded.

Certified Industrial Hygienist (C.I.H.): Project/task management and technical support relating to building related services and programs focused on indoor air quality, asbestos, lead paint, hazardous materials, and H&S programs. This position also entails serving as Corporate H&S officer with assistance from experienced support staff located at the regional offices.

Class I Asbestos Work: Activities defined by OSHA involving the removal of thermal system insulation (TSI) and surfacing ACM.

Class II Asbestos Work: Activities defined by OSHA involving the removal of ACM which is not thermal system insulation or surfacing material. This includes, but is not limited to, the removal of asbestos - containing wallboard, floor tile and sheeting, roofing and siding shingles, and construction mastic. Certain "incidental" roofing materials such as mastic, flashing and cements, when they are still intact, are excluded from Class II asbestos work. Removal of small amounts of these materials which would fit into a glovebag may be classified as a Class III job.

Class III Asbestos Work: Activities defined by OSHA that involve repair and maintenance operations, where ACM, including TSI and surfacing ACM, is likely to be disturbed. Operations may include drilling, abrading, cutting a hole, cable pulling, crawling through tunnels or attics and spaces above the ceiling, where asbestos is actively disturbed or asbestos-containing debris is actively disturbed.

Class IV Asbestos Work: Maintenance and custodial construction activities during which employees contact but do not disturb ACM and activities to clean-up dust, waste and debris resulting from Class I, II, and III activities. This may include dusting surfaces where ACM waste and debris and accompanying dust exists and cleaning up loose ACM debris from TSI or surfacing ACM following construction.

Clean Room: An uncontaminated area or room that is part of the worker's decontamination enclosure system, with provisions for storage of worker's street clothes and protective equipment.

Competent Person: A contractor's employee by virtue of his education and experience who is capable of operating an asbestos hazard abatement project in accordance with current EPA, OSHA, and NIOSH regulations, and standard work practices established for asbestos removal. Duties of the competent person are as defined in OSHA Regulations 29 CFR 1926.58(b) (www.osha.gov/complinks.html).

Contractor/Supervisor: Individual who supervises asbestos abatement work and has EPA Model Accreditation Plan "Contractor/Supervisor" training; has EPA/State certification as a "Contractor/Supervisor".

Consultant: A certified industrial hygienist (C.I.H.), the designated asbestos project manager, or an industrial hygiene technician under the supervision of the C.I.H. or the asbestos project manager.

Contaminated: Containing or coated with asbestos.

Curtained Doorway: A device to permit ingress or egress from one room to another while minimizing air movement between the rooms, typically constructed by placing two overlapping sheets of plastic over an existing or temporarily formed doorway, securing each along the top of the doorway, securing the vertical edge of one sheet along one vertical side of the doorway, and securing the vertical edge of the other sheet along the opposite vertical side of the doorway. Two curtained doorways spaced a minimum of 6 feet apart from the airlock.

Decontamination Enclosure System: A series of connected rooms, with curtained doorways between any two adjacent rooms, for the decontamination of workers or of materials and equipment. A decontamination enclosure system always contains at least one airlock.

Demolition: The wrecking or taking out of any structural materials of a facility together with any related handling operations.

Disposal bag: 6 mil thick leak-tight plastic bags used for transporting asbestos waste from work and to disposal site. Each is labeled as follows:

DANGER
CONTAINS ASBESTOS FIBERS
MAY CAUSE CANCER
CAUSES DAMAGE TO LUNGS
DO NOT BREATH DUST
AVOID CREATING DUST

Disturbance: Activities that disrupt the matrix of ACM, crumble or pulverize ACM, or generate visible debris from ACM. Disturbance includes cutting away small amounts of ACM, no greater than the amount which can be contained in 1 standard sized glovebag or waste bag, not larger than 1.5 m 60 inches in length and width in order to access a building component.

Encapsulant: A liquid material that can be applied to asbestos containing materials or cleaned substrates following the removal of asbestos containing materials to control the possible release of residual asbestos fibers from the material by creating a membrane over the surface or by penetrating into the material and binding its components together.

Encapsulation: The application of an encapsulant to asbestos-containing materials to control the release of asbestos fibers into the air.

Bridging Encapsulant: an encapsulant that forms a discrete layer on the surface of an asbestos matrix.

Penetrating Encapsulant: an encapsulant that is absorbed by the asbestos matrix without leaving a discrete surface layer.

Removal Encapsulant: a penetrating encapsulant specifically designed for removal of asbestos-containing materials rather than for in situ encapsulation.

Enclosure: The construction of an airtight impermeable, permanent barrier around asbestos-containing material to control the release of asbestos fibers into the air.

EPA: United States Environmental Protection Agency, 40l M Street, S.W., Washington, D.C. 20460.

Equipment Decontamination Enclosure System: That portion of a decontamination enclosure system designed for controlled transfer of materials and equipment into or out of the work area, typically consisting of a washroom and holding area.

Equipment Room: A contaminated area or room that is part of the worker decontamination enclosure system, with provisions for storage of contaminated clothing and equipment.
Facility: Any institutional, commercial, or industrial structure, installation or building.

Facility Component: Any pipe, duct, boiler, tank, fan, engines, or furnace at or in a facility, or any structural member of a facility.

Filter: A media component used in respirators to remove solid or liquid particles from the inspired air.

Fixed Object: A piece of equipment or furniture in the work area that cannot be removed from the work area.

Friable Asbestos Material: Material that contains more than 1.0 % asbestos by weight and that can be crumbled, pulverized, or reduced to powder by hand pressure when dry.

Glove-bag Technique: A method with limited applications for removing small amounts of asbestos containing material from HVAC ducts, piping runs, valves, joints, elbows, and other non-planar surfaces in an uncontaminated (plasticized) work area. The glove-bag assembly is a manufactured or fabricated device consisting of a glove-bag (typically constructed of 6-mil transparent plastic), two inward projecting, long sleeves, rubber gloves; one inward-projecting water wand sleeve; an internal tool pouch; and an attached-labeled receptacle for asbestos waste. The glove-bag is constructed and installed in such a manner that it surrounds the object or area to be decontaminated and contains all asbestos fibers released during the removal process. All workers, who are permitted to use the glove-bag technique, must be highly trained, experienced, and skilled in this method.

HVAC: Heating, ventilation, and air conditioning systems.

HEPA Filter: A high efficiency particulate air filter capable of removing particles greater than 0.3 microns in diameter with 99.97% efficiency.

HEPA Filter Vacuum Collection Equipment: High efficiency particulate air (absolute) filtered vacuum collection equipment with a filter system capable of collecting and retaining asbestos fibers of 0.3 microns or larger.

HEPA Vacuum: A vacuum system equipped with HEPA filtration.

High-Efficiency Filter: A filter which removes from air 99.97 % or more of monodisperse dioctyl phthalate (DOP) particles having a mean particle diameter of 0.3 microns.

Holding Area: A chamber between the washroom and an uncontaminated area in the equipment decontamination enclosure system. The holding area comprises an air lock.

Intact: ACM which has not crumbled, been pulverized, or otherwise deteriorated so that the asbestos is no longer likely to be bound with its matrix. Removal of "intact" asphaltic, resinous, cementitious products does not render the ACM non-intact simply by being separated into smaller pieces.
Model Accreditation Plan (MAP): USEPA training accreditation requirements for persons who work with asbestos as specified in 40 CFR 763

Movable Object: A piece of equipment or furniture in the work area which can be removed from the work area.

Negative Initial Exposure Assessment: A demonstration by the Contractor to show that employee exposure during an operation is expected to be consistently below the OSHA Permissible Exposure Limits (PELs).

Negative Pressure: A pressure lower than surrounding areas, generally caused by exhausting air from a sealed space (work area).

Negative Pressure Respirator: A respirator in which the air pressure inside the respiratory-inlet covering is positive during exhalation in relation to the air pressure of the outside atmosphere and negative during inhalation in relation to the air pressure of the outside atmosphere.

Negative-Pressure Ventilation System: A local exhaust system capable of maintaining a detectable pressure differential across containment barriers relative to adjacent unsealed areas.

NESHAPS: The National Emission Standards for Hazardous Air Pollutants (40 CFR Part 61)

NIOSH: The National Institute for Occupational Safety and Health.

Nonfriable ACM: A NESHAP term defined in 40 CFR 61, Subpart M and EPA 340/1-90/018 meaning any material containing more than 1 percent asbestos that, when dry, cannot be crumbled, pulverized or reduced to powder by hand pressure.

Nonfriable ACM (Category I): A NESHAP term defined in 40 CFR 61, Subpart E and EPA 340/1-90/018 meaning asbestos-containing packings, gaskets, resilient floor covering, and asphalt roofing products containing more than 1 percent asbestos.

Nonfriable ACM (Category II): A NESHAP term defined in 40 CFR 61, Subpart E and EPA 340/1-90/018 meaning any material, excluding Category I nonfriable ACM, containing more than 1 percent asbestos.

OSHA: Occupational Safety and Health Administration.

Outside Air: The air outside buildings and structures.

Penetrating Encapsulant: A liquid designed to saturate the material, thereby binding asbestos fibers to one another and to substances in the material.

Permissible Exposure Limits (PELs)

PEL-Time Weighted Average (TWA): Concentration of asbestos not in excess of 0.1 fibers per cubic centimeter of air (f/cc) as an 8-hour time weighted average (TWA).

PEL-Excursion Limit: An airborne concentration of asbestos not in excess of 1.0 f/cc of air as averaged over a sampling period of 30 minutes

Personal Monitoring: Sampling of the asbestos fiber concentrations within the breathing zone of an employee.

Plasticize: To cover floors, walls, etc., with plastic sheets as herein specified.

Protection Factor: The ratio of the ambient concentration of an airborne substance to the concentration of the substance inside the respiration at the breathing zone of the wearer. The protection factor is a measure of the degree of protection provided by a respirator to the wearer.

Regulated Area: An OSHA term defined in 29 CFR 1926.1101 meaning an area established by the Contractor to demarcate areas where Class I, II, and III asbestos work is conducted; also, any adjoining area where debris and waste from such asbestos work accumulates; and an area within which airborne concentrations of asbestos exceed, or there is a reasonable possibility they may exceed, the permissible exposure limit.

Removal: All herein specified procedures necessary to strip or clean up asbestos containing materials from designated areas and to dispose of these materials at an acceptable disposal site.

Repair: Overhauling, rebuilding, reconstructing, or reconditioning of structures or substrates, including encapsulation or other repair of ACM attached to structures or substrates.

Respirator: A device designed to protect the wearer from the inhalation of harmful atmospheres.

Shower Room: A room between the clean room and the equipment room in the worker decontamination enclosure system, with hot and cold or warm running water and suitably arranged for complete showering during decontamination. The shower room comprises an airlock between contaminated and clean areas.

Staging Area: Either the holding area or an area near the waste transfer airlock where containerized asbestos waste has been placed prior to removal from the work area.

Stripping: All herein specified procedures necessary to remove asbestos containing materials or asbestos contaminated materials from their substrate or from any component of the facility.

Substrate: The underlying surface or material to which asbestos-containing material has been applied.

Surfacing ACM: Asbestos-containing material which contains more than 1 percent asbestos and is sprayed-on, troweled-on, or otherwise applied to surfaces, such as acoustical plaster on ceilings and fireproofing materials on structural members, or other materials on surfaces for acoustical, fireproofing, or other purposes.

Surfactant: A chemical wetting agent added to water to improve penetration.

Time Weighted Average (TWA): The average concentration of a contaminant in air during a specific time period.

Thermal Insulation: Insulation used to prevent heat loss from pipes, boilers, tanks, breaching, heat exchangers, etc.

Visible Emissions: Any emissions containing particulate asbestos material that are visually detectable without the aid of instruments.

Washroom: A room between the work area and the holding area in the equipment decontamination enclosure system. A washroom comprises an air lock.

Wet Cleaning: The process of eliminating asbestos contamination from building surfaces and objects by using cloths, mops, or other cleaning tools that have been dampened with water and the disposing of these cleaning tools as asbestos contaminated waste.

Work Area: Designated rooms, spaces, or areas of the project in which asbestos abatement actions to be undertaken or which may be contaminated as a result of such abatement actions. A contained work area is one that has been sealed, plasticized and equipped with a decontamination enclosure system. An isolated work area is a controlled-access work area that has been isolated by plastic curtains and in which the openings to the outside are sealed with plastic sheeting. An isolated work area is not an airtight containment area and is not equipped with a decontamination enclosure system.

Worker: Individual (not designated as the Competent Person or a supervisor) who performs asbestos work and has completed asbestos worker training required by 29 CFR 1926.1101, to include EPA Model Accreditation Plan (MAP) "Worker" training; accreditation if required by the OSHA Class of work to be performed or by the state where the work is to be performed.

2.3 System Description

This section covers all operations in which asbestos-containing materials (ACM) are encountered. These procedures and equipment are required to protect workers and building occupants from airborne asbestos fibers and ACM dust and debris. Activities include OSHA [Class I] [Class II] [Class III] [Class IV] work operations. This section also includes containment, storage, transportation and disposal of the generated ACM wastes.

2.3.1 Discovery of Unexpected Asbestos:

Suspect asbestos containing material that is discovered during abatement and/or demolition (in particular buildings constructed no later than 1980), which was previously inaccessible, will be sampled and analyzed for its asbestos content by the Consulting Agency personnel. Sampling activities undertaken to determine the presence of additional ACM should be conducted by personnel who have successfully completed the EPA Model Accreditation (MAP) "Building Inspector" course and has EPA / State certification/license as a "Builder Inspector".

2.4 Consulting Agency and Testing Laboratory

The Consulting Agency shall be contracted by Owner completely independent from the Prime Contractor and all lower tier Subcontractors. The Consulting Agency shall identify the independent testing laboratory selected to perform the sample analyses. The testing laboratory shall be completely independent from the Contractor as recognized by federal, state or local regulations.

2.4.1 Phase Contrast Microscopy (PCM):

The laboratory shall be fully equipped and proficient in conducting PCM of airborne samples using the methods specified by 29 CFR 1926.1101, the most current version of NIOSH Method 7400. The laboratory shall be currently judged proficient (classified as acceptable) in counting airborne asbestos samples by PCM by successful participation in each of the last 4 rounds in the American Industrial Hygiene Association (AIHA) Proficiency Analytical Testing (PAT) Program or by participating in the AIHA PAT Program, and being judged proficient in counting samples.

2.4.2 Polarized Light Microscopy (PLM):

The PLM laboratory shall be fully equipped and proficient in conducting PLM analyses of suspect ACM bulk samples in accordance with 40 CFR 763, Subpart E, Appendix E; the laboratory shall be currently accredited by NIST under the NVLAP.

2.4.3 Transmission Electron Microscopy (TEM):

The laboratory shall be proficient in conducting TEM analysis of airborne samples using the mandatory method specified by 40 CFR 763, Subpart E, Appendix E; the laboratory is currently accredited by NIST under the NVLAP for airborne sample analysis of asbestos by TEM; the laboratory will use analysts with demonstrated proficiency under NVLAP.] [proficient in conducting analysis for low asbestos concentration, enhanced analysis of floor tiles and bulk materials where multiple layers are present, using an improved EPA test method titled, "Method for the Determination of Asbestos in Bulk Building Materials".]

2.4.4 PCM/TEM:

The laboratory is fully equipped and each analyst is proficient in conducting PCM and TEM analysis of airborne samples using NIOSH NMAM Method 7400 PCM and NIOSH NMAM Method 7402 (TEM confirmation of asbestos content of PCM results) from the same filter.

2.5 Quality Assurance / Submittals

In addition to detailed requirements of this specification, work performed under this contract shall comply with ALL applicable federal, state, and local laws, ordinances, criteria, rules and regulations regarding handling, storing, transporting, and disposing of asbestos waste materials. Matters of interpretation of standards shall be submitted to the appropriate administrative agency for resolution before starting work. Where the requirements of this specification, applicable laws, criteria, ordinances, regulations, and referenced documents vary, the most stringent requirements shall apply.

2.5.1 Specific Requirements

Designate in writing, personnel meeting the following qualifications:

a) Asbestos Abatement Contractor: Certified/licensed [by applicable state agencies] to perform asbestos-related activities.

b) Designated Competent Person: Qualified in accordance with 29 CFR 1926.32 and 29 CFR 1926.1101, has EPA MAP "Contractor/Supervisor" training accreditation, has EPA/State certification/license as a "Contractor/Supervisor" and is experienced in the administration and supervision of asbestos abatement projects, including exposure assessment and monitoring, work practices, abatement methods, protective measures for personnel, setting up and inspecting asbestos abatement work areas, evaluating the integrity of containment barriers, placement and operation of local exhaust systems, ACM generated waste containment and disposal procedures, decontamination units installation and maintenance requirements, site safety and health requirements, notification of other employees onsite, etc. The Designated Competent Person shall be responsible for compliance with applicable federal, state and local requirements, the Contractor's Accident Prevention Plan (APP) and Asbestos and Lead Hazard Abatement Plan (ALHAP). Submit the "Contractor/Supervisor" course completion certificate and the most recent certificate for required refresher training, [EPA/State certification/license] with the employee "Certificate of Worker Acknowledgment". Submit evidence that this person has a minimum of 2 Years of on-the-job asbestos abatement experience relevant to OSHA competent person requirements. The Designated Competent Person shall be onsite at all times during the conduct of this project.

c) Project and Other Supervisors: Have EPA MAP "Contractor/Supervisor" training accreditation. Submit the "Contractor/Supervisor" course completion certificate and the most recent certificate for required refresher training, EPA/State certification/license with the employee "Certificate of Worker Acknowledgment". Also submit evidence that the Project Supervisor has a minimum of 2 years of on-the-job asbestos abatement experience relevant to

project supervisor responsibilities and the other supervisors have a minimum of 1 year on-the-job asbestos abatement experience commensurate with the responsibilities they will have on this project.

d) Asbestos Abatement Workers: Meet the requirements contained in 29 CFR 1926.1101, 40 CFR 61, Subpart M, and other applicable federal, state and local requirements. Worker training documentation shall be provided as required on the "Certificate of Workers Acknowledgment". Training documentation is required for each employee who will perform OSHA Class I, Class II, Class III, or Class IV asbestos abatement operations. Such documentation shall be submitted on a Contractor generated form titled "Certificate of Workers Acknowledgment", to be completed for each employee. Training course completion certificates (initial and most recent update refresher) required by the information checked on the form shall be attached.

e) Physician: The physician shall be currently licensed by the state where the workers will be or have been examined, have expertise in asbestos exposure and shall be responsible for the determination of medical surveillance protocols and for review of examination/test results performed in compliance with 29 CFR 1926.1101. Submit for each worker the Texas Department of State Health Services Medical Evaluation Form.

f) Disposal Facility, Transporter: Written evidence that the landfill to be used is approved for asbestos disposal by the USEPA and state and local regulatory agencies. Copies of signed agreements between the Contractor (including subcontractors and transporters) and the asbestos waste disposal facility to accept and dispose of all asbestos containing waste shall be provided. The Contractor and transporters shall meet the DOT requirements of 49 CFR 171, 49 CFR 172, and 49 CFR 173 as well as registration requirements of 49 CFR 107 and other applicable state or local requirements. The disposal facility shall meet the requirements of 40 CFR 61, Sections .154 or .155, as required in 40 CFR 61 150(b), and other applicable state or local requirements.

2.5.2 Preconstruction Conference

The Contractor and the Contractor's Designated Competent Person, Project Superintendent, and Consultant’s Project Manager shall meet with the Owner’s Representative prior to beginning work at a safety preconstruction conference to discuss the details of the Contractor's submitted APP to include the ALHAP and AHAs. Deficiencies will be addressed and plans modified where required. Onsite work shall not begin until the plans have been accepted.

2.6 Security

Fenced and locked security area shall be provided for the project. A log book shall be kept documenting entry into and out of the job site. Entry into regulated areas shall only be by personnel authorized by the Owner's Representative. Personnel authorized to enter regulated areas shall be trained, medically evaluated, and wear the required personal protective equipment.

2.6.1 Licenses, Permits and Notifications

Obtain necessary licenses, permits and notifications in conjunction with the project's asbestos abatement, transportation and disposal actions and timely notification furnished of such actions as required by federal, state, regional, and local authorities. 10 days prior to the commencement of work, in accordance with 40 CFR 61, Subpart M, and state and local requirements to include the mandatory "Notification of Demolition and Renovation Record" form and other required notification documents.

2.6.2 Regulated Areas

All Class I, II, and III asbestos work shall be conducted within regulated areas. The regulated area shall be demarcated to minimize the number of persons within the area and to protect persons outside the area from exposure to airborne asbestos. Control access to regulated areas, ensure that only authorized personnel enter, and verify that Contractor required medical surveillance, training and respiratory protection program requirements are met prior to allowing entrance.

2.6.3 Warning Signs and Tape

Warning signs and tape printed bilingually in English and Spanish shall be provided at the regulated boundaries and entrances to regulated areas. Signs shall be located to allow personnel to read the signs and take the necessary protective steps required before entering the area.

Post "keep out" signs at the perimeter entrances or plywood barriers. In addition, post regulation asbestos caution signs at a level within the first perimeter. These signs should be printed with 3-inch block letters at a minimum. Where appropriate, equivalent signs printed in Spanish will be used in addition to English signs. Work areas that are in open space, which cannot feasibly be partitioned, will be sectioned off with 3-inch plastic tape with the printed warning, "CAUTION ASBESTOS HAZARD". This tape will be placed 3 to 4 feet from the ground.

2.6.4 Warning Labels

Warning labels shall be affixed to all asbestos disposal containers, asbestos materials, scrap, waste debris, and other products contaminated with asbestos. Containers with preprinted warning labels conforming to requirements are acceptable.

2.7 Medical Surveillance Requirement

Medical surveillance requirements shall conform to 29 CFR 1926.1101. Asbestos workers shall be enrolled in a medical surveillance program that meets 29 CFR 1926.1101 (m) requirements and other pertinent state or local requirements. This requirement shall have been satisfied within the last 12 months. Submit required medical certification and the Physician's written opinion.

2.7.1 Respiratory Protection Program

The Designated Competent Person shall establish in writing, and implement a respiratory protection program in accordance with 29 CFR 1926.1101 and 29 CFR 1910.134. The Consultant’s Project Manager shall establish minimum respiratory protection requirements based on measured or anticipated levels of airborne asbestos fiber concentrations.

2.7.2 Respiratory Fit Testing

The Contractor shall conduct a qualitative or quantitative fit test conforming to Appendix A of 29 CFR 1910.134 for each worker required to wear a respirator, and any authorized visitors who enter a regulated area where respirators are required to be worn. A respirator fit test shall be performed prior to initially wearing a respirator and every 12 months thereafter. If physical changes develop that will affect the fit, a new fit test shall be performed. Functional fit checks shall be performed each time a respirator is put on and in accordance with the manufacturer's recommendation.

2.7.3 Respirator Selection and Use Requirements

Provide respirators, and ensure that they are used as required by 29 CFR 1926.1101 and in accordance with the manufacturer's recommendations. Respirators shall be approved by the National Institute for Occupational Safety and Health NIOSH, under the provisions of 42 CFR 84, for use in environments containing airborne asbestos fibers. For air-purifying respirators, the particulate filter shall be high-efficiency particulate air P-100. The initial respirator selection and the decisions regarding the upgrading or downgrading of respirator type shall be made by the Consultant’s Project Manager based on the measured or anticipated airborne asbestos fiber concentrations to be encountered.

2.7.4 Personal Protective Equipment

Provide workers with personal protective clothing and equipment and ensure that it is worn properly. The Consultant's Project Manager and Designated Competent Person shall select and approve all the required personal protective clothing and equipment.

2.7.5 Whole Body Protection

Personnel exposed to or having the potential to be exposed to airborne concentrations of asbestos that exceed the PELs, or for all OSHA Classes of work for which a required negative exposure assessment is not produced, shall be provided with whole body protection and such protection shall be worn properly. Disposable whole body protection shall be disposed of as asbestos contaminated waste upon exiting from the regulated area. Reusable whole body protection worn shall be either disposed of as asbestos contaminated waste upon exiting from the regulated area or be properly laundered in accordance with 29 CFR 1926.1101. The Consultant's Project Manager, has the authority to take immediate action to upgrade or downgrade whole body protection when there is an immediate danger to the health and safety of the wearer.

2.7.6 Coveralls

Disposable-breathable coveralls with a zipper front shall be provided. Sleeves shall be secured at the wrists, and foot coverings secured at the ankles.

2.7.7 Gloves

Gloves shall be provided to protect the hands where there is the potential for hand injuries (i.e., scrapes, punctures, cuts, etc.).

2.7.8 Foot Coverings

Cloth socks shall be provided and worn next to the skin. Footwear, as required by OSHA and having steel toe protection, that is appropriate for safety and health hazards in the area shall be worn. Reusable footwear removed from the regulated area shall be thoroughly decontaminated or disposed of as ACM waste.

2.7.9 Head Covering

Hood type disposable or reusable head covering shall be provided. In addition, protective head gear (hard hats) shall be provided as required. Hard hats shall only be removed from the regulated area after being thoroughly decontaminated.

2.7.10 Protective Eye Wear

Eye protection shall be provided, when operations present a potential eye injury hazard, and shall meet the requirements of ANSI/ISEA Z87.1.

2.8 Hygiene

Establish a decontamination area for the decontamination of employees, material and equipment. Ensure that employees enter and exit the regulated area through the decontamination area.

2.8.1 3-Stage Decontamination Area

A temporary negative pressure decontamination unit that is adjacent and attached in a leak-tight manner to the regulated area shall be provided for each regulated area. Each decontamination unit shall have an equipment room and a clean room separated by a shower that complies with 29 CFR 1910.141, unless the Contractor can demonstrate that such facilities are not feasible. Equipment and surfaces of containers filled with ACM shall be cleaned prior to removing them from the equipment room or area. Two separate lockers shall be provided for each asbestos worker, one in the equipment room and one in the clean room. Provide the appropriate number of showers based on crew size. Wastewater shall be collected and filtered to remove asbestos contamination. Filters and residue shall be disposed of as asbestos contaminated material. Filtered water shall be discharged to the sanitary sewer system. Wastewater filters shall be installed in series with the first stage pore size of 20 microns and the second stage pore size of 5 microns. The floor of the decontamination unit's clean room shall be kept dry and clean at all times. Proper housekeeping and hygiene requirements shall be maintained. Soap and towels shall be provided for showering, washing and drying. Any cloth towels provided shall be disposed of as ACM waste or shall be laundered in accordance with 29 CFR 1926.1101.

2.8.2 Load-Out Unit

A temporary load-out unit that is adjacent and connected to all regulated areas. Each load-out unit shall be attached in a leak-tight manner to each regulated area.

2.8.3 Decontamination Area Exit Procedures

Ensure that the following procedures are followed:

a) Before leaving the regulated area, remove all gross contamination and debris from work clothing using a HEPA vacuum.

b) Employees shall remove their protective clothing in the equipment room and deposit the clothing in labeled impermeable bags or containers for disposal and/or laundering.
c) Employees shall not remove their respirators until showering.
d) Employees shall shower prior to entering the clean room. If a shower has not been located between the equipment room and the clean room or the work is performed outdoors, ensure that employees engaged in Class I asbestos jobs:

1. Remove asbestos contamination from their work suits in the equipment room or decontamination area using a HEPA vacuum before proceeding to a shower that is not adjacent to the work area; or
2. Remove their contaminated work suits in the equipment room, without cleaning work suits, and proceed to a shower that is not adjacent to the work area.

2.8.4 Smoking

Smoking shall only be permitted in designated areas outside the building.

2.9 Training Program

Establish and submit a training program as specified by EPA MAP, training requirements at 40 CFR 763, the Texas Asbestos Health Protection Act, and OSHA requirements at 29 CFR 1926.1101 (k)(9). Contractor employees shall complete the required training Class I and II operations 32 hours Asbestos Worker Training.

Prior to commencement of work the Contractor's Competent Person shall instruct each worker about:

a) The hazards and health effects of the specific types of ACM to be abated; and
b) The content and requirements of the Contractor's APP to include the ALHAP and AHAs and site-specific safety and health precautions.

2.10 Encapsulants

Encapsulates shall conform to USEPA requirements, shall contain no toxic or hazardous substances and no solvent. Submit certificates stating that encapsulates meet the applicable specified performance requirements.

2.11 Encasement Products

Encasement shall consist of primary cellular polymer coat, polymer finish coat, and any other finish coat as approved by the owner. Encasements are not anticipated for the Hotel Grim project.

2.12 Expendable Supplies

2.12.1 Glovebag

Glovebags shall be provided as described in 29 CFR 1926.1101. The glovebag assembly shall be 0.15 mm 6 mil thick plastic, prefabricated and seamless at the bottom with preprinted OSHA warning label.

2.12.2 Duct Tape

Industrial grade duct tape of appropriate widths suitable for bonding sheet plastic and disposal container.

2.12.3 Disposal Containers

Leak-tight (defined as solids, liquids, or dust that cannot escape or spill out) disposal containers shall be provided for ACM wastes as required by 29 CFR 1926.1101. Disposal containers can be in the form of:

a) Disposal Bags
b) Fiberboard Drums

2.12.4 Sheet Plastic

Sheet plastic shall be polyethylene of 0.15 mm 6 mil minimum thickness and shall be provided in the largest sheet size necessary to minimize seams. Film shall be clear or frosted and conform to ASTM D4397.

2.12.4.1 Flame Resistant

Where a potential for fire exists, flame-resistant sheets shall be provided. Film shall be frosted or black and shall conform to the requirements of NFPA 701.

2.12.4.2 Reinforced

Reinforced sheets shall be provided where high skin strength is required, such as where it constitutes the only barrier between the regulated area and the outdoor environment. The sheet stock shall consist of translucent, nylon-reinforced or woven-polyethylene thread laminated between 2 layers of polyethylene film. Film shall meet flame resistant standards of NFPA 701.

2.12.5 Mastic Removing Solvent

Mastic removing solvent shall be nonflammable and shall not contain methylene chloride, glycol ether, or halogenated hydrocarbons. Solvents used onsite shall have a flash point greater than 60 degrees C 140 degrees F.

2.12.6 Leak-tight Wrapping

Two layers of 0.15 mm 6 mil minimum thick polyethylene sheet stock shall be used for the containment of removed asbestos-containing components or materials such as reactor vessels, large tanks, boilers, insulated pipe segments and other materials too large to be placed in disposal bags. Upon placement of the ACM component or material, each layer shall be individually leak-tight sealed with duct tape.

2.12.7 Viewing Inspection Window

Where feasible, a minimum of 1 clear, 1/8-inch-thick (minimum thickness), acrylic sheet, 12 by 18 inches, shall be installed as a viewing inspection window at eye level on a wall in each containment enclosure. The windows shall be sealed leak-tight with industrial grade duct tape.

2.12.8 Wetting Agents

Removal encapsulant (a penetrating encapsulant) shall be provided when conducting debris removal and abatement activities that require a longer removal time or are subject to rapid evaporation of amended water. The removal encapsulant shall be capable of wetting the ACM and retarding fiber release during disturbance of the ACM greater than or equal to that provided by amended water.

2.13 Equipment

2.13.1 Local Exhaust System

Local exhaust units (negative air machines) shall conform to ASSE Z9.2 and 29 CFR 1926.1101. Filters on local exhaust system equipment shall conform to ASSE Z9.2 and UL 586. Filter shall be UL labeled. Submit pressure differential recordings and Manufacturer's certifications showing compliance with ASSE Z9.2 for:

1) Vacuums.
2) Water filtration equipment.
3) Ventilation equipment.
4) Other equipment required to contain airborne asbestos fibers.

2.13.2 Vacuums

Vacuums shall be equipped with HEPA filters, of sufficient capacity and necessary capture velocity at the nozzle or nozzle attachment to efficiently collect, transport and retain the ACM waste material. Power tools shall not be used to remove ACM unless the tool is equipped with effective, integral HEPA filtered exhaust ventilation capture and collection system. Reusable tools shall be thoroughly decontaminated prior to being removed from regulated areas.

2.13.3 Rental Equipment

If rental equipment is to be used, written notification shall be provided to the rental agency, concerning the intended use of the equipment, the possibility of asbestos contamination of the equipment and the steps that will be taken to decontaminate such equipment.

2.13.4 Air Monitoring Equipment

All testing and analysis (excluding personal exposure sampling and analysis) shall be at the Owner's expense. The Owner shall provide an independent third-party Consulting Agency to conduct baseline, ambient, clearance and waste characterization testing analysis and shall provide air monitoring equipment for use by the Project Manager and/or AMT. The testing equipment will include, but shall not be limited to:

a) High-volume sampling pumps that can be calibrated and operated at a constant airflow up to 16 liters per minute.
b) Low-volume, battery powered, body-attachable, portable personal pumps that can be calibrated to a constant airflow up to approximately 3.5 liters per minute, and a self-contained rechargeable power pack capable of sustaining the calibrated flow rate for a minimum of 10 hours. The pumps shall also be equipped with an automatic flow control unit which shall maintain a constant flow, even as filter resistance increases due to accumulation of fiber and debris on the filter surface.
c) Single use standard 25 mm diameter cassette, open face, 0.8-micron pore size, mixed cellulose ester membrane filters and cassettes with 50 mm electrically conductive extension cowl, and shrink bands for personal, ambient, and clearance sampling.
d) A flow calibrator capable of calibration to within plus or minus 2 percent of reading over a temperature range of minus 20 to plus 60 degrees C minus 4 to plus 140 degrees F and traceable to a NIST primary standard.

2.14 Protection of Adjacent Work or Areas to Remain

Perform asbestos abatement without damage to or contamination of adjacent work or area. Where such work or area is damaged or contaminated, it shall be restored to its original condition or decontaminated at no expense to the owner. When spills occur, work shall stop in all affected areas immediately and the spill shall be cleaned. When satisfactory visual inspection and air sampling analysis results are obtained, and have been evaluated by the Consultant's Project Manager, work shall proceed.

2.15 Objects

2.15.1 Removal of Mobile Objects

All furnishings and debris within the building are considered contaminated with asbestos fibers and lead based paints. Large non-porous furnishings shall be precleaned using HEPA filtered vacuum followed by wet wiping. These objects shall be removed to an area outside the building for disposal as general wastes. Carpets, draperies, and other items shall be disposed of as asbestos contaminated material.

2.15.2 Stationary Objects

Stationary objects and equipment where designated by owners shall remain in place and shall be precleaned using HEPA vacuum followed by adequate wet wiping. Stationary objects shall be covered with 2 layers of polyethylene and edges sealed with duct tape.

2.16 Ventilation Systems and Critical Barriers

Building ventilation system supply and return air ducts (not scheduled for disposal) shall be isolated by airtight seals to prevent the spread of contamination throughout the system.

2.17 Pre-Cleaning

Building components not affected by asbestos or lead removal shall be precleaned. Surfaces shall be cleaned by HEPA vacuum and adequately wet wiped, prior to establishment of containment.

2.18 Methods of Compliance

2.18.1 Mandated Practices

The specific abatement techniques and items identified shall be detailed in the Contractor's ALHAP. Use the following engineering controls and work practices in all operations, regardless of the levels of exposure:

a) Vacuum cleaners equipped with HEPA filters.
b) Wet methods or wetting agents except where it can be demonstrated that the use of wet methods is unfeasible due to the creation of electrical hazards, equipment malfunction, and in roofing.
c) Prompt clean-up and disposal.
d) Inspection and repair of polyethylene.
e) Cleaning of equipment and surfaces of containers prior to removing them from the equipment room or area.

2.18.2 Control Methods

Use the following control methods:

a) Local exhaust ventilation equipped with HEPA filter;
b) Enclosure or isolation of processes producing asbestos dust;
c) Where the feasible engineering and work practice controls are not sufficient to reduce employee exposure to or below the PELs, use them to reduce employee exposure to the lowest levels attainable and shall supplement them by the use of respiratory protection.

2.18.3 Unacceptable Practices

The following work practices shall not be used:

a) High-speed abrasive disc saws that are not equipped with point of cut ventilator or enclosures with HEPA filtered exhaust air.
b) Compressed air used to remove asbestos containing materials, unless the compressed air is used in conjunction with an enclosed ventilation system designed to capture the dust cloud created by the compressed air.
c) Dry sweeping, shoveling, or other dry clean up.
d) Employee rotation as a means of reducing employee exposure to asbestos.

2.18.4 Class I Work Procedures

In addition to requirements of paragraphs Mandated Practices and Control Methods, the following engineering controls and work practices shall be used:

a) The Contractor's Competent Person shall supervise the installation and operation of the control methods.
b) For jobs involving the removal of more than 25 feet or 10 square feet of TSI or surfacing material, place critical barriers over all openings to the regulated area.
c) HVAC systems shall be isolated in the regulated area by sealing with a double layer of plastic or air-tight rigid covers.
d) Impermeable drop cloths (0.15 mm 6 mil or greater thickness) shall be placed on surfaces beneath all removal activity.
e) Where a negative exposure assessment has not been provided or where exposure monitoring shows the PEL was exceeded, the regulated area shall be ventilated with a HEPA unit and employees must use PPE.

2.18.5 Specific Control Methods for Class I Work

2.18.5.1 Negative Pressure Enclosure (NPE) System

The system shall provide at least 4 air changes per hour inside the containment. The local exhaust unit equipment shall be operated 24 hours per day until the containment is cleared. The NPE shall be smoke tested for leaks at the beginning of each shift and be sufficient to maintain a minimum pressure differential of minus 0.5 mm 0.02 inch of water column relative to adjacent, unsealed areas. Pressure differential shall be monitored continuously, 24 hours per day, with an automatic manometric recording instrument and Records shall be provided daily on the same day collected to the Project Manager. The Project Manager shall be notified immediately if the pressure differential falls below the prescribed minimum. The building ventilation system shall not be used as the local exhaust system for the regulated area. The NPE shall terminate outdoors unless an alternate arrangement is allowed by the Consultant's Project Manager. All filters used shall be new at the beginning of the project and shall be periodically changed as necessary and disposed of as ACM waste.

2.18.5.2 Glovebag Systems

Glovebag systems shall be limited to TSI piping in good condition. All TSI piping insulation in poor condition shall be removed within a full containment. Glovebags shall be used without modification, smoke-tested for leaks, and completely cover the circumference of pipe or other structures where the work is to be done. Glovebags shall be used only once and shall not be moved. Glovebags shall not be used on surfaces that have temperatures exceeding 66 degrees C 150 degrees F. Prior to disposal, glovebags shall be collapsed using a HEPA vacuum. Before beginning the operation, loose and friable material adjacent to the glovebag operation shall be wrapped and sealed in 2 layers of plastic or otherwise rendered intact. At least 2 persons shall perform glovebag removal. Designated boundary limits for the asbestos work shall be established with rope or other continuous barriers and all other requirements for asbestos control areas shall be maintained, including area signage and boundary warning tape as specified in OSHA 29 CFR 1926.1101 k.

2.18.5.3 Glove Box Systems

Attach HEPA vacuum systems to the bag to prevent collapse during removal of ACM. The negative pressure glove boxes shall be fitted with gloved apertures and a bagging outlet and constructed with rigid sides from metal or other material which can withstand the weight of the ACM and water used during removal. A negative pressure shall be created in the system using a HEPA filtration system. The box shall be smoke tested for leaks prior to each use.

2.18.5.4 Mini-Enclosures
A mini-containment (small walk-in enclosure) to accommodate no more than 2 persons, may be used if the disturbance or removal can be completely contained by the enclosure. Each mini-enclosure shall be inspected for leaks and smoke tested before each use. Air movement shall be directed away from the employee's breathing zone within each mini-enclosure, by means of HEPA equipped negative air machines.

2.18.5.5 Wrap and Cut Operation – NOT APPLICABLE FOR THE HOTEL GRIM PROJECT.

2.18.6 Class II Work

Class II work may also be performed using a method allowed for Class I work, except that glovebags and glove boxes are allowed if they fully enclose the Class II material to be removed.

In addition to the requirements of paragraphs Mandated Practices and Control Methods, the following engineering controls and work practices shall be used:

a. The Contractor's Competent Person shall supervise the work.
b. For indoor work, critical barriers shall be placed over all openings to the regulated area.
c. Impermeable drop cloths shall be placed on surfaces beneath all removal activity.

2.18.7 Specific Control Methods for Class II Work

2.18.7.1 Vinyl and Asphalt Flooring Materials
When removing asbestos-containing vinyl and asphalt flooring materials use the following practices:

Resilient sheeting shall be removed by adequately wet methods. Tiles shall be removed intact (if possible); wetting is not required when tiles are heated and removed intact. Flooring or its backing shall not be sanded. Scraping of residual adhesive and/or backing shall be performed using wet methods. Mechanical chipping is prohibited unless performed in a negative pressure enclosure. Dry sweeping is prohibited. Use vacuums equipped with HEPA filter, disposable dust bag, and metal floor tool to clean floors.

2.18.7.2 Roofing Material
When removing roofing materials which contain ACM as described in 29 CFR 1926.1101(g)(8)(ii), use the following practices. Roofing material shall be removed in an intact state. Wet methods shall be used to remove roofing materials that are not intact, or that will be rendered not intact during removal, unless such wet methods are not feasible or will create safety hazards. When removing built-up roofs, with asbestos-containing roofing felts and an aggregate surface, using a power roof cutter, all dust resulting from the cutting operations shall be collected by a HEPA dust collector, or shall be HEPA vacuumed by vacuuming along the cut line. Asbestos-containing roofing material shall not be dropped or thrown to the ground, but shall be lowered to the ground via covered, dust-tight chute, crane, hoist or other method approved by the Project Manager. Any ACM that is not intact shall be lowered to the ground as soon as practicable, but not later than the end of the work shift. While the material remains on the roof it shall be kept wet or placed in an impermeable waste bag or wrapped in plastic sheeting. Intact ACM shall be lowered to the ground as soon as practicable, but not later than the end of the work shift. Unwrapped material shall be transferred to a closed receptacle. Critical barriers shall be placed over roof level heating and ventilation air intakes.

2.18.7.3 Cementitious Siding and Shingles or Transite Panels
When removing cementitious asbestos-containing siding, shingles or transite panels use the following work practices:

Intentionally cutting, abrading or breaking is prohibited. Each panel or shingle shall be sprayed with amended water prior to removal. Nails shall be cut with flat, sharp instruments. Unwrapped or unbagged panels or shingles shall be immediately lowered to the ground via covered dust-tight chute, crane or hoist, or placed in an impervious waste bag or wrapped in plastic sheeting and lowered to the ground no later than the end of the work shift.

2.18.7.4 Gaskets
Gaskets shall be thoroughly wetted with amended water prior to removal and immediately placed in a disposal container. If a gasket is visibly deteriorated and unlikely to be removed intact, removal shall be undertaken within a glovebag. Any scraping to remove residue shall be performed wet.

2.18.8 Specific Control Methods for Class III Work

Class III asbestos work shall be conducted using engineering and work practice controls which minimize the exposure to employees performing the asbestos work. The work shall be performed using wet methods and, to the extent feasible, using local exhaust. Use impermeable drop cloths and shall isolate the operation, using mini-enclosures or glovebag systems, where the disturbance involves drilling, cutting, abrading, sanding, chipping, breaking, or sawing of TSI or surfacing material.

2.18.9 Specific Control Methods for Class IV Work

Class IV jobs shall be conducted using wet methods and HEPA vacuums. Employees cleaning up debris and waste in a regulated area where respirators are required shall wear the selected respirators.

2.18.10 Class I Asbestos Work Response Action

The following Class I Asbestos Work Response Actions are anticipated for the Hotel Grim abatement project:

a) Asbestos-contaminated Masonry Wall or Thermal Insulation (Boiler Flue Chase)
b) Fireproofing or Thermal Surface Insulation
c) Piping and Fitting Insulation (Using a Glovebag)
d) Horizontal Pipe Insulation (Using a Containment Area)
e) Pipe Insulation (Using a Mini-Containment Area)
f) Storage Tank and Boiler Breeching Insulation (Boiler Room using Full Containment). Insulation shall be sprayed with a mist of amended water or removal encapsulant. Amended water or removal encapsulant shall be allowed to saturate material to substrate. Cover jackets shall be slit at seams, and sections removed and hand-placed in a polyethylene disposable bag. Exposed surfaces shall be continuously sprayed with amended water to minimize airborne dust. Insulation on tanks and boiler breeching shall not be allowed to drop to the floor. Lagging on piping and insulation on fittings shall be removed. A penetrating encapsulant shall be sprayed on all exposed tank, boiler and boiler breeching surfaces.

2.18.11 Class II Asbestos Work Response Actions

The following class II Asbestos work response actions are anticipated for the Hotel Grim Abatement Project:

a) Interior Asbestos Cement, Transite Boards.
b) Glued-on Acoustical Ceiling and Wall Tile Mastic.
c) Vinyl or Vinyl Asbestos Tile Adhered to Concrete Floor System by Asbestos-Containing Adhesive.
d) Vinyl or Vinyl Asbestos Tile Adhered to Wood Floor System by Asbestos Containing Adhesive.
e) Vinyl Asbestos Tile Adhered to Concrete Floor System by Asbestos Containing Adhesive.
f) Asbestos-Containing Sheet Flooring Adhered to Concrete Floor System by Asbestos-Containing Adhesive.
g) Carpeting (Asbestos-Containing or Contaminated).
h) Miscellaneous Asbestos-Containing Materials.
i) Built-Up Roofing and Flashing.

j) Electrical Wiring and Fixtures.
k) Boiler Firebox Insulation: Firebox lining shall be removed from out-of-service boilers before the boiler is dismantled.

2.18.12 Abatement of Asbestos Contaminated Soil – NOT APPLICABLE FOR THE GRIM PROJECT

2.18.13 Enclosure of ACM – NOT APPLICABLE FOR THE GRIM PROJECT

2.18.14 Encapsulation of ACM

Prior to applying any encapsulant, the entire surface area shall be inspected for loose, or damaged asbestos material:

a) *Penetrating Encapsulation*: Before penetrating encapsulation is applied, asbestos removal work in the area shall be complete. Substrate shall be evaluated before application to ensure that the encapsulant will not cause the substrate to fail in any way. Plug samples shall be taken to determine if full penetration has been achieved. If full penetration has not been achieved, surfaces shall be recoated while the matrix is still wet, until full penetration is achieved.
b) *Bridging Encapsulation*: The surface shall be encapsulated in sections 1000 square feet or less as recommended by the encapsulant manufacturer. Upon completion of each section, the dry thickness of the bridging encapsulation shall be measured. Additional bridging encapsulant shall be applied to obtain the desired encapsulant thickness. Additional coats shall blend with the original bridging encapsulant.

Bridging encapsulation where applicable shall include:
1) Troweled Wall Plaster
2) Troweled Ceiling Plaster
3) Acoustical Wall Plaster
4) Acoustical Ceiling Plaster
5) Asbestos Cement Wall, Fiberboard and Drywall Panels
6) Exterior Asbestos Stucco
7) Interior Asbestos Stucco
8) Storage Tank and Boiler Breeching
9) Boiler and Piping Gasket

2.18.15 Sealing Contaminated Items Designated for Disposal

Contaminated items designated for removal shall be coated with an asbestos lockdown encapsulant before being removed from the asbestos control area. The asbestos lockdown encapsulant shall be tinted a contrasting color and shall be spray applied by airless method. Thoroughness of sealing operation shall be visually gauged by the extent of colored coating on exposed surfaces.

2.19 Final Cleaning and Visual Inspection

After completion of all asbestos removal work and the gross amounts of asbestos have been removed from every surface, any remaining visible accumulations of asbestos shall be collected. For all classes of indoor asbestos abatement projects a final cleaning shall be performed using HEPA vacuum and wet cleaning of all exposed surfaces and objects in the regulated area. Upon completion of the cleaning, conduct a visual pre-inspection of the cleaned area in preparation for a final inspection before final air clearance monitoring. The Contractor and the Project Manager shall conduct a final visual inspection of the cleaned regulated area and document the results on the Final Cleaning and Visual Inspection. If the Project Manager rejects the clean regulated area as not meeting final cleaning requirements, reclean as necessary and have a follow-up inspection conducted with the Project Manager. Recleaning and follow-up re-inspection shall be at the Contractor's expense.

2.20 Lockdown

Prior to removal of plastic barriers and after final visual inspection, a (lockdown) encapsulant shall be spray applied to ceiling, walls, floors, and other surfaces for each affected regulated area.

2.21 Exposure Assessment and Air Monitoring

2.21.1 General Requirements

a) Exposure assessment, air monitoring and analysis of airborne concentration of asbestos fibers shall be performed in accordance with 29 CFR 1926.1101, and the Contractor's air monitoring plan. Results of breathing zone samples shall be posted at the job site and made available to the Project Manager. Submit all documentation regarding initial exposure assessments, negative exposure assessments, and air-monitoring results.

b) Worker Exposure.
   1) The Contractor's Designated AMT shall collect personal samples representative of the exposure of each employee who is assigned to work within a regulated area. Breathing zone samples shall be taken for at least 25 percent of the workers in each shift, or a minimum of 2, whichever is greater. Air monitoring results at the 95 percent confidence level.
   2) The Contractor will contract directly with an independent testing laboratory with qualified analysts and appropriate equipment to conduct sample analyses of air samples using the methods prescribed in 29 CFR 1926.1101, to include NIOSH Method 7400.
   3) Workers shall not be exposed to an airborne fiber concentration in excess of 1.0 f/cc, as averaged over a sampling period of 30 minutes. Should a personal excursion concentration of 1.0 f/cc expressed as a 30-minute

sample occur inside a regulated work area, stop work immediately, notify the Consultant's Project Manager, and implement additional engineering controls and work practice controls to reduce airborne fiber levels below prescribed limits in the work area. Do not restart work until authorized by the Project Manager.

c) Environmental Exposure
   1) All environmental air monitoring shall be performed by Owner's designated Consulting Agency.
   2) Environmental and final clearance air monitoring shall be performed using NIOSH Method 7400 (PCM) with optional confirmation of results by EPA AHERA TEM.
   3) For environmental and final clearance, air monitoring shall be conducted at a sufficient velocity and duration to establish the limit of detection of the method used at 0.005 f/cc.
   4) When confirming asbestos fiber concentrations (asbestos f/cc) from environmental and final clearance samples, Consultant may use TEM in accordance with NIOSH Method 7402. When such confirmation is conducted, it shall be from the same sample filter used for the NIOSH Method 7400 PCM analysis. All confirmation of asbestos fiber concentrations, using NIOSH Method 7402, shall be at the Contractor's expense.
   5) Maintain a fiber concentration inside a regulated area less than or equal to 0.1 f/cc expressed as an 8 hour, time-weighted average (TWA) during the conduct of the asbestos abatement.
   6) At the discretion of the Consultant's Project Manager, fiber concentration may exceed 0.1 f/cc but shall not exceed 1.0 f/cc expressed as an 8-hour TWA. Should an environmental concentration of 1.0 f/cc expressed as an 8-hour TWA occur inside a regulated work area, stop work immediately, and implement additional engineering controls and work practice controls to reduce airborne fiber levels below prescribed limits in the work area. Work shall not restart until authorized by the Project Manager.

2.21.2 Initial Exposure Assessment

The Owner has retained an independent Consulting and Air Monitoring Firm to perform pre-abatement, during abatement, and final clearance air monitoring. The Air Monitoring Consulting Firm has been provided a copy of the contract that includes this abatement work. The abatement Contractor will provide the Consulting Firm with an up-to-date copy of the accepted ALHAP, APP and pertinent detailed drawings.

The Consultant's Designated Project Manager and/or AMT shall conduct an exposure assessment at the initiation of an asbestos abatement operation to ascertain expected exposures during that operation. The assessment shall be completed in time to provide information necessary to assure that all control systems planned are appropriate for that operation. The assessment shall take into consideration both the monitoring results and

all observations, information or calculations which indicate employee exposure to asbestos, including any previous monitoring conducted in the workplace, or of the operations of the Contractor which indicate the levels of airborne asbestos likely to be encountered on the job. For Class I asbestos work, until the employer conducts exposure monitoring and documents that employees on that job will not be exposed in excess of PELs, or otherwise makes a negative exposure assessment, presume that employees are exposed in excess of the PEL-TWA and PEL-Excursion Limit.

a) Initial Exposure Monitoring: The results of initial exposure monitoring of the current job, made from breathing zone air samples that are representative of the 8-hour PEL-TWA and 30-minute short-term exposures of each employee. The monitoring covered exposure from operations which are most likely during the performance of the entire asbestos job to result in exposures over the PELs.

2.21.3 Negative Exposure Assessment – Will be based solely on data collected at the Hotel Grim Project.

2.21.4 Pre-abatement Environmental Air Monitoring

Pre-abatement environmental air monitoring shall be established (baseline) prior to the masking and sealing operations for each regulated area to determine background concentrations before abatement work begins. As a minimum, pre-abatement air samples shall be collected using NIOSH NMAM Method 7400, PCM at these locations: outside the building; inside the building, but outside the regulated area perimeter; and inside each regulated work area. One sample shall be collected for every 2000 square feet of floor space. At least 2 samples shall be collected outside the building: at the exhaust of the HEPA units; and downwind from the abatement site. The PCM samples shall be analyzed within 24 hours; and if any result in fiber concentration greater than 0.01 f/cc, asbestos fiber concentration, confirmed using NIOSH NMAM Method 7402 (TEM), may be requested by the Project Consultant or Building Owner.

2.21.5 Environmental Air Monitoring During Abatement

Environmental air monitoring shall be conducted at locations and frequencies that will accurately characterize any evolving airborne asbestos fiber concentrations. The monitoring shall be at least once per shift at locations including, but not limited to, close to the work inside a regulated area; pre-abatement sampling locations; outside entrances to a regulated area; close to glovebag operations; representative locations outside of the perimeter of a regulated area; inside clean room; and at the exhaust discharge point of local exhaust system ducted to the outside of a containment. If the sampling outside regulated area shows airborne fiber levels have exceeded background or 0.01 f/cc, whichever is greater, work shall be stopped immediately, and the Consultant notified. The condition causing the increase shall be corrected. Work shall not restart until authorized by the Consultant's Project Manager.

2.21.6 Final Clearance Air Monitoring

The Consultant's Project Manager and/or Air Monitoring Technician (AMT) shall perform clearance testing for each enclosed area. Final air clearance will be conducted using aggressive air sampling techniques as defined in 40 CFR 763, Subpart E, Appendix A, for all indoor asbestos abatement projects. Clearance air monitoring is not required for outside work.

2.21.6.1 Final Clearance Requirements

NIOSH PCM Method for PCM sampling and analysis using NIOSH NMAM Method 7400, the fiber concentration inside the abated regulated area, for each airborne sample, shall be less than 0.01 f/cc. The abatement inside the regulated area is considered complete when every PCM final clearance sample is below the clearance limit. If any confirmation sample result is greater than 0.01 f/cc, abatement is incomplete and cleaning shall be repeated. Upon completion of any required recleaning, re-sampling with results to meet the above clearance criteria shall be done.

2.21.6.2 Final Clearance Requirements, EPA TEM Method

For EPA TEM sampling and analysis, using the EPA Method specified in 40 CFR 763 appendix A, abatement inside the regulated area is considered complete when the arithmetic mean asbestos concentration of the 5 inside samples is less than or equal to 70 structures per square millimeter (70 S/mm). When the arithmetic mean is greater than 70 S/mm, the 3 blank samples shall be analyzed. If the 3 blank samples are greater than 70 S/mm, resampling shall be done. If less than 70 S/mm, the 5 outside samples shall be analyzed and a Z-test analysis performed. When the Z-test results are less than 1.65, the decontamination shall be considered complete. If the Z-test results are more than 1.65, the abatement is incomplete and cleaning shall be repeated. Upon completion of any required recleaning, resampling with results to meet the above clearance criteria shall be done.

2.21.6.3 Air Clearance Failure

Where clearance sampling results fail to meet the final clearance requirements, the contractor shall incur all costs associated with the required recleaning, resampling, and analysis, until final clearance requirements are met.

2.21.7 OSHA Personal Air-Monitoring Results and Documentation

Air sample fiber counting shall be completed and results provided within 24 hours after completion of a sampling period. The Project Manager shall be notified immediately of any airborne levels of asbestos fibers in excess of established requirements. Written sampling results shall be provided within 5 working days of the date of collection. The written results shall be signed by testing laboratory analyst, testing laboratory. The air sampling results shall be documented on a Contractor's daily air monitoring log.

The daily air monitoring log shall contain the following information for each sample:

a) Sampling and analytical method used;
b) Date sample collected;
c) Sample number;
d) Location/activity/name where sample collected;
e) Sampling pump beginning flow rate, end flow rate, average flow rate (L/min);
f) Calibration date, time, method, location, name of calibrator, signature;
g) Sample period (start time, stop time, elapsed time (minutes);
h) Total air volume sampled (liters);
i) Sample results (f/cc and S/mm square) if EPA methods are required for final clearance;
j) Laboratory name, location, analytical method, analyst, confidence level. In addition, the printed name and a signature and date block for the Project Manager / AMT who conducted the sampling.

2.22 Clearance Certification

When asbestos abatement is complete, ACM waste is removed from the regulated areas, and final clean-up is completed, the Project Manager will allow the warning signs and boundary warning tape to be removed. After final clean-up and acceptable airborne concentrations are attained, but before the HEPA unit is turned off and the containment removed, the Contractor shall remove all pre-filters on the building HVAC system and provide new pre-filters. Dispose of such filters as asbestos contaminated materials. HVAC, mechanical, and electrical systems shall be re-established in proper working order. The Contractor and the Project Manager shall visually inspect all surfaces within the containment for residual material or accumulated debris. Reclean all areas showing dust or residual materials. The Project Manager will certify in writing that the area is safe before unrestricted entry is permitted.

2.23 Clean-up and Disposal

2.23.1 Title to ACM Materials

ACM material resulting from abatement work, except as specified otherwise, shall be labeled as the building Owner's and shall be disposed of as specified and in accordance with applicable federal, state and local regulations.

2.23.2 Collection and Disposal of Asbestos

All ACM waste shall be collected including contaminated wastewater filters, scrap, debris, bags, containers, equipment, and asbestos contaminated clothing and placed in leak-tight containers. Waste within the containers shall be wetted in case the container is breeched. Asbestos-containing waste shall be disposed of at an EPA, state and local

approved asbestos landfill. For temporary storage, sealed impermeable containers shall be stored in an asbestos waste load-out unit or in a storage/transportation conveyance (i.e., dumpster, roll-off waste boxes, etc.) in a manner acceptable to and in an area assigned by the Consultant's Project Manager. Procedure for hauling and disposal shall comply with 40 CFR 61, Subpart M, state, regional, and local standards.

2.23.3 Records

2.23.3.1 Asbestos Waste Shipment Records
Complete and provide the Consultant's Project Manager's and/or Owner's representative final completed copies of the Waste Shipment Record for all shipments of waste material as specified in 40 CFR 61, Subpart M and other required state waste manifest shipment records, within 3 days of delivery to the landfill. Each Waste Shipment Record shall be signed and dated by the Owner's Designated Person, the waste transporter and disposal facility operator.

2.23.3.2 Abatement Supply Records
Submit manufacturer's catalog data for all materials and equipment to be used, including brand name, model, capacity, performance characteristics and any other pertinent information. Test results and certificates from the manufacturer of encapsulants substantiating compliance with performance requirements of this specification. Material Safety Data Sheets for all chemicals to be used onsite in the same format as implemented in the Contractor's HAZARD COMMUNICATION PROGRAM. Data shall include, but shall not be limited to, the following items:

a) High Efficiency Filtered Air (HEPA) local exhaust equipment
b) Vacuum cleaning equipment
c) Pressure differential monitor for HEPA local exhaust equipment
d) Air monitoring equipment
e) Respirators
f) Personal protective clothing and equipment
g) Glovebags. Written manufacturer's proof that glovebags will not break down under expected temperatures and conditions.
h) Duct Tape
i) Disposal Containers
j) Sheet Plastic
k) Wetting Agent
l) Strippable Coating
m) Prefabricated Decontamination Unit
n) Material Safety Data Sheets (for all chemicals proposed)

SECTION III - LEAD HAZARD ABATEMENT

3.1 General Requirements

This section shall cover all activities involving the disturbance of lead based paints and/or lead dust hazards including cleaning and removal of lead contaminated debris. It is anticipated that the majority of all initial site work in each area of the Hotel Grim building will involve the disturbance of lead paints and/or lead dust. The requirements and procedures within this section shall be implemented to safeguard workers and establish a building meeting HUD clearance level standards from which new construction and renovations can safely be completed by others.

3.2 Lead Cleaning and Stabilization

These requirements and procedures shall apply to all cleaning, stabilization and abatement work where an employee may be occupationally exposed to lead. Construction work is defined as work for construction, alteration and/or repair, including painting and decorating. It includes but is not limited to the following:

a) Demolition or salvage of structures where lead or materials containing lead are present;
b) Cleaning, removal or encapsulation of materials containing lead;
c) New construction, alteration, repair, or renovation of structures, substrates, or portions thereof, that contain lead, or materials containing lead;
d) Installation of products containing lead;
e) Lead contamination/emergency cleanup;
f) Transportation, disposal, storage, or containment of lead or materials containing lead on the site or location at which construction activities are performed, and
g) Maintenance operations associated with the construction activities described in this paragraph.

3.3 Definitions

3.3.1 Abatement - Measures defined in 40 CFR 745, Section 223, designed to permanently eliminate lead-based paint hazards.

3.3.2 Action Level - Means employee exposure, without regard to the use of respirators, to an airborne concentration of lead of 30 micrograms per cubic meter of air (30 ug/m3) calculated as an 8-hour time-weighted average (TWA).

3.3.3 Bare Soil - Soil not covered with grass, sod, or some other similar vegetation. Bare soil includes sand.

3.3.4 Child-Occupied Facility - A building, or part of a building, constructed before 1978 that is visited regularly by the same child, six years of age or younger, on at least two different days in any seven-day period beginning on Sunday and ending on Saturday, if each day's visit lasts at least three (3) hours, the combined weekly visits at least six (6) hours, and the combined annual visits last at least 60 hours. The term may include, but is not limited to, day-care centers, preschools, or kindergarten classrooms.

3.3.5 Clearance Levels - Values that indicate the maximum amount of lead permitted in dust on a surface following completion of an abatement activity. Clearance levels that are appropriate for the purposes of these regulations may be found in the Environmental Protection Agency Guidance on Residential Lead Based Paint, Lead-Contaminated Soil (60 Federal Register 47248 (1995).

3.3.6 Component or Building Component - Specific design or structural elements or fixtures of target housing or a child-occupied facility that are distinguished from each other by form, function, and location. These include, but are not limited to, interior components such as: ceiling, crown molding, walls, chair rails, doors, door trim, floors, fireplaces, radiators and other heating units, shelves, shelf supports, stair treads, stair risers, stair stringers, newel posts, railing caps, balustrades, windows and trim (including vanities, counter tops, and air conditioners; and exterior components such as: painted roofing, chimneys, flashing, gutters and downspouts, ceilings, soffits, facias, rake boards, corner boards, bulkheads, doors and door trim, fences, floors, joists, lattice work, railings and railing caps, siding, handrails, stair risers and treads, stair stringers, columns, balustrades, window sills or stools and troughs, casings, sashes and wells, and air conditioners.

3.3.7 Competent Person - Defined as one who is capable of identifying existing and predictable lead hazards in the surroundings or working conditions and who has authorization to take prompt corrective measures to eliminate them.

3.3.8 Containment - A regulated area that has been sealed and designed to prevent the release of lead-containing dust or materials into surrounding areas

3.3.9 Deteriorated Paint - Any interior or exterior paint or other coating that is peeling, chipping, chalking or cracking, or any paint or coating located on an interior or exterior surface or fixture that is otherwise damaged or separated from the substrate.

3.3.10 Encapsulant - A substance that forms a barrier between lead-based paint and the environment using a liquid-applied coating (with or without reinforcement materials) or an adhesively bonded covering material. Only encapsulant products that meet the performance standards developed by ASTM (E1796, E1795) shall be used for lead hazard reduction.

3.3.11 Encapsulation - The application of an encapsulant.

3.3.12 Enclosure - A process that makes lead-based paint inaccessible by providing a physical barrier that is mechanically attached to a surface

3.3.13 EPA - The United States Environmental Protection Agency

3.3.14 HUD - The United States Department of Housing and Urban Development

3.3.15 HVAC - Heating, ventilation, and air conditioning systems

3.3.15 Impact Surface - An interior or exterior surface that is subject to damage by repeated sudden force such as certain parts of door frames.

3.3.17 Interim Controls - A set of measures designed to temporarily reduce human exposure or likely exposure to lead-based paint hazards, including specialized cleaning, repairs, maintenance, painting, temporary containment, ongoing monitoring of lead-based paint hazards or potential hazards, and the establishment and operation of management and resident education programs.

3.3.18 Lead - Means metallic lead, all inorganic lead compounds, and organic lead soaps. Excluded from this definition are all other organic lead compounds.

3.3.19 Lead Abatement –

(A) Includes any measure or set of measures designed to permanently eliminate lead-based paint hazards. Abatement includes, but is not limited to:

1) the removal of paint and dust, the permanent enclosure or encapsulation of lead-based paint, the replacement of painted surfaces or fixtures, or the removal or permanent covering of soil, when lead-based paint hazards are present in such paint, dust or soil; and

(B) Excludes:

1) renovation, remodeling, or landscaping activities, which are not designed to permanently eliminate lead-based paint hazards, but, instead, are designed to repair, restore, or remodel a given structure or dwelling, even though these activities may incidentally result in a reduction or elimination of lead-based paint hazards;
2) interim controls, operations and maintenance activities, or other measures and activities designed to temporarily, but not permanently, reduce lead-based paint hazards; and

3.3.20 Lead-Based Paint - Paint or other surface coatings that contain lead equal to or in excess of 1.0 milligrams per square centimeter or more than 0.5% by weight.

3.3.21 Lead-Based Paint Activity - Inspection, testing, risk assessment, risk reduction, lead abatement project design or planning, abatement or removal, or creation of lead-based paint hazards.

3.3.22 Lead-Based Paint Hazard
Hazardous lead-based paint, dust-lead hazard or soil-lead hazard as identified below.

(A) Paint-lead hazard. A paint-lead hazard is any of the following:

1) any lead-based paint on a friction surface that is subject to abrasion and where the lead dust levels on the nearest horizontal surface underneath the friction surface (e.g., the window sill, or floor) are equal to or greater than the dust-lead hazard levels identified as clearance levels in 40 CFR 745 section 65.

3.3.23 Target Housing - Residential real property which is housing constructed prior to 1978, except housing for the elderly or persons with disabilities (unless any one or more children age 6 years or under resides or is expected to reside in such housing for the elderly or persons with disabilities) or any 0-bedroom dwelling.

3.3.24 TSCA - Toxic Substances Control Act (15 United States Code §2681 et seq) Title IV.

3.3.25 Visual Inspection for Clearance Testing - The visual examination of a residential dwelling or a child-occupied facility following an abatement to determine whether or not the abatement has been successfully completed, as indicated by the absence of visible residue, dust, and debris.

3.4 System Description

3.4.1 Protection of Existing Areas to Remain

All project work including, but not limited to, lead hazard abatement work, storage, transportation, and disposal shall be performed without damaging or contaminating adjacent work and areas. Where such work or areas are damaged or contaminated, restore work and areas to the original condition.

3.4.2 Coordination with Other Work

Coordinate lead hazard abatement activities with work being performed in adjacent areas. Coordination procedures shall be explained in the Contractor's Accident Prevention Plan and describe how the Contractor will prevent lead exposure to other Contractors and/or Owner’s personnel performing work unrelated to lead hazard abatement activities.

3.4.3 Sampling and Analysis

Sampling and analysis will be performed by the Consultant throughout all phases of abatement and cleaning to continuously monitor the effectiveness of equipment and procedures to prevent migration of contamination while lead hazard abatement activities are performed and to assure clearance/cleanup requirements have been achieved.

The Consultant shall furnish a weekly record of the analytical results from sampling conducted during the abatement. The log of results shall be kept current with project activities and shall be briefed to the Contractor as analytical results are reported.

3.4.3.1 Lead air sampling shall be performed to evaluate worker exposure levels.

3.4.3.2 Soil Sampling and Analysis

Sampling shall conform to ASTM E1727. [Analysis shall conform to ASTM E1613 and ASTM E1726].

3.4.3.3 Clearance Monitoring

a. The Consultant shall collect dust wipe samples inside the lead hazard control area after the final visual inspection in the quantities and at the locations specified.
    1. Floors: one (1) sample for each room. Rooms scheduled for occupancy; take a minimum of two (2) samples and at least one (1) per 250 square feet of area.
    2. Interior Window Sills: one (1) sample per window.
    3. Window Troughs: one (1) sample per window.

b. The Consultant shall collect exterior bare soil samples inside the lead hazard control area after the final visual inspection in the quantities and at the locations specified.
    1. Near the building foundation: one (1) sample for each exterior wall where soil in present within 10’.
    2. Nearby Play areas: three (3) samples were soil is present.

3.4.4 Clearance Requirements

NOTE: Clearance criteria are as follows:
Target housing and child occupied facilities.
a) Building Interior:

Floors - 40 micrograms/square foot.
Interior Window Sills - 250 micrograms/square foot.

Window Troughs - 800 micrograms/square foot.

b) Building Exterior:
Bare soils in play areas used by children under the age of 6 - 400 mg/kg.
Bare soils, all other areas - 1200 mg/kg

3.5 Contractor Personnel and Management

3.5.1 Personnel Responsibilities and Qualifications

3.5.1.1 Certified Abatement Supervisor
The abatement supervisor shall be certified pursuant to 40 CFR 745, Section 226 and is responsible for development and implementation of the occupant protection plan, the abatement report and shall supervise lead hazard abatement work activities.

3.5.1.2 Lead Hazard Abatement Workers
Lead hazard abatement workers shall be certified pursuant to 40 CFR 745, Section 226 and shall be responsible for performing the labor necessary to complete the lead hazard abatement activities required for this project.

3.5.1.3 Testing Laboratories
The laboratory selected to perform analysis on air, dust wipe, paint chip and soil samples shall be recognized by the EPA's National Lead Laboratory Accreditation Program (NLLAP).

3.5.2 Occupant Protection Plan

The certified supervisor shall develop and implement an Occupant Protection Plan describing the measures and management procedures to be taken during lead hazard abatement activities to protect the building occupants/building facilities and the outside environment from exposure to any lead contamination while lead hazard abatement activities are performed.

3.5.3 Licenses, Permits and Notifications

The Contractor shall certify and submit in writing to the owner and Consultant at least ten (10) days prior to the commencement of work that all applicable licenses, permits and notifications have been obtained. All associated fees or costs incurred in obtaining the licenses, permits and notifications shall be included in the contract price.

3.6 Permissible Exposure Limit

The Contractor shall assure that no employee is exposed to lead at concentrations greater than fifty micrograms per cubic meter of air (50 ug/m3) averaged over an 8-hour period.

If an employee is exposed to lead for more than 8 hours in any work day the employees' allowable exposure, as a time weighted average (TWA) for that day, shall be reduced according to the following formula:

Allowable employee exposure (in ug/m3) = 400 divided by hours worked in the day.

3.7 Exposure Assessment

The Contractor shall initially determine if any employee may be exposed to lead at or above the action level.

The Contractor shall collect personal samples representative of a full shift including at least one sample for each job classification in each work area either for each shift or for the shift with the highest exposure level.

Full shift personal samples shall be representative of the monitored employee's regular, daily exposure to lead.

3.7.1 Protection of Employees During Assessment of Exposure

With respect to the lead related tasks, where lead is present, the Contractor shall treat the employee as if the employee were exposed above the PEL, and not in excess of ten (10) times the PEL, and shall implement employee protective measures prescribed in paragraph (d)(2)(v) 29 CFR 1926.62. The tasks covered by this requirement include all cleaning and stabilization activities where lead containing coatings or paint are present: Manual demolition of structures (e.g., dry wall), all HEPA vacuum cleanup and bagging procedures, manual scraping, manual sanding, heat gun applications, and power tool cleaning with dust collection systems;

In addition, with regard to tasks not listed above, where the Consultant’s Project Manager has any reason to believe that an employee performing the task may be exposed to lead in excess of the PEL, until the Contractor performs an employee exposure assessment and documents that the employee's lead exposure is not above the PEL the Contractor shall treat the employee as if the employee were exposed above the PEL and shall implement employee protective measures as prescribed in paragraph (d)(2)(v) of 29 CFR 1926.62.

Where lead and/or lead contamination is present, until the Contractor performs an employee exposure assessment, and documents that the employee performing any of the listed tasks is not exposed in excess of 2,500 ug/m (3), the Contractor shall treat the employee as if the employee were exposed to lead in excess of 2,500 ug/m (3) and shall implement employee protective measures. Where the Contractor does establish that the employee is exposed to levels of lead below 2,500 ug/m(3), the Contractor may provide the exposed employee with the appropriate respirator prescribed for such use at such lower exposures. The tasks covered by this requirement are:

a) Abrasive blasting
b) Welding
c) Cutting
d) Torch burning
e) Power tool cleaning

Contractor shall provide:

a) Appropriate personal protective clothing and equipment in accordance with paragraph (g) 29 CFR 1926.62.
b) Change areas in accordance with paragraph (i)(2) 29 CFR 1926.62.
c) Hand washing facilities in accordance with paragraph (i)(5) 29 CFR 1926.62.
d) Biological monitoring in accordance with paragraph (j)(1)(i) 29 CFR 1926.62, to consist of blood sampling and analysis for lead and zinc protoporphyrin levels, and
e) Training as required under paragraph (l)(1)(i) 29 CFR 1926.62 and in accordance with 29 CFR 1926.59, Hazard Communication; training as required under 29 CFR 1926.62, regarding use of respirators; and training in accordance with 29 CFR 1926.21, Safety training and education.

3.7.2 Basis of Initial Determination

3.7.2.1 The Contractor shall monitor employee exposures and shall base initial determinations on the employee exposure monitoring results and any of the following, relevant considerations:

Any information, observations, or calculations which would indicate employee exposure to lead;

Any previous measurements of airborne lead; and

Any employee complaints of symptoms which may be attributable to exposure to lead.

3.7.3 Positive Initial Determination and Initial Monitoring.

Where a determination conducted under paragraphs 3.3 of this section shows the possibility of any employee exposure at or above the action level the Contractor shall conduct monitoring which is representative of the exposure for each employee in the workplace who is exposed to lead.

3.7.4 Negative Initial Determination

Where a determination, conducted under paragraph 3.3 of this section is made that no employee is exposed to airborne concentrations of lead at or above the action level the Contractor shall make a written record of such determination.

3.7.5 Frequency

If the initial determination reveals employee exposure to be below the action level further exposure determination shall be repeated for each regulated area established to complete the project.

If the initial determination or subsequent determination reveals employee exposure to be at or above the action level the Contractor shall continue monitoring at the required frequency until at least three consecutive measurements, taken at least 4 days apart, are below the action level at which time the Contractor may discontinue monitoring for that employee except as otherwise provided in 29 CFR 1926.62.

3.7.6 Additional Exposure Assessments

Whenever there has been a change of equipment, process, control, personnel or a new task has been initiated that may result in additional employees being exposed to lead at or above the action level or may result in employees already exposed at or above the action level being exposed above the PEL, the Contractor shall conduct additional monitoring.

3.7.7 Employee Notification

The Contractor must, as soon as possible but no later than 3 working days after the receipt of the results of any monitoring performed during this project, notify each affected employee of these results either individually in writing or by posting the results in an appropriate location that is accessible to employees.

Whenever the results indicate that the representative employee exposure, without regard to respirators, is at or above the PEL the Contractor shall include in the written notice a statement that the employees' exposure was at or above that level and a description of the corrective action taken or to be taken to reduce exposure to below that level.

Accuracy of measurement. The Contractor shall ensure a method of monitoring and analysis which has an accuracy (to a confidence level of 95 percent) of not less than plus or minus 25 percent for airborne concentrations of lead equal to or greater than 30 ug/m(3).

3.7.8 Employee Observation

The Contractor shall provide affected employees or their designated representatives an opportunity to observe any monitoring of employee exposure to lead conducted pursuant to paragraph 3.3 of this section.

3.7.8.1 Observation procedures.

a) Whenever observation of the monitoring of employee exposure to lead requires entry into an area where the use of respirators, protective clothing or equipment is required, the Contractor shall provide the observer with and assure the use of such respirators, clothing and equipment, and shall require the observer to comply with all other applicable safety and health procedures.
b) Without interfering with the monitoring, observers shall be entitled to:

c) Receive an explanation of the measurement procedures;
d) Observe all steps related to the monitoring of lead cleaning, stabilization and/or abatement work performed at the Hotel Grim Project.
e) Record the results obtained or receive copies of the results when returned by the laboratory.

3.8 Methods of Compliance

3.8.1 Engineering and Work Practice Controls

The Contractor shall implement engineering and work practice controls, including administrative controls, to reduce and maintain employee exposure to lead to or below the permissible exposure limit to the extent that such controls are feasible. Wherever all feasible engineering and work practices controls that can be instituted are not sufficient to reduce employee exposure to or below the permissible exposure limit, the Contractor shall nonetheless use them to reduce employee exposure to the lowest feasible level and shall supplement them by the use of respiratory protection that complies with the requirements of paragraph (f) of 29 CFR 1926.62.

3.8.2 Compliance Program

Prior to commencement of the project each Contractor shall establish and implement a written compliance program to achieve compliance with the OSHA Lead PEL.

The compliance program shall provide for frequent and regular inspections of job sites, materials, and equipment to be made by a competent person.

Written programs shall be submitted upon request to any affected employee or authorized employee representatives and shall be available at the worksite for examination.

Written programs must be Site-Specific for the Grim Project.

Written plans for these compliance programs shall include at least the following:

3.8.2.1 A description of each activity in which lead is emitted; e.g. equipment used, material involved, controls in place, crew size, employee job responsibilities, operating procedures and maintenance practices;

3.8.2.2 A description of the specific means that will be employed to achieve compliance and, where engineering controls are required engineering plans and studies used to determine methods selected for controlling exposure to lead;

3.8.2.3 A report of the technology considered in meeting the PEL;

3.8.2.4 A detailed schedule for implementation of the program, including documentation such as copies of purchase orders for equipment, construction contracts, etc.;

3.8.2.5 A work practice program which protective clothing, housekeeping, hygiene facilities and safe work practices.

3.8.2.6 A description of arrangements made among contractors on multi-contractor sites with respect to informing affected employees of potential exposure to lead.

3.8.3 Mechanical Ventilation

When ventilation is used to control lead exposure, the Contractor shall evaluate the mechanical performance of the system in controlling exposure as necessary to maintain its effectiveness.

3.8.4 Administrative Controls

Administrative controls may not be as a means of reducing employees' exposure for the Grim Project.

3.8.5 Safe Work Practices

The Contractor shall ensure that, to the extent relevant, employees follow safe work practices such as described in Appendix B of 29 CFR 1926.62.

3.9 Respiratory Protection

General. For employees who use respirators required by this section, the Contractor must provide each employee an appropriate respirator that complies with the requirements of this paragraph.

3.9.1 Respirators Must Be Used During:

Periods when an employee's exposure to lead exceeds the PEL.

Work operations for which engineering and work-practice controls are not sufficient to reduce employee exposures to or below the PEL.

Periods when an employee requests a respirator.

Periods when respirators are required to provide interim protection of employees while they perform the operations specified in paragraph 3.3 of this section.

3.9.2 Respirator Program

The Contractor must implement a respiratory protection program in accordance with § 1910.134(b) through (d) (except (d)(1)(iii)), and (f) through (m), which covers each employee required by this section to use a respirator.

If an employee has breathing difficulty during fit testing or respirator use, the Contractor must provide the employee with a medical examination in accordance with paragraph (j)(3)(i)(B) of this section to determine whether or not the employee can use a respirator while performing the required duty.

3.9.3 Respirator Selection

The Contractor shall select, and provide to employees, the appropriate respirators specified in paragraph (d)(3)(i)(A) of 29 CFR 1910.134.

Provide employees with a full facepiece respirator instead of a half mask respirator for protection against lead aerosols that may cause eye or skin irritation at the use concentrations.

Provide HEPA filters for powered and non-powered air-purifying respirators.

The Contractor must provide a powered air-purifying respirator when an employee chooses to use such a respirator and it will provide adequate protection to the employee.

3.10 Protective Work Clothing and Equipment.

3.10.1 Provision and Use

Where an employee is exposed to lead above the PEL without regard to the use of respirators, where employees are exposed to lead compounds which may cause skin or eye irritation (e.g. lead arsenate, lead azide), and as interim protection for employees performing tasks as specified in section 3.3.1of this section, the Contractor shall provide at no cost to the employee and assure that the employee uses appropriate protective work clothing and equipment that prevents contamination of the employee and the employee's garments such as, but not limited to:

Coveralls or similar full-body work clothing;

Gloves, hats, and shoes or disposable shoe coverlets; and

Face shields, vented goggles, or other appropriate protective equipment which complies with 29 CFR 1910.133.

3.10.2 Cleaning and Replacement

The Contractor shall provide the protective clothing required in paragraph 3.6.1 of this section in a clean and dry condition at least weekly, and daily to employees whose exposure levels without regard to a respirator are over 200 ug/m(3) of lead as an 8-hour TWA.

The Contractor shall provide for the cleaning, laundering, and disposal of protective clothing and equipment required by paragraph 3.6.1 of this section.

The Contractor shall repair or replace required protective clothing and equipment as needed to maintain their effectiveness.

The Contractor shall assure that all protective clothing is removed at the completion of a work shift only in change areas provided for that purpose.

The Contractor shall assure that contaminated protective clothing which is to be cleaned, laundered, or disposed of, is placed in a closed container in the change area which prevents dispersion of lead outside the container.

The Contractor shall inform in writing any person who cleans or launders protective clothing or equipment of the potentially harmful effects of exposure to lead.

The Contractor shall ensure that the containers of contaminated protective clothing and equipment are labeled as follows:

DANGER: CLOTHING AND EQUIPMENT CONTAMINATED WITH LEAD. MAY DAMAGE FERTILITY OR THE UNBORN CHILD. CAUSES DAMAGE TO THE CENTRAL NERVOUS SYSTEM. DO NOT EAT, DRINK OR SMOKE WHEN HANDLING. DO NOT REMOVE DUST BY BLOWING OR SHAKING. DISPOSE OF LEAD CONTAMINATED WASH WATER IN ACCORDANCE WITH APPLICABLE LOCAL, STATE, OR FEDERAL REGULATIONS.

The Contractor shall prohibit the removal of lead from protective clothing or equipment by blowing, shaking, or any other means which disperses lead into the air.

3.11 Housekeeping

All surfaces shall be maintained as free as practicable of accumulations of lead.

Clean-up of floors and other surfaces where lead accumulates shall wherever possible, be cleaned by vacuuming or other methods that minimize the likelihood of lead becoming airborne.

Shoveling, dry or wet sweeping, and brushing may be used only where vacuuming or other equally effective methods have been tried and found not to be effective.

Where vacuuming methods are selected, the vacuums shall be equipped with HEPA filters and used and emptied in a manner which minimizes the reentry of lead into the workplace.

Compressed air shall not be used to remove lead from any surface unless the compressed air is used in conjunction with a ventilation system designed to capture the airborne dust created by the compressed air.

3.12 Hygiene Facilities and Practices

The Contractor shall assure that in areas where employees are exposed to lead above the Active Level without regard to the use of respirators, food or beverage is not present or consumed, tobacco products are not present or used, and cosmetics are not applied.

3.12.1 Change Areas

The Contractor shall provide clean change areas for employees whose airborne exposure to lead is above the PEL, and as interim protection for employees performing tasks as specified in paragraph 3.3.1 of this section, without regard to the use of respirators.

The Contractor shall assure that change areas are equipped with separate storage facilities for protective work clothing and equipment and for street clothes which prevent cross-contamination.

The Contractor shall assure that employees do not leave the workplace wearing any protective clothing or equipment that is required to be worn during the work shift.

3.12.2 Shower Facilities

The Contractor shall provide shower facilities, for use by employees whose airborne exposure to lead is above the PEL.

The Contractor shall assure, that employees shower at the end of the work shift and shall provide an adequate supply of cleansing agents and towels for use by affected employees.

3.12.3 Eating Facilities

The Contractor shall provide lunchroom facilities or eating areas for employees whose airborne exposure to lead is above the PEL, without regard to the use of respirators.

The Contractor shall assure that lunchroom facilities or eating areas are as free as practicable from lead contamination and are readily accessible to employees.

The Contractor shall assure that employees whose airborne exposure to lead is above the PEL, without regard to the use of a respirator, wash their hands and face prior to eating, drinking, smoking or applying cosmetics.

The Contractor shall assure that employees do not enter lunchroom facilities or eating areas with protective work clothing or equipment unless surface lead dust has been removed by vacuuming, downdraft booth, or other cleaning method that limits dispersion of lead dust.

3.12.4 Hand Washing Facilities

The Contractor shall provide adequate handwashing facilities for use by employees exposed to lead in accordance with 29 CFR 1926.51(f).

3.13 Materials and Supplies

Materials and equipment needed to complete the project, shall be available and kept on the site. The Contractor shall submit a description of the materials and equipment to be used; including Material Safety Data Sheets (MSDSs) for material brought onsite to perform the work.

3.13.1 Expendable Supplies

The Contractor shall submit a description of the expendable supplies required.

3.13.1.1 Polyethylene Bags
Disposable bags shall be polyethylene plastic and shall be a minimum of 0.15 mm 6 mils thick (0.1 mm 4 mils thick if double bags are used) or any other thick plastic material shown to demonstrate at least equivalent performance; and shall be capable of being made leak-tight. Leak-tight means that solids, liquids or dust cannot escape or spill out.

3.13.1.2 Polyethylene Leak-tight Wrapping
Wrapping used to wrap lead contaminated debris shall be polyethylene plastic that is a minimum of 0.15 mm 6 mils thick or any other thick plastic material shown to demonstrate at least equivalent performance.

3.13.1.3 Polyethylene Sheeting
Sheeting shall be polyethylene plastic with a minimum thickness of 0.15 mm 6 mil, or any other thick plastic material shown to demonstrate at least equivalent performance; and shall be provided in the largest sheet size reasonably accommodated by the project to minimize the number of seams. Where the project location constitutes an out of the ordinary potential for fire, or where unusual fire hazards cannot be eliminated, flame-resistant polyethylene sheets which conform to the requirements of NFPA 701 shall be provided.

3.13.1.4 Tape and Adhesive Spray
Tape and adhesive shall be capable of sealing joints between polyethylene sheets and for attachment of polyethylene sheets to adjacent surfaces. After dry application, tape or adhesive shall retain adhesion when exposed to wet conditions, including amended water. Tape shall be minimum 50 mm 2 inches wide, industrial strength.

3.13.1.5 Containers
When used, containers shall be leak-tight and shall be labeled in accordance with EPA, DOT and OSHA standards.

3.13.1.6 Chemical Paint Strippers
Chemical paint strippers shall not contain methylene chloride and shall be formulated to prevent stain, discoloration, or raising of the substrate materials.

3.13.1.7 Chemical Paint Stripper Neutralizer
Neutralizers for paint strippers shall be compatible with the substrate and suitable for use with the chemical stripper that has been applied to the surface.

3.13.1.8 Detergents and Cleaners
Detergents or cleaning agents shall not contain trisodium phosphate and shall have demonstrated effectiveness in lead control work using cleaning techniques specified by HUD 6780 guidelines.

3.14 Equipment

3.14.1 Abrasive Removal Equipment

The use of powered machine for vibrating, sanding, grinding, or abrasive blasting is prohibited unless equipped with local exhaust ventilation systems equipped with high efficiency particulate air (HEPA) filters.

3.14.3 Vacuum Systems

Vacuum systems shall be suitably sized for the project, and filters shall be capable of trapping and retaining all mono-disperse particles as small as 0.3 micrometers (mean aerodynamic diameter) at a minimum efficiency of 99.97 percent. Used filters that are being replaced shall be disposed in a proper manner.

3.14.4 Heat Blower Guns

Heat blower guns shall be flameless, electrical, paint-softener type with controls to limit temperature to 1,100 degrees F. Heat blower shall be DI (non-grounded) 120 volts ac, and shall be equipped with cone, fan, glass protector and spoon reflector nozzles.

3.15 Work Procedures and Methods

Perform work following practices and procedures in project work plans and the occupant protection plan.

3.15.1 Lead Hazard Control Areas, Equipment and Procedures

Set up lead hazard control areas and operate equipment within the lead hazard control area in a manner that will minimize migration of lead dust beyond the lead hazard control area boundaries.

3.15.2 Lead Hazard Control Areas

Access into lead hazard control areas by the general public shall be prohibited. Lead hazard control area preparation and restriction requirements follow:

a) Containment features for interior lead hazard control projects:
Polyethylene sheeting sealed with spray adhesive and duct tape shall be used for each lead hazard control area. Each entry/exit shall be sealed with primitive air lock Openings. HVAC supply and return air vents, into the lead hazard control areas shall be sealed with polyethylene sheeting and duct tape or with sealed rigid coverings to form critical barriers.

b) Containment features for exterior lead hazard control projects:
A roped-off boundary perimeter, using caution tape or a barrier installed at 10' distance from where the lead control work is performed.

3.15.3 Negative Air Pressure System Containment

a) Each negative air pressure systems shall be operated to provide at least four (4) air changes per hour inside the containment. The local exhaust unit equipment shall be operated continuously until the containment is removed. The negative air pressure system shall be smoke tested for leaks at the beginning of each shift. The certified supervisor is responsible to continuously monitor and keep a pressure differential log with an automatic manometric recording instrument. The Consultant's Project Manager shall be notified immediately if the pressure differential falls below the prescribed minimum. Submit the continuously monitored pressure differential log, as specified. The building ventilation system shall not be used as the local exhaust system. The local exhaust system shall terminate out of doors unless the Consultant's Project Manager allows an alternate arrangement. All filters shall be new at the beginning of the project and shall be periodically changed as necessary to maintain specified pressure differential and shall be disposed of as lead contaminated waste.

b) Discontinuing Negative Air Pressure System. The negative air pressure system shall be operated continuously during abatement activities unless otherwise authorized by the Consultant's Project Manager. At the completion of the project, units shall be run until full cleanup has been completed and final clearance testing requirements have been met. Dismantling of the negative air pressure systems shall conform to written decontamination procedures. The HEPA filter machine intakes shall be sealed with polyethylene to prevent environmental contamination.

3.16 Furnishings

All furniture and equipment within the Hotel Grim shall be considered lead contaminated. All porous materials shall be collected, bagged or containerized for proper disposal. Large non-porous items that can be wet wiped and decontaminated may be discarded as general construction debris.

3.17 Clearance Procedures

3.17.1 Visual Inspection

The certified supervisor shall perform a visual inspection, to assure that lead hazard abatement activities, identified in the individual work task data elements, have been properly completed. The certified supervisor shall visually verify that lead hazards have been abated and the area is free of dust and paint chips generated by lead hazard cleaning and stabilization activities.

3.17.2 Analytical Demonstration of Clearance

After the visual inspection, the Consultant's Project Manager shall take clearance samples for laboratory analysis to verify clearance requirements specified in paragraph CLEARANCE REQUIREMENTS in PART 1 have been met.

3.17.3 Clearance

The Consultant's Certified Risk Assessor shall review analytical results for the samples taken to determine compliance with project specific clearance requirements. The following actions apply and shall be performed at the Contractor's expense if project specific clearance levels are exceeded:

Reclean surfaces.
Retest to determine clearance.

3.18 Medical Surveillance

The Contractor shall make available initial medical surveillance to employees occupationally exposed on any day to lead at or above the action level. Initial medical surveillance consists of biological monitoring in the form of blood sampling and analysis for lead and zinc protoporphyrin levels.

The medical surveillance program shall conform to the requirements set forth in 29 CFR 1926.62(j) and shall include: Biological Monitoring, Medical Examination and Consultations and Chelation.

3.18.1 Temporary medical removal and return of an employee

Contractor shall comply with all provisions of 29 CFR 1926.62 (k) related to medical protection.

3.19 Hazard Communication

The Contractor shall include lead in the program established to comply with the Hazard Communication Standard (HCS) 29 CFR.1910.1200. The Contractor shall ensure that each employee has access to labels and safety data sheets for job site supplies and is trained in accordance with the provisions of HCS and all provisions of this section. The Contractor shall ensure that at least the following lead hazards are addressed:

a) Reproductive/developmental toxicity;
b) Central nervous system effects;
c) Kidney effects;
d) Blood effects; and
e) Acute toxicity effects.

3.20 Training

The Contractor shall train each employee who is subject to exposure to lead at or above the action level on any day, or who is subject to exposure to lead compounds which may cause skin or eye irritation (e.g., lead arsenate, lead azide), in accordance with the requirements of this section. The Contractor shall institute a training program and ensure employee participation in the program.

The Contractor shall provide the training program as initial training prior to the time of job assignment or prior to the startup date for this requirement, whichever comes last.

The Contractor shall also provide the training program at least annually for each employee who is subject to lead exposure at or above the action level on any day.

3.20.1 Training Program

a) The Contractor shall assure that each employee is trained in the following:
b) The content and provisions of the OSHA Lead Construction Standard;
c) The specific nature of the operations which could result in exposure to lead above the action level;
d) The purpose, proper selection, fitting, use, and limitations of respirators;
e) The purpose and a description of the medical surveillance program, and the medical removal protection program including information concerning the adverse health effects associated with excessive exposure to lead (with particular attention to the adverse reproductive effects on both males and females and hazards to the fetus and additional precautions for employees who are pregnant);

f) The engineering controls and work practices associated with the employee's job assignment including training of employees to follow relevant good work practices described in Appendix B of 29 CFR 1926.62;
g) The contents of any compliance plan in effect;
h) Instructions to employees that chelating agents should not routinely be used to remove lead from their bodies and should not be used at all except under the direction of a licensed physician; and
i) The employee's right of access to records under 29 CFR 1910.20.

3.20.2 Access to Information and Training Materials

The Contractor shall make readily available to all affected employees a copy of all applicable Federal and State Lead Standards and include OSHA, EPA, HUD and the Texas Environmental Lead Reduction Rules.

The Contractor shall provide, upon request, all materials relating to the employee information and training program to affected employees and their designated representatives.

3.21 Signs

The Contractor shall post the following warning signs in each work area where an employee's exposure to lead is above the PEL.

DANGER
LEAD WORK AREA
MAY DAMAGE FERTILITY OR THE UNBORN CHILD
CAUSES DAMAGE TO THE CENTRAL NERVOUS SYSTEM
DO NOT EAT, DRINK OR SMOKE IN THIS AREA

The Contractor shall ensure that no statement appears on or near any sign that contradicts or detracts from the meaning of the required sign.

The Contractor shall ensure that signs are illuminated and cleaned as necessary so that the legend is readily visible.

The Contractor may use signs required by other statutes, regulations or ordinances in addition to, or in combination with this section.

3.22 Record Keeping

The Contractor shall submit the report, written by the certified supervisor, covering each element in 40 CFR 745, Section 227 (e) (10). Cover the following information in the abatement report:

a) Start and completion dates of lead hazard control activities.
b) The name and address of each firm conducting lead hazard control activities and the name of each supervisor assigned to the project.
c) The Occupant Protection Plan prepared pursuant to paragraph OCCUPANT PROTECTION PLAN in PART 1.
d) The name, address and signature of the certified risk assessor to indicating clearance requirements have been met.
e) Certification of each Final Cleaning and Visual Inspection performed by the certified supervisor.
f) The results of clearance testing and all soil analyses, and the name of each laboratory that conducted the analyses.
g) A detailed written description of the lead abatement including abatement methods used, locations of rooms and/or components where lead abatement activities occurred.
h) Hazardous waste disposal documentation.
i) Contractor provided installation/maintenance manuals.

3.22.1 Exposure Assessment

The Contractor shall establish and maintain an accurate record of all monitoring and other data used in conducting employee exposure assessments.

Exposure monitoring records shall include:

a) The date(s), number, duration, location and results of each of the samples taken if any, including a description of the sampling procedure used to determine representative employee exposure where applicable;
b) A description of the sampling and analytical methods used and evidence of their accuracy;
c) The type of respiratory protective devices worn, if any;
d) Name, social security number, and job classification of the employee monitored and of all other employees whose exposure the measurement is intended to represent; and
e) The environmental variables that could affect the measurement of employee exposure.
f) The Contractor shall maintain monitoring and other exposure assessment records in accordance with the provisions of 29 CFR 1926.33.

3.22.2 Medical Surveillance

The Contractor shall establish and maintain an accurate record for each employee subject to medical surveillance.

This record shall include:

a) The name, social security number, and description of the duties of the employee;
b) A copy of the physician's written opinions;

c) Results of any airborne exposure monitoring done on or for that employee and provided to the physician; and
d) Any employee medical complaints related to exposure to lead.
e) The Contractor shall keep, or assure that the examining physician keeps, the following medical records:
f) A copy of the medical examination results including medical and work history.
g) A description of the laboratory procedures and a copy of any standards or guidelines used to interpret the test results or references to that information;
h) A copy of the results of biological monitoring.

The Contractor shall maintain or assure that the physician maintains medical records in accordance with the provisions of 29 CFR 1926.33.

3.22.3 Medical Removals

The Contractor shall establish and maintain an accurate record for each employee removed from current exposure to lead pursuant to paragraph (k) of 29 CFR 1926.62.

Each record shall include:

a) The name and social security number of the employee;
b) The date of each occasion that the employee was removed from current exposure to lead as well as the corresponding date on which the employee was returned to his or her former job status;
c) A brief explanation of how each removal was or is being accomplished; and
d) A statement with respect to each removal indicating whether or not the reason for the removal was an elevated blood lead level.

The Contractor shall maintain each medical removal record for at least the duration of employee's employment.

3.22.4 Availability and Transfer of Records

The Contractor shall make available upon request all records required to be maintained by this section to affected employees, former employees, and their designated representatives.

Whenever the Contractor ceases to do business, the successor Contractor shall receive and retain all records relative to the Hotel Grim Project.

The Contractor shall also comply with any additional requirements involving the transfer of records set forth in 29 CFR 1910.1020(h).

3.23 Certification of Visual Inspection

Certify that the lead hazard control area(s) for each individual work task have passed visual clearance criteria and are ready for clearance sampling. To pass visual clearance, lead hazards have to be removed; control technology appropriately applied/installed; the lead hazard control area must be free from visible dust debris, paint chips or any other residue that may have been generated by the lead hazard control activities.

Certificate of Worker's Acknowledgement

HOTEL GRIM BUILDING, TEXARKANA, TEXAS
CERTIFICATE OF WORKER'S ACKNOWLEDGMENT

PROJECT NAME _____ CONTRACT NO. _____
PROJECT ADDRESS _____
CONTRACTOR FIRM NAME _____
EMPLOYEE'S NAME _____,_____,_____
(Print) (Last) (First) (MI)
Social Security Number: _____-_____-_____,__(Optional)

WORKING WITH ASBESTOS CAN BE DANGEROUS. INHALING ASBESTOS FIBERS HAS BEEN LINKED WITH TYPES OF LUNG DISEASE AND CANCER. IF YOU SMOKE AND INHALE ASBESTOS FIBERS, THE CHANCE THAT YOU WILL DEVELOP LUNG CANCER IS GREATER THAN THAT OF THE NONSMOKING PUBLIC.

Your employer's contract for the above project requires that you be provided and you complete formal asbestos training specific to the type of work you will perform and project specific training; that you be supplied with proper personal protective equipment including a respirator, that you be trained in its use; and that you receive a medical examination to evaluate your physical capacity to perform your assigned work tasks, under the environmental conditions expected, while wearing the required personal protective equipment. These things are to be done at no cost to you. By signing this certification, you are acknowledging that your employer has met these obligations to you. The Contractor's Health and Safety Manager will check the block(s) for the type of formal training you have completed.

Review the checked blocks prior to signing this certification.

FORMAL TRAINING:
_____ a. For Competent Persons and Supervisors: I have completed EPA's Model Accreditation Program (MAP) training course, "Contractor/Supervisor", that meets Texas requirements.
b. For Workers:
_____ (1) For OSHA Class I work: I have completed EPA's MAP training course, "Worker", that meets Texas requirements.
_____ (2) For OSHA Class II work (where there will be abatement of more than one type of Class II materials, i.e., roofing, siding, floor tile, etc.): I have completed EPA's MAP training course, "Worker", that meets Texas requirements.
_____ (3) For OSHA Class III work: I have completed at least a 16-hour course consistent with EPA requirements for training of local education agency maintenance and custodial staff at 40 CFR 763, Section .92(a)(2) and the elements of 29 CFR 1926.1101(k)(9)(viii), in addition to the specific work practices and engineering controls at 29 CFR 1926.1101, and hands-on training.

HOTEL GRIM BUILDING, TEXARKANA, TEXAS
CERTIFICATE OF WORKER'S ACKNOWLEDGMENT
(page 2)

_____ (5) For OSHA Class IV work: I have completed at least a 2-hr course consistent with EPA requirements for training of local education agency maintenance and custodial staff at 40 CFR 763, (a)(1), and the elements of 29 CFR 1926.1101(k)(9)(viii), in addition to the specific work practices and engineering controls at 29 CFR 1926.1101(g) and hands-on training.

_____ c. Workers, Supervisors and the Designated Competent Person: I have completed annual refresher training as required by EPA's MAP that meets Texas requirements.

PROJECT SPECIFIC TRAINING:

_____ I have been provided and have completed the project specific training required by this Contract. My employer's Designated Health and Safety Manager and Designated Competent Person conducted the training.

RESPIRATORY PROTECTION:

_____ I have been trained in accordance with the criteria in the Contractor's Respiratory Protection program. I have been trained in the dangers of handling and breathing asbestos dust and in the proper work procedures and use and limitations of the respirator(s) I will wear. I have been trained in and will abide by the facial hair and contact lens use policy of my employer.

RESPIRATOR FIT-TEST TRAINING:

_____ I have been trained in the proper selection, fit, use, care, cleaning, maintenance, and storage of the respirator(s) that I will wear. I have been fit-tested in accordance with the criteria in the Contractor's Respiratory Program and have received a satisfactory fit. I have been assigned my individual respirator. I have been taught how to properly perform positive and negative pressure fit-check upon donning negative pressure respirators each time.

EPA/TEXAS CERTIFICATION/LICENSE AND TEXAS LICENSE / REGIISTRATION

I have an EPA/[_____] certification/license as:
Building Inspector/Management Planner; Certification #_____ Exp. Date _____
Contractor/Supervisor, Certification # _____ Exp. Date _____
Project Designer, Certification # _____ Exp. Date _____
Worker, Certification # _____ Exp. Date _____

HOTEL GRIM BUILDING, TEXARKANA, TEXAS
CERTIFICATE OF WORKER'S ACKNOWLEDGMENT
(page 3)

MEDICAL EXAMINATION:

_____ I have had a medical examination within the last twelve months which was paid for by my employer. The examination included: health history, pulmonary function tests, and may have included an evaluation of a chest x-ray. A physician made a determination regarding my physical capacity to perform work tasks on the project while wearing personal protective equipment including a respirator. I was personally provided a copy and informed of the results of that examination. My employer's Health and Safety Manager evaluated the medical certification provided by the physician and checked the appropriate blank below. The physician determined that there:

_____ were no limitations to performing the required work tasks.
_____ were identified physical limitations to performing the required work tasks.

CERTIFICATE OF WORKER'S ACKNOWLEDGMENT

Date of the medical examination _____

Employee Signature _____ date _____

Health and Safety Manager

Signature _____ date _____

Asbestos Inspection Records, 2015

ASBESTOS BULK ANALYSIS REPORT

Date: March 27, 2015

HEC Environmental Group, Inc.

Report: 2915-0868
T15147 / Grim Hotel

This document shall be considered a duly signed original report of the results obtained from the analyses performed. All analyses are done within government guidelines and regulations.

Gary R. Simmons
Laboratory Manager

Lab Comments on Project: N/A

306 W. Edgewood Dr., Suite D, Friendswood, TX 77546 www.apasi.net Office (281) 648-9918 | Fax (281) 648-9595

PLM (Bulk) - Asbestos Analysis Report - Visual ID

(EPA Method 600/R-93-116 Visual Area Estimation)

HEC Environmental Group, Inc.
409 Hazel Street
TexArkana, AR 71854
870-772-4700
Contact: Jerry Jones

Report Number: 2915-0868
Report Date: March 27, 2015
Samples Collected: March 17-18, 2015
Date Received: March 24, 2015
Turn-around time: 72 Hours

Job ID / Site: T15147 / Grim Hotel

Client Sample Number	Lab Sample Number (by layer)	Color / Description / Fibrous / NonFibrous / Homogeneity	Asbestos Content Type & %	Non-Asbestos Fibrous Type & %	Matrix
147-1	2915-0868-01	Green,White,Tan / Plaster / Fibrous / Homogeneous	None Detected	Synthetic 2%	Binder
147-2	2915-0868-02A	Black,Tan / Paint / NonFibrous / Homogeneous	None Detected	None Detected	Binder
	2915-0868-02B	White / Paint,Texture / NonFibrous / Homogeneous	None Detected	None Detected	Binder
147-3	2915-0868-03	Light Grey / Insulation / Fibrous / Homogeneous	Chrysotile 70%	Cellulose 10%	Binder
147-4	2915-0868-04	Brown,Off White / Drywall / Fibrous / Homogeneous	None Detected	Cellulose 10%	Binder
147-5	2915-0868-05	White,Tan / Plaster / Fibrous / Homogeneous	None Detected	Synthetic 2%	Binder
147-6	2915-0868-06	Light Grey / Insulation / Fibrous / Homogeneous	Chrysotile 70%	Cellulose 10%	Binder
147-7	2915-0868-07	Brown / Insulation / Fibrous / Homogeneous	None Detected	Cellulose 10% Synthetic 80%	Binder
147-8	2915-0868-08	White,Tan / Plaster / Fibrous / Homogeneous	None Detected	Synthetic 2%	Binder
147-9	2915-0868-09	Brown / Insulation / Fibrous / Homogeneous	None Detected	Synthetic 10%	Binder

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Client Sample Number	Lab Sample Number (by layer)	Color / Description / Fibrous / NonFibrous / Homogeneity	Asbestos Content Type & %	Non-Asbestos Fibrous Type & %	Matrix
147-10	2915-0868-10	White,Tan / Plaster / Fibrous / Homogeneous	None Detected	Synthetic 2%	Binder
147-11	2915-0868-11	Tan / Insulation / Fibrous / Homogeneous	None Detected	Cellulose 95%	Binder
147-12	2915-0868-12	Green,White,Tan / Plaster / Fibrous / Homogeneous	None Detected	Synthetic 2%	Binder
147-13	2915-0868-13A	Black,Brown / 12x12 Floor Tile / Fibrous / Homogeneous	Chrysotile 5%	None Detected	Binder
	2915-0868-13B	Black / Mastic / Fibrous / Homogeneous	Chrysotile 5%	None Detected	Binder
147-14	2915-0868-14A	Black,Brown / 12x12 Floor Tile / Fibrous / Homogeneous	Chrysotile 5%	None Detected	Binder
	2915-0868-14B	Black / Mastic / Fibrous / Homogeneous	Chrysotile 5%	None Detected	Binder
147-15	2915-0868-15A	Black,Brown / 12x12 Floor Tile / Fibrous / Homogeneous	Chrysotile 5%	None Detected	Binder
	2915-0868-15B	Black / Mastic / Fibrous / Homogeneous	Chrysotile 5%	None Detected	Binder
147-16	2915-0868-16	White,Tan / Plaster / Fibrous / Homogeneous	None Detected	Synthetic 2%	Binder

PLM (Bulk) - Asbestos Analysis Report - Visual ID

(EPA Method 600/R-93-116 Visual Area Estimation)

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Client Sample Number	Lab Sample Number (by layer)	Color / Description / Fibrous / NonFibrous / Homogeneity	Asbestos Content Type & %	Non-Asbestos Fibrous Type & %	Matrix
147-17	2915-0868-17	White / Plaster / NonFibrous / Homogeneous	None Detected	None Detected	Binder
147-18	2915-0868-18	White,Tan / Plaster / Fibrous / Homogeneous	None Detected	Synthetic 2%	Binder
147-19	2915-0868-19	Off White / Plaster / Fibrous / Homogeneous	None Detected	Synthetic 2%	Binder
147-20	2915-0868-20	White,Tan / Plaster / Fibrous / Homogeneous	None Detected	Synthetic 2%	Binder
147-21	2915-0868-21A	Black / 9x9 Floor Tile / Fibrous / Homogeneous	Chrysotile 3%	Cellulose 3%	Binder
	2915-0868-21B	Black / Mastic / Fibrous / Homogeneous	Chrysotile 5%	None Detected	Binder
147-22	2915-0868-22A	Black / 9x9 Floor Tile / Fibrous / Homogeneous	Chrysotile 3%	Cellulose 3%	Binder
	2915-0868-22B	Black / Mastic / Fibrous / Homogeneous	Chrysotile 5%	None Detected	Binder
147-23	2915-0868-23A	Black / 9x9 Floor Tile / Fibrous / Homogeneous	Chrysotile 3%	Cellulose 3%	Binder
	2915-0868-23B	Black / Mastic / Fibrous / Homogeneous	Chrysotile 5%	None Detected	Binder

PLM (Bulk) - Asbestos Analysis Report - Visual ID

(EPA Method 600/R-93-116 Visual Area Estimation)

HEC Environmental Group, Inc.
409 Hazel Street
TexArkana, AR 71854
870-772-4700
Contact: Jerry Jones

Report Number: 2915-0868
Report Date: March 27, 2015
Samples Collected: March 17-18, 2015
Date Received: March 24, 2015
Turn-around time: 72 Hours

Job ID / Site: T15147 / Grim Hotel

Client Sample Number	Lab Sample Number (by layer)	Color / Description / Fibrous / NonFibrous / Homogeneity	Asbestos Content Type & %	Non-Asbestos Fibrous Type & %	Matrix
147-24	2915-0868-24A	White / Texture / NonFibrous / Homogeneous	None Detected	None Detected	Binder
	2915-0868-24B	Tan / Plaster / Fibrous / Homogeneous	None Detected	Synthetic 2%	Binder
147-25	2915-0868-25	Green / Vibration Damper / Fibrous / Homogeneous	None Detected	Cellulose 90%	Binder
147-26	2915-0868-26	Brown,Off White / Sheetrock / Fibrous / Homogeneous	None Detected	Cellulose 10%	Binder
147-27	2915-0868-27A	Off White / Paint / NonFibrous / Homogeneous	None Detected	None Detected	Binder
	2915-0868-27B	Brown,Off White / Sheetrock / Fibrous / Homogeneous	None Detected	Cellulose 10%	Binder
147-28	2915-0868-28A	Brown,White / 9x9 Floor Tile / NonFibrous / Homogeneous	None Detected	None Detected	Binder
	2915-0868-28B	Yellow,Tan / Mastic / NonFibrous / Homogeneous	None Detected	None Detected	Binder
147-29	2915-0868-29A	Brown,White / 9x9 Floor Tile / NonFibrous / Homogeneous	None Detected	None Detected	Binder
	2915-0868-29B	Yellow,Tan / Mastic / NonFibrous / Homogeneous	None Detected	None Detected	Binder

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Client Sample Number	Lab Sample Number (by layer)	Color / Description / Fibrous / NonFibrous / Homogeneity	Asbestos Content Type & %	Non-Asbestos Fibrous Type & %	Matrix
147-30	2915-0868-30A	Brown,White / 9x9 Floor Tile / NonFibrous / Homogeneous	None Detected	None Detected	Binder
	2915-0868-30B	Yellow,Tan / Mastic / NonFibrous / Homogeneous	None Detected	None Detected	Binder
147-31	2915-0868-31A	Black,Brown / 9x9 Floor Tile / NonFibrous / Homogeneous	None Detected	None Detected	Binder
	2915-0868-31B	Yellow,Tan / Mastic / NonFibrous / Homogeneous	None Detected	None Detected	Binder
147-32	2915-0868-32A	Black,Brown / 9x9 Floor Tile / NonFibrous / Homogeneous	None Detected	None Detected	Binder
	2915-0868-32B	Yellow,Tan / Mastic / NonFibrous / Homogeneous	None Detected	None Detected	Binder
147-33	2915-0868-33A	Black,Brown / 9x9 Floor Tile / NonFibrous / Homogeneous	None Detected	None Detected	Binder
	2915-0868-33B	Yellow,Tan / Mastic / NonFibrous / Homogeneous	None Detected	None Detected	Binder
147-34	2915-0868-34A	Beige / Wrap / Fibrous / Homogeneous	None Detected	Cellulose 100%	
	2915-0868-34B	Off White / Insulation / Fibrous / Homogeneous	Chrysotile 70%	Cellulose 10%	Binder

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Job ID / Site: T15147 / Grim Hotel

Client Sample Number	Lab Sample Number (by layer)	Color / Description / Fibrous / NonFibrous / Homogeneity	Asbestos Content Type & %	Non-Asbestos Fibrous Type & %	Matrix
147-35	2915-0868-35	Green,Brown / Vibration Damper / Fibrous / Homogeneous	None Detected	Cellulose 90%	Binder
147-36	2915-0868-36	Tan,Off White / Linoleum / Fibrous / Homogeneous	None Detected	Cellulose 15% Fibrous Glass 2%	Binder
147-37	2915-0868-37	Tan,Off White / Linoleum / Fibrous / Homogeneous	None Detected	Cellulose 15% Fibrous Glass 2%	Binder
147-38	2915-0868-38A	Light Tan / 9x9 Floor Tile / Fibrous / Homogeneous	Chrysotile 5%	None Detected	Binder
	2915-0868-38B	Dark Brown,Grey / Mastic,Material / Fibrous / Homogeneous	None Detected	Cellulose 45% Synthetic 5%	Binder
147-39	2915-0868-39A	Light Tan / 9x9 Floor Tile / Fibrous / Homogeneous	Chrysotile 5%	None Detected	Binder
	2915-0868-39B	Dark Brown,Grey / Mastic,Material / Fibrous / Homogeneous	None Detected	Cellulose 45% Synthetic 5%	Binder
147-40	2915-0868-40A	Light Tan / 9x9 Floor Tile / Fibrous / Homogeneous	Chrysotile 5%	None Detected	Binder
	2915-0868-40B	Dark Brown,Grey / Mastic,Material / Fibrous / Homogeneous	None Detected	Cellulose 45% Synthetic 5%	Binder
147-41	2915-0868-41A	Grey,Red,Green / 9x9 Floor Tile / Fibrous / Homogeneous	Chrysotile 5%	None Detected	Binder

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Job ID / Site: T15147 / Grim Hotel

Client Sample Number	Lab Sample Number (by layer)	Color / Description / Fibrous / NonFibrous / Homogeneity	Asbestos Content Type & %	Non-Asbestos Fibrous Type & %	Matrix
147-41	2915-0868-41B	Dark Brown / Mastic / Fibrous / Homogeneous	None Detected	Cellulose 2%	Binder
147-42	2915-0868-42	White,Tan / Plaster / Fibrous / Homogeneous	None Detected	Synthetic 2%	Binder
147-43	2915-0868-43	White,Tan / Plaster / Fibrous / Homogeneous	None Detected	Synthetic 2%	Binder
147-44	2915-0868-44	White,Tan / Plaster / Fibrous / Homogeneous	None Detected	Synthetic 2%	Binder
147-45	2915-0868-45	White,Tan / Plaster / Fibrous / Homogeneous	None Detected	Synthetic 2%	Binder
147-46	2915-0868-46A	Light Green / 9x9 Floor Tile / Fibrous / Homogeneous	Chrysotile 15%	None Detected	Binder
	2915-0868-46B	Black,Brown / Mastic,Material / Fibrous / Homogeneous	Chrysotile 3%	Cellulose 70%	Binder
147-47	2915-0868-47	White,Brown / Plaster / Fibrous / Homogeneous	None Detected	Synthetic 2%	Binder
147-48	2915-0868-48A	Dark Brown / 9x9 Floor Tile / Fibrous / Homogeneous	Chrysotile 10%	None Detected	Binder
	2915-0868-48B	Black / Mastic / Fibrous / Homogeneous	Chrysotile 5%	None Detected	Binder

PLM (Bulk) - Asbestos Analysis Report - Visual ID

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Job ID / Site: T15147 / Grim Hotel

Client Sample Number	Lab Sample Number (by layer)	Color / Description / Fibrous / NonFibrous / Homogeneity	Asbestos Content Type & %	Non-Asbestos Fibrous Type & %	Matrix
147-49	2915-0868-49A	Dark Brown / 9x9 Floor Tile / Fibrous / Homogeneous	Chrysotile 10%	None Detected	Binder
	2915-0868-49B	Black / Mastic / Fibrous / Homogeneous	Chrysotile 5%	None Detected	Binder
147-50	2915-0868-50A	Dark Brown / 9x9 Floor Tile / Fibrous / Homogeneous	Chrysotile 10%	None Detected	Binder
	2915-0868-50B	Black / Mastic / Fibrous / Homogeneous	Chrysotile 5%	None Detected	Binder
147-51	2915-0868-51A	Brown / 9x9 Floor Tile / Fibrous / Homogeneous	Chrysotile 10%	None Detected	Binder
	2915-0868-51B	Black / Mastic / Fibrous / Homogeneous	Chrysotile 5%	None Detected	Binder
147-52	2915-0868-52	White,Tan / Plaster / Fibrous / Homogeneous	None Detected	Synthetic 2%	Binder
147-53	2915-0868-53	White / Plaster / NonFibrous / Homogeneous	None Detected	None Detected	Binder
147-54	2915-0868-54A	Off White / Paint,Texture / NonFibrous / Homogeneous	None Detected	None Detected	Binder
	2915-0868-54B	Brown,Off White / Sheetrock / Fibrous / Homogeneous	None Detected	Cellulose 10%	Binder

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Job ID / Site: T15147 / Grim Hotel

Client Sample Number	Lab Sample Number (by layer)	Color / Description / Fibrous / NonFibrous / Homogeneity	Asbestos Content Type & %	Non-Asbestos Fibrous Type & %	Matrix
147-55	2915-0868-55A	Green / 9x9 Floor Tile / Fibrous / Homogeneous	Chrysotile 10%	None Detected	Binder
	2915-0868-55B	Black / Mastic / Fibrous / Homogeneous	Chrysotile 5%	None Detected	Binder
147-56	2915-0868-56A	Black,Off White / 9x9 Floor Tile / Fibrous / Homogeneous	Chrysotile 10%	None Detected	Binder
	2915-0868-56B	Black,Brown / Mastic,Material / Fibrous / Homogeneous	None Detected	Cellulose 60%	Binder
147-57	2915-0868-57A	Green / 9x9 Floor Tile / Fibrous / Homogeneous	Chrysotile 10%	None Detected	Binder
	2915-0868-57B	Black / Mastic / Fibrous / Homogeneous	Chrysotile 5%	None Detected	Binder
147-58	2915-0868-58A	Light Blue / 9x9 Floor Tile / Fibrous / Homogeneous	Chrysotile 10%	None Detected	Binder
	2915-0868-58B	Black / Mastic / Fibrous / Homogeneous	Chrysotile 5%	None Detected	Binder
147-59	2915-0868-59A	Light Red / 9x9 Floor Tile / Fibrous / Homogeneous	Chrysotile 5%	None Detected	Binder
	2915-0868-59B	Black / Mastic / Fibrous / Homogeneous	Chrysotile <1%	None Detected	Binder

PLM (Bulk) - Asbestos Analysis Report - Visual ID

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409 Hazel Street	**Report Date:** March 27, 2015
TexArkana, AR 71854	**Samples Collected:** March 17-18, 2015
870-772-4700	**Date Received:** March 24, 2015
Contact: Jerry Jones	**Turn-around time:** 72 Hours

Job ID / Site: T15147 / Grim Hotel

Client Sample Number	Lab Sample Number (by layer)	Color / Description / Fibrous / NonFibrous / Homogeneity	Asbestos Content Type & %	Non-Asbestos Fibrous Type & %	Matrix
147-60	2915-0868-60A	Light Blue / 9x9 Floor Tile / Fibrous / Homogeneous	Chrysotile 10%	None Detected	Binder
	2915-0868-60B	Black / Mastic / Fibrous / Homogeneous	Chrysotile 5%	None Detected	Binder
147-61	2915-0868-61A	Grey,Black / 9x9 Floor Tile / Fibrous / Homogeneous	Chrysotile 5%	None Detected	Binder
	2915-0868-61B	Black / Mastic / Fibrous / Homogeneous	Chrysotile <1%	None Detected	Binder
147-62	2915-0868-62A	Dark Brown / 9x9 Floor Tile / Fibrous / Homogeneous	Chrysotile 10%	None Detected	Binder
	2915-0868-62B	Black / Mastic / Fibrous / Homogeneous	None Detected	Cellulose 5%	Binder
147-63	2915-0868-63	Grey,Black / Wire Insulation / Fibrous / Homogeneous	None Detected	Cellulose 35%	Binder
147-64	2915-0868-64	Grey,Black / Wire Insulation / Fibrous / Homogeneous	None Detected	Cellulose 35%	Binder
147-65	2915-0868-65	Brown,Black / Wire Insulation / Fibrous / Homogeneous	None Detected	Cellulose 35%	Binder
147-66	2915-0868-66	Grey,Black / Roofing Mastic / Fibrous / Homogeneous	Chrysotile 10%	None Detected	Binder

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Client Sample Number	Lab Sample Number (by layer)	Color / Description / Fibrous / NonFibrous / Homogeneity	Asbestos Content Type & %	Non-Asbestos Fibrous Type & %	Matrix
147-67	2915-0868-67	White,Brown / Ceiling Tile / Fibrous / Homogeneous	None Detected	Cellulose 85%	Binder
147-68	2915-0868-68	White,Brown / Ceiling Tile / Fibrous / Homogeneous	None Detected	Cellulose 85%	Binder
147-69	2915-0868-69	White,Brown / Ceiling Tile / Fibrous / Homogeneous	None Detected	Cellulose 85%	Binder
147-70	2915-0868-70	White,Brown / Wallpaper / Fibrous / Homogeneous	None Detected	Cellulose 50%	Binder
147-71	2915-0868-71	White,Brown / Wallpaper / Fibrous / Homogeneous	None Detected	Cellulose 50%	Binder
147-72	2915-0868-72	White,Brown / Wallpaper / Fibrous / Homogeneous	None Detected	Cellulose 50%	Binder
147-73	2915-0868-73	White,Light Tan / Window Glazing / NonFibrous / Homogeneous	None Detected	None Detected	Binder
147-74	2915-0868-74	White,Light Tan / Window Glazing / NonFibrous / Homogeneous	None Detected	None Detected	Binder
147-75	2915-0868-75	White,Light Tan / Window Glazing / NonFibrous / Homogeneous	None Detected	None Detected	Binder
147-76	2915-0868-76	White,Light Tan / Window Glazing / NonFibrous / Homogeneous	None Detected	None Detected	Binder

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Client Sample Number	Lab Sample Number (by layer)	Color / Description / Fibrous / NonFibrous / Homogeneity	Asbestos Content Type & %	Non-Asbestos Fibrous Type & %	Matrix
147-77	2915-0868-77	White / Wall Texture / NonFibrous / Homogeneous	None Detected	None Detected	Binder
147-78	2915-0868-78	White / Wall Texture / NonFibrous / Homogeneous	None Detected	None Detected	Binder
147-79	2915-0868-79	White / Wall Texture / NonFibrous / Homogeneous	None Detected	None Detected	Binder
147-80	2915-0868-80	Tan / Silver / Pipe Wrap / Fibrous / Homogeneous	None Detected	Cellulose 95%	Binder
147-81	2915-0868-81A	Black / Pipe Insulation / Fibrous / Homogeneous	Chrysotile 30%	Cellulose 10% Synthetic 3%	Binder
	2915-0868-81B	Brown / Pipe Insulation / Fibrous / Homogeneous	None Detected	Cellulose 95%	Binder
147-82	2915-0868-82A	Black / Pipe Insulation / Fibrous / Homogeneous	Chrysotile 30%	Cellulose 10% Synthetic 5%	Binder
	2915-0868-82B	Brown / Pipe Insulation / Fibrous / Homogeneous	None Detected	Cellulose 95%	Binder
147-83	2915-0868-83	Black / 9x9 Floor Tile / Fibrous / Homogeneous	Chrysotile 5%	None Detected	Binder
147-84	2915-0868-84	Black / 9x9 Floor Tile / Fibrous / Homogeneous	Chrysotile 5%	None Detected	Binder

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409 Hazel Street	**Report Date:** **March 27, 2015**
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870-772-4700	**Date Received:** **March 24, 2015**
Contact: Jerry Jones	**Turn-around time:** **72 Hours**

Job ID / Site: **T15147 / Grim Hotel**

Client Sample Number	Lab Sample Number (by layer)	Color / Description / Fibrous / NonFibrous / Homogeneity	Asbestos Content Type & %	Non-Asbestos Fibrous Type & %	Matrix
147-85	2915-0868-85	Black / 9x9 Floor Tile / Fibrous / Homogeneous	Chrysotile 5%	None Detected	Binder
147-86	2915-0868-86A	Red,Brown / 9x9 Floor Tile / Fibrous / Homogeneous	Chrysotile 15%	None Detected	Binder
	2915-0868-86B	Black / Mastic / Fibrous / Homogeneous	Chrysotile 5%	None Detected	Binder
147-87	2915-0868-87A	Red,Brown / 9x9 Floor Tile / Fibrous / Homogeneous	Chrysotile 15%	None Detected	Binder
	2915-0868-87B	Black / Mastic / Fibrous / Homogeneous	Chrysotile 5%	None Detected	Binder
147-88	2915-0868-88A	Red,Brown / 9x9 Floor Tile / Fibrous / Homogeneous	Chrysotile 15%	None Detected	Binder
	2915-0868-88B	Black / Mastic / Fibrous / Homogeneous	Chrysotile 5%	None Detected	Binder
147-89	2915-0868-89	White,Tan / Plaster / Fibrous / Homogeneous	None Detected	Synthetic 2%	Binder
147-90	2915-0868-90	White / Plaster / NonFibrous / Homogeneous	None Detected	None Detected	Binder
147-91	2915-0868-91	White / Plaster / NonFibrous / Homogeneous	None Detected	None Detected	Binder

NVLAP Lab Code: 200633-0 PLM

TDSHS Asbestos License#: 30-0312 PLM/PCM

306 W. Edgewood Dr., Suite D, Friendswood, TX 77546 www.apasi.net Office (281) 648-9918 | Fax (281) 648-9595

Lead Paint Report, 2015

LEAD-CONTAINING PAINT SAMPLE SUMMARY
GRIM HOTEL
301 NORTH STATE LINE AVENUE
TEXARKANA, TEXAS
May 8, 2015

Sample No.	Paint Color	Paint Substrate	Material Location	Surface Condition	Analytical Result (Concentration - ppm)
LBP-1	Pink	Wood	Column and walls – Lobby Entrance	Poor	**160,000**
LBP-2	Brown	Wood	Column base trim – Lobby Entrance	Poor	**13,000**
LBP-3	Green	Wood	Support Pillars – South Side Rooms	Poor	**5,100**
LBP-4	Blue	Plaster	Support Pillars – North Portion Of Lobby	Poor	**48,000**
LBP-5	White	Plaster	Walls throughout	Poor	**66,000**
LBP-6	Pink	Plaster	Walls throughout	Poor	1,900
LBP-7	Teal	Plaster	Three room walls – 3rd Floor	Poor	4,600

Sample Results in **bold** are Considered Lead Based Paint

May 24, 2017

Mr. Jim Sari
Sari & Company
406 East 4th Street
Winston-Salem, North Carolina 27101

RE: **ENVIRONMENTAL SITE ASSESSMENT/MUNICIPAL SETTINGS DESIGNATION (MSD) WORKPLAN**
GRIM HOTEL
301 NORTH STATE LINE
TEXARKANA, TEXAS 76040

Mr. Sari:

Included is a proposal for pursuing regulatory closure (or the equivalent) from the Texas Commission on Environmental Quality (TCEQ) for the groundwater pollution case associated with the above referenced facility (site property). The following presentation reflects the scope of services and the estimated costs for providing the services.

According to a Phase II Environmental Site Assessment (Phase II ESA) Report prepared by Terracon Consultants, Inc. (Terracon) and dated May 27, 2015, the site has been negatively affected by heavy metal impacts to soil and groundwater at concentrations exceeding TCEQ Action Levels. Mercury, arsenic, and lead concentrations in soil and lead concentrations in groundwater exceeded the respective Action Levels. Action Level exceedances would subject the site to environmental cleanup requirements under TCEQ Texas Risk Reduction Program (TRRP) rules. In addition, information obtained from the U.S. Environmental Protection Agency (EPA) indicates that the soil exposure pathway would be remediated/addressed through the EPA Brownfields Program. Upon completion of EPA Brownfield activities the groundwater ingestion exposure pathway would be the primary human health exposure pathway remaining requiring remedial actions.

During a site visit it was observed that all monitoring wells installed by Terracon had been plugged. Replacement monitoring wells will have to be installed and groundwater samples collected to confirm whether groundwater is still affected. Response actions will have to be conducted to obtain regulatory closure from the TCEQ if groundwater continues to be affected at concentrations above Action Levels. If groundwater sample results are below TCEQ Action Levels a letter requesting concurrence for "No Further Action" (NFA) will be submitted to the Industrial and Hazardous Waste Corrective Action Program (Corrective Action Program) [this option would only be available if groundwater samples are below Action Levels].

Pursuing regulatory closure from the TCEQ will require entering a program such as the Voluntary Cleanup Program (VCP) or the Corrective Action Program and pursuing a Certificate of Completion (COC) from the VCP or a No Further Action (NFA) from the Corrective Action

Program. The VCP is the preferred option since a VCP COC provides a release of liability to future property owners whereas an NFA designation does not offer liability protection.

A VCP application will be submitted to the TCEQ to enroll the site property into the VCP. Once the site has been entered into the VCP, an Affected Property Assessment Report (APAR) would have to be prepared to evaluate applicable human health exposure pathways and provide remedial options for addressing human health exposure exceedances to soil and groundwater.

The recommended groundwater response action includes restricting access to affected groundwater via deed restriction prohibiting installation of water wells and groundwater use within the affected property. A Municipal Settings Designation (MSD) is proposed as the primary remedial option to eliminate the groundwater ingestion pathway. The MSD, supported by City Ordinance and TCEQ Certification would prohibit the use of shallow groundwater and would thus eliminate the groundwater ingestion pathway as a human health exposure concern. It should be noted that site property proximity to the Arkansas state boundary could potentially affect MSD eligibility. MSD rules are based on obtaining Resolutions of Support from Texas municipalities located within ½ mile and notifying Texas water well owners within 5 miles of the property. An inquiry has been made to the TCEQ MSD Program regarding applicability. The TCEQ has indicated that a decision regarding MSD applicability cannot be made until an MSD Application is actually submitted to the TCEQ.

A contingency to the MSD remedial option would be Monitored Natural Attenuation (MNA). A Plume Management Zone (PMZ) could be established, which could be deed restricted and a groundwater monitoring program could be initiated to demonstrate plume stability. This option will be available throughout the MSD process although the MSD process should be allowed to play out before resorting to the PMZ with Deed Restriction option.

The following is the scope of services required to complete proposed activities.

SCOPE OF SERVICES – Subsurface Investigation (Install Monitoring Wells and Collect Groundwater Samples)

- Install up to twelve (12) monitoring wells to allow collection of groundwater samples.
- Initially install five (5) monitoring wells to replace previously destroyed wells.
- Collect soil and groundwater samples from all monitoring well locations. Groundwater samples will be collected using filtering and un-filtering methods to verify whether groundwater affected.
- Contingency for plume delineation - Install up to 4 additional monitoring wells for plume delineation.
- Additional contingency for additional plume delineation - Install up to 3 additional monitoring wells for plume delineation.
- Collect confirmation soil and groundwater samples from all wells installed for plume delineation.
- Soil and groundwater samples will be analyzed for lead via EPA method 6010.
- Prepare a Phase II Environmental Site Assessment Report documenting results of subsurface investigation.

SCOPE OF SERVICES – Voluntary Cleanup Program (VCP)

- VCP Application Fee to TCEQ.
- Prepare VCP Application and VCP Agreement for submittal to TCEQ.
- Complete and submit Affected Property Assessment Report (APAR) to TCEQ.
- Make amendments to APAR as request by TCEQ (if needed).
- Submit Quarterly Status Reports to TCEQ.
- Submit Response Action Effectiveness Report (RAER) as applicable to TCEQ (only applies when MNA used as a remedial option).
- Submit Response Action Completion Report (RACR) as applicable to TCEQ.
- Obtain a Certificate of Completion (COC) from the VCP.

SCOPE OF SERVICES – Quarterly Groundwater Monitoring

- Measure the depth to groundwater to allow groundwater gradient determination.
- Purge wells using low flow purge/sample techniques. Groundwater discharge will be directed through a flow cell equipped with a multi-parameter meter designed to record water quality measurements. Groundwater will be purged at approximate rates of 4 to 8 ounces per minute until water quality measurements (pH, temperature, conductivity, oxidation reduction potential, dissolved oxygen, and turbidity) stabilize. Efforts will be made to achieve stabilized turbidity measurements of less than 10 nephelometric turbidity units (NTU's) before collecting groundwater samples.
- Groundwater samples will be collected once water quality measurements stabilize. Unfiltered groundwater samples will be collected directly from discharge tubing. Filtered samples will also be collected by attaching a 10-micron inline filter to discharge tubing and allowed to discharge for a minimum of 5 minutes before filtered sample collection.
- Groundwater samples will be analyzed for lead via EPA method 6010.
- Submit Groundwater Monitoring Reports to TCEQ VCP.

SCOPE OF SERVICES - Municipal Settings Designation (MSD)

- MSD Program Application Fee to TCEQ.
- Submit MSD Application and obtain MSD Ordinance from City of Texarkana which includes negotiations with City personnel, complete city MSD application, respond to City's questions, and attend Public Hearings and City Council meetings.
- Obtain 5-Mile Water Well search and 5-Mile Water Utility District (WUD) search.
- Provide certified letter notifications to water well owners within 5 miles. A minimum of 3 notification attempts are required for undeliverable notices (with first 2 attempts being Certified Mail with Return Receipt Confirmation).
- Obtain MSD Resolutions of Support from municipalities within ½ mile of site property and Water Utility Districts within 5 miles of the site property.
- May require negotiations with Arkansas Department of Environmental Quality (ADEQ).

POTENTIAL ADDITIONAL SERVICES

Additional services that could be required:

- Although the EPA will be addressing the soils exposure pathway, consideration should be given to excavation of all soils exceeding 500 mg/kg for lead.
- Installation of soil-gas sample points and collection of vapor samples.

EnviroPhase appreciates the opportunity to present this Scope of Services. Please contact Envirophase at (817) 266-5143 if you have any questions regarding this Workplan.

Respectfully,
ENVIROPHASE, INC.
Texas Geoscience Firm No 50444

Kevin W. Almaguer, P.G. #1858
Professional Geoscientist