Final

QUALITY ASSURANCE PROJECT PLAN FOR ENVIRONMENTAL INVESTIGATIONS AT THE FORMER YORK NAVAL ORDNANCE PLANT

SAIC Project 166345.00.08232.76.6076.00

Prepared for:

Harley-Davidson Motor Company Operations, Inc.

York, PA

December 2009

Science Applications International Corporation
6310 Allentown Boulevard / Harrisburg, PA 17112 / tel: 717.901.8100 / www.saic.com

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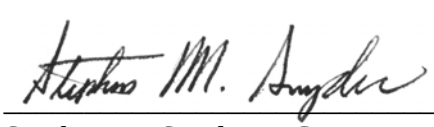
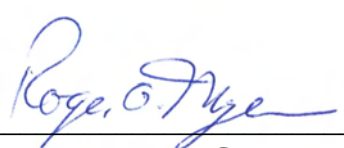
Respectfully submitted,



Stephen M. Snyder, P.G.
Project Director



Roger D. Myers, CHMM
Project Manager

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Appendix A – SAIC Standard Operating Procedures ....Following Text
Appendix B – Quality Assurance Manual for Test America (1-31-2009) ....Following Text

REVISION LIST

Revision Number	Date	Section	Page Number	Description of Revision
3	12/18/2009	1 and 2	1 & 8	Revised project personnel lists, site history, and summaries of existing data.
3	9/2/2009	5	38	Updated sampling procedures.
3	9/2/2009	Appendix A	Following Text	Added SAIC corporate data management and standard operating procedures.
3	9/2/2009	4	31	Added the latest update of the Harrisburg office sampling and data management procedures.
3	9/2/2009	Figure 4-1	34	Documented the use of the MobileMapper® to locate sampling points on-site.
3	9/2/2009	5.3	43	Updated the sampling nomenclature guidance to include recent revisions of location identifiers and waste sample identifiers, along with sample depth identifiers.
3	9/2/2009	3.0, Tables 3-1 through 3-8	19 - 28	Updated the list of sampling methods used for the project samples at TestAmerica.
3	9/2/2009	Tables 3-3 through 3-8	22 - 28	Updated the list of laboratory reporting limits for all analytes, using current methods.
3	9/2/2009	4.3, 5.2, and 6.1	32, 40, 49	Updated sample bottle requirements, holding times, and new electronic chain-of-custody requirements.
3	9/2/2009	Table 12-2	81	Updated Electronic Data Deliverable (EDD) requirements from TestAmerica.
3	9/2/2009	Appendix B	Following Text	Added the current TestAmerica laboratory Quality Assurance Manual.
3	9/2/2009	4.12 and 4.13	37	Referenced the use of web-based fYNOP internet site for data viewing and data validation.
3	10/1/2009	4.13 and 12.2	37 & 78	Update QA program to include validation of all data for holding times and field blank contamination.

LIST OF ACRONYMS AND ABBREVIATIONS

%R	-	percent recovery
AMF	-	American Machine & Foundry Company
AMOED	-	AMO Environmental Decisions, Inc.
AOC	-	area of concern
ASTM	-	American Standard for Testing and Materials
°C	-	degrees Centigrade
COC	-	contaminants of concern
DOT	-	Department of Transportation
DQO	-	data quality objectives
EDD	-	electronic data deliverable
EPA	-	United States Environmental Protection Agency
FCO	-	field change order
FCR	-	field change request
FPC	-	facility project coordinator
FS	-	feasibility study
FUDS	-	Formerly Used Defense Sites
fYNOP	-	former York Naval Ordnance Plant
GPS	-	global positioning system
Harley-Davidson	-	Harley-Davidson Motor Company Operations, Inc.
ICP	-	inductively coupled plasma
IDW	-	investigative-derived wastes
Langan	-	Langan Engineering and Environmental Services, Inc.
LCS	-	laboratory control sample
LOR	-	letter of receipt
M&TE	-	measuring and testing equipment
MDL	-	method detection limit
mm	-	millimeter
MOA	-	memorandum of agreement
MS/MSD	-	matrix spike/matrix spike duplicate
NCR	-	nonconformance report
NIOSH	-	National Institute for Occupational Safety and Health
NIR	-	notice of intent to remediate

NIST	-	National Institute of Standards and Testing
NPDES	-	National Pollutant Discharge Elimination System
PADEP	-	Pennsylvania Department of Environmental Protection
PAHs	-	polyaromatic hydrocarbons
PCBs	-	polychlorinated biphenyls
PCE	-	tetrachloroethene
PDA	-	personal digital assistant
PID	-	photoionization detector
QA	-	quality assurance
QA/QC	-	quality assurance/quality control
QAPP	-	Quality Assurance Project Plan
QC	-	quality control
QCR	-	quality control report
RCRA	-	Resource Conservation and Recovery Act
RI	-	Remedial Investigation
RI/FS	-	Remedial Investigation/Feasibility Study
RPD	-	relative percent difference
SAIC	-	Science Applications International Corporation
SDG	-	sample delivery group
SOP	-	standard operation procedure
SOW	-	scope of work
SSHO	-	site safety and health officer
SSHP	-	Site Safety and Health Plan
SVOC	-	Semi-volatile Organic Compound
SWMU	-	Solid Waste Management Unit
TCA	-	1,1,1-trichloroethane
TCE	-	trichloroethene
TCLP	-	Toxicity Characteristic Leaching Procedure
USACE	-	United States Army Corps of Engineers
VOC	-	volatile organic compounds
WWII	-	World War II
YNOP	-	York Naval Ordnance Plant

1.0 PROJECT DESCRIPTION

This Quality Assurance Project Plan (QAPP) is for activities to be performed during remedial environmental work at the former York Naval Ordnance Plant (fYNOP) in York, Pennsylvania. This QAPP presents the organization, objectives, functional activities, and specific quality assurance (QA) and quality control (QC) activities. It describes the specific protocols that will be followed for sampling, sample handling and storage, chain-of-custody, and laboratory analysis. This plan also presents details regarding data quality objectives for the project, sampling and preservation procedures for samples collected in the field, field and sample documentation, sample packaging and shipping, and laboratory analytical procedures for all media sampled. Specific QA procedures for Science Applications International Corporation (SAIC) employees collecting samples and handling laboratory data have been included in Appendix A, while specific laboratory QA and analytical protocols for TestAmerica are included in Appendix B.

All quality assurance/quality control (QAQC) procedures will be in accordance with applicable professional technical standards, United States Environmental Protection Agency (EPA) requirements, government regulations and guidelines, and specific project goals and requirements. This QAPP is prepared in accordance with EPA QAPP and United States Army Corps of Engineers (USACE) guidance documents; *Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans* (EPA, 1991), *EPA Requirements for Quality Assurance Project Plans for Environmental Data Operations* (EPA, 1994a), *Requirements for the Preparation of Sampling and Analysis Plans* (USACE, 1994), *Chemical Quality Assurance for HTRW Projects* (USACE, 1997), and the *Shell for Analytical Chemistry Requirements* (USACE, 1998).

1.1 Site Setting and History

The fYNOP facility is located in Springettsbury Township in York, York County, Pennsylvania, and is currently an active motorcycle manufacturing facility situated on approximately 230 acres. The facility is bordered on the south by Route 30; on the west by Eden Road, a railroad line, and Codorus Creek; and on the east and north by residential properties. A site location map is provided on Figure 1-1.

NOTE: Map based on USGS 7.5 minute series York quadrangle.

0 1,000 2,000 4,000 '

1 inch = 2,000 feet

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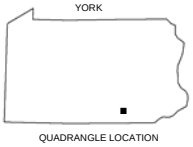

QUADRANGLE LOCATION

FORMER YORK NAVAL ORDNANCE PLANT

1425 EDEN ROAD, YORK, PA 17402

SITE LOCATION MAP

drawn AGM	checked RDM	approved RDM	figure no. 1-1
date 10/20/08	date 8/14/09	date 8/14/09	
job no. 166345.00.08232.76.6076.00.518		file no. 1_1_SL_20090814.mxd	

initials	date	revision

SAIC From Science to Solutions

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The site is underlain by fill (associated with site industrial and roadway construction), residual soil produced from the weathering of the underlying bedrock, and alluvium. Soils are comprised of sandy silt and clayey silts and silt loam deposits from four primary soil classifications (Duffield, Glenelg, Elk, and Chester). These soil formations are derived primarily from quartzite and limestone. Two geologic rock formations underlie the site. Solution-prone (karst) gray limestone underlies the flat lowland (western) portion of the site. Quartzitic sandstone underlying the more steeply sloping hills or upland area is present on the eastern part of the site. A detailed discussion of the geology and hydrogeology is included in SAIC's February 1995 report entitled "Groundwater Extraction and Treatment System Annual Operations Report." Groundwater flow is generally westward, from the upland area at the eastern part of the site toward Codorus Creek; however, localized groundwater flow is also controlled by an active groundwater extraction and treatment system on-site.

The York facility was constructed in 1941 by the York Safe and Lock Company, a United States Navy contractor, for the manufacture, assembly, and testing of 40 millimeter (mm) twin and quadruple gun mounts, complete with guns. In 1944, the Navy took possession of the York facility. The Navy owned and operated the facility as the York Naval Ordnance Plant (YNOP) until 1964, switching operations after World War II (WWII) to overhauling war-service weapons, making rocket launchers, and manufacturing 3-inch/50-caliber guns, 20 mm aircraft guns and power-drive units for 5-inch/54-caliber guns. In 1964, the Navy sold the York facility to American Machine and Foundry Company (AMF), who continued similar manufacturing. In 1969, AMF merged with Harley-Davidson Motor Company Operations, Inc. (Harley-Davidson). In 1973, Harley-Davidson moved its motorcycle assembly operations to the York facility. In 1981, AMF sold the York facility to Harley-Davidson. Harley-Davidson has continued motorcycle assembly operations at the York facility since 1981.

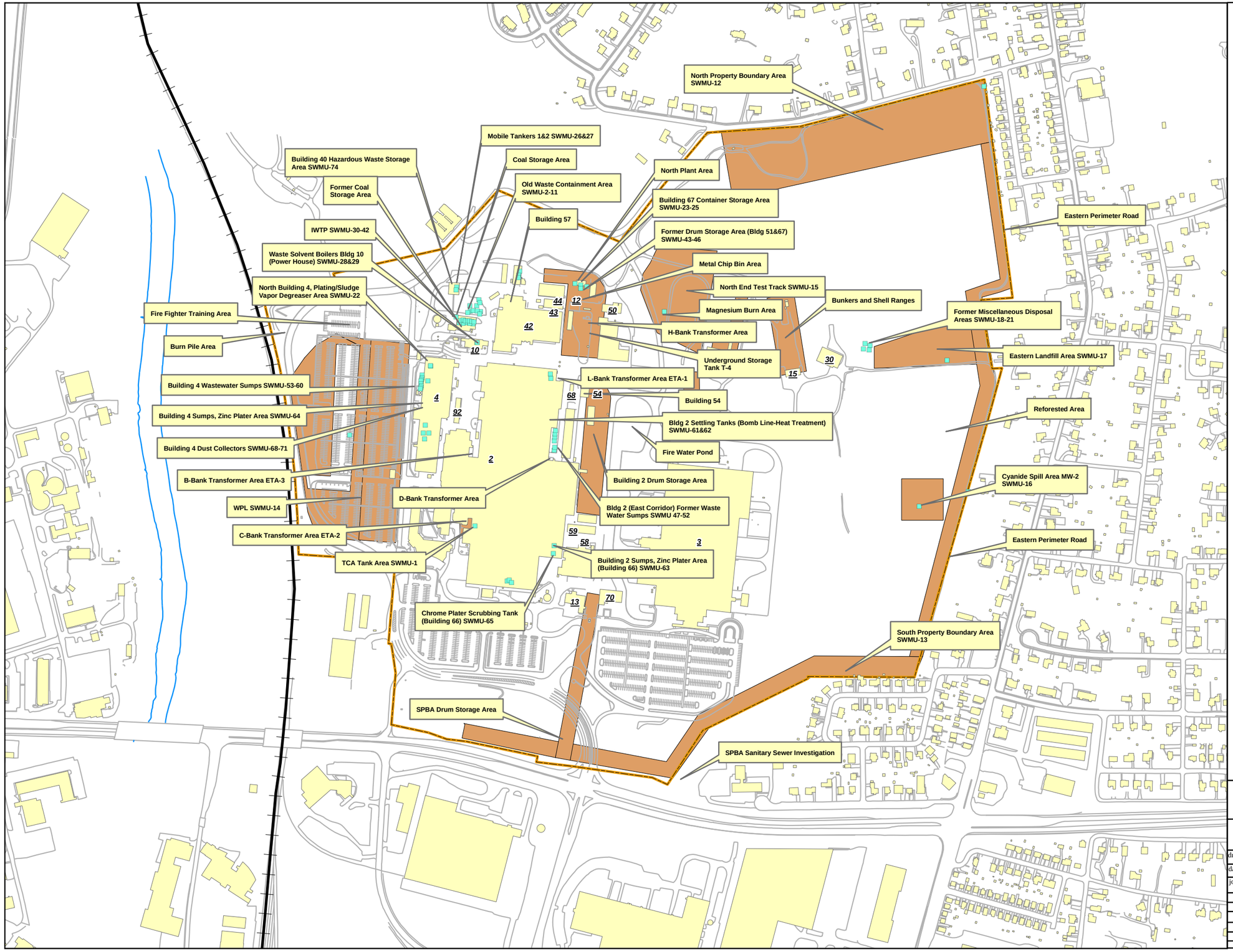
Harley-Davidson has been performing remedial environmental activities at the site since 1986. In 1989, EPA performed a Resource Conservation and Recovery Act (RCRA) facility inspection of the facility. As a result of this inspection, 73 solid waste management units

(SWMUs) were identified as areas of concern (AOCs), needing further investigation. These SWMUs included:

- 28 SWMUs requiring no action or continued compliance
- 13 SWMUs investigated and closed through RCRA procedures
- 13 SWMUs to be considered as part of Remedial Investigation/Feasibility Study (RI/FS)
- 19 SWMUs with action pending (RI/FS Work Plan Addendum)

Harley-Davidson entered into a Settlement Agreement with the Department of Defense and the Department of the Navy (as facilitated by USACE) on January 24, 1995. That agreement established a cost-sharing arrangement between Harley-Davidson, as the present site owner, and the United States, as the past owner, for costs incurred in the response to environmental contamination at the facility. A Trust Fund was established to handle the cost sharing of those response actions.

A site-wide RI/FS was initiated in 1998 and is presently ongoing. The objectives of the site-wide RI/FS are to evaluate potential sources of soil and groundwater impacts, determine the fate and transport characteristics of known contaminants of concern (COCs), and evaluate the risk that the COCs pose to human health and the environment. The results of the investigation are to be used to evaluate and define remedies that will minimize risks to human health and the environment. The resulting AOCs were identified in the site-wide Remedial Investigation (RI) Report (Langan Engineering and Environmental Services, Inc. [Langan], 2003 [draft]). The general locations of the AOCs are shown on Figure 1-2.



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Legend

- Soild Waste Management Units Identified by A.T. Kerney (1989)
- AOC
- Harley Davidson Property Boundary
- Buildings
- Cordorus Creek
- Railroad
- Roads and Curb Boundary

0 245 490 980

1 INCH EQUALS 500 FEET

FORMER YORK NAVAL ORDNANCE PLANT

1425 EDEN ROAD, YORK, PA 17402

Areas of Concern Location Map

drawn AGM	checked RDM	approved RDM	figure no. 1-2
date 09/15/08	date 08/14/09	date 08/14/09	
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initials	date	revision

SAIC From Science to Solutions

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On May 20, 2002, fYNOP committed to EPA's "Facility Lead Program" under the RCRA Corrective Action Program through a letter of commitment to EPA. Subsequently, fYNOP has entered into the One Cleanup program established by the EPA (Region III) and the Pennsylvania Department of Environmental Protection (PADEP), which was outlined in a Memorandum of Agreement (MOA) dated April 24, 2004. Under the MOA, both agencies agreed to work with fYNOP to complete RCRA Corrective Actions for the facility and meet Act 2 cleanup standards in accordance with Act 2 and Chapter 250 of Pennsylvania's Land Recycling and Environmental Remediation Standards Act. The One Cleanup program initiative began on February 7, 2005, when fYNOP submitted a Notice of Intent to Remediate (NIR) to PADEP. Official public information about the facility can be found at the public web-link, http://yorksiteremedy.com/

1.2 Summary of Existing Data and Contaminants of Concern

In 1998, a remedial investigation was initiated by Langan. The results of this study, including more detailed summaries of soil, groundwater, sediment, and surface water sampling, is provided in a draft report entitled "Interim Site-Wide Remedial Investigation Report, Harley-Davidson Motor Company, York, Pennsylvania Facility" (Langan, 2003). The purpose of the RI work was to characterize the site for the development of appropriate remedial measures. This was facilitated through the investigation of potential source areas, further development of the conceptual model, and evaluation of migration and exposure pathways.

In 2007, a supplemental investigation was initiated by SAIC. The results of that study are still under review. The objectives of the Site-wide RI/FS (and Supplemental RI) are to evaluate potential sources of soil and groundwater impacts, determine the fate and transport characteristics of known contaminants of concern (COCs), and evaluate the risk that the COCs pose to human health and the environment. The results of the investigation are to be used to evaluate and define remedies that will minimize risks to human health and the environment.

Previous remedial activities at the site have indicated that the primary COCs in groundwater due to concentration, frequency, and potential for off-site migration are chlorinated solvents, including tetrachloroethene (PCE), trichloroethene (TCE), and 1,1,1-trichloroethane (TCA), as

well as the degradation products of those compounds. Lesser frequencies of hexavalent chromium, lead, and cyanide have also been detected in selected site groundwater monitoring wells. The distribution of these constituents in groundwater suggests that they have originated from multiple sources.

The constituents in soils that have exceeded applicable PADEP standards include metals (antimony, arsenic, cadmium, hexavalent chromium, lead, nickel, selenium, silver, thallium, and zinc); VOCs (benzene, chlorobenzene, ethylbenzene, PCE, toluene, xylenes, TCA, TCE, and vinyl chloride); polycyclic aromatic hydrocarbons (PAHs) (anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, and inden(1,2,3-cd)pyrene); and polychlorinated biphenyls (PCBs) (Arochlor-1254 and Arochlor-1260).

1.3 Site-Specific Sampling and Analysis Problems

The site is an active industrial facility. Care must be utilized when working on-site to avoid underground utilities during all intrusive activities. The quantitation limits of the proposed sampling and the type of analyses requested do not present completion problems. Sampling for hexavalent chromium requires rapid submittal to the laboratory due to short holding times.

1.4 Required Chemistry

Area- or task-specific work plans will provide the details of the project scope and objectives, sampling design, procedures, methods, and rationales. These work plans will also contain additional background information, along with past data collection activities and existing site data information. The anticipated sampling frequency, number of samples, frequency of QC samples, and types of analyses will also be provided in the work plan. Primary project organization and responsibilities for laboratory-related activities are presented in Section 2.0 of this QAPP.

2.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

The organizational chart shown on Figure 2-1 outlines the management structure that will be used to implement remedial environmental projects. The functional responsibilities of key roles are described in the following parts of this section.

2.1 Harley-Davidson Facility Project Coordinator

As the Facility Lead, Harley-Davidson ensures the overall management and quality of Harley-Davidson's environmental activities. Sharon R. Fisher, CHMM, is identified as the Harley-Davidson Facility Project Coordinator (FPC) for the One Cleanup program and will ensure that all project goals and objectives are met in a high-quality and timely manner. QA and nonconformance issues will be addressed by this individual in coordination with the Contractor's Program Manager. Ms. Fisher's business address and telephone number are:

Harley-Davidson Motor Company Operations, Inc.
1425 Eden Road
York, PA 17402
(717) 852-6544
(717) 852-6718 (Fax)

2.2 USACE Baltimore District Representative

The USACE Baltimore District representative for the site is Nicki Fatherly, R.G. As the representative of the former site owner for the Navy, Ms. Fatherly reviews all matters with the Harley-Davidson FPC and the Trust Fund coordinator concerning investigation or remediation of environmental impacts from those past operations at the site. Ms. Fatherly's business address and telephone number are:

United States Army Corps of Engineers
Baltimore District, CENAB-EN-HN
10 South Howard Street
Baltimore, MD 21201-1717
(410) 962-3542
(410) 962-2318 (Fax)

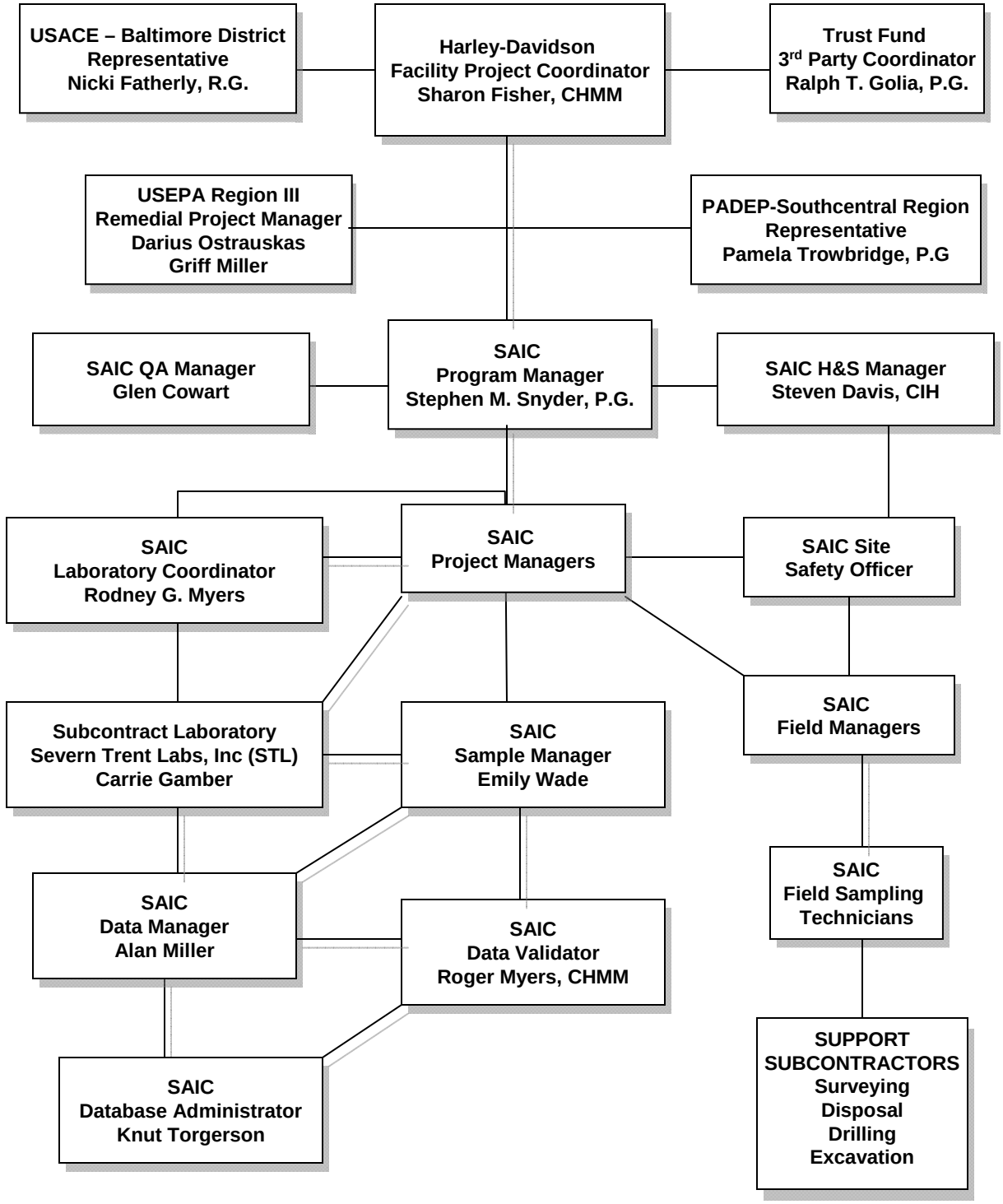
Figure 2-1

Project Organization Chart

Quality Assurance Project Plan

Harley-Davidson Motor Company Operations, Inc.,

York Facility



2.3 Trust Fund 3rd Party Coordinator

The Trust Fund 3rd Party Coordinator, Ralph T. Golia, P.G. (AMO Environmental Decisions, Inc. [AMOED]), is the liaison between shared cleanup responsibility between Harley-Davidson and the federal government and serves as the technical lead and point of contact with the USACE (Formerly Used Defense Sites [FUDS] Team Lead). These activities will also involve interfacing with EPA personnel and tracking Trust Fund-related budgets and schedules. Mr. Golia's business address and telephone number are:

AMO Environmental Decisions, Inc.
4327 Point Pleasant Pike
Danboro, PA 18916
(215) 230-8282
(215) 230-8283 (Fax)

2.4 EPA Region III Remedial Project Manager

The EPA Region III Remedial Project Managers for the project are Griff Miller and Darius Ostrauskas. Mr. Miller and Mr. Ostrauskas work with the Harley-Davidson FPC and PADEP representative to provide regulatory review and federal oversight for the project. Specifically, the EPA works directly with the PADEP to provide guidance for fYNOP under the One Cleanup program. Mr. Ostrauskas is the primary lead for EPA on the One Cleanup program at Harley-Davidson. Mr. Ostrauskas' business address and telephone number are:

EPA Region III
Pennsylvania Operations Branch (3WC22)
1650 Arch Street
Philadelphia, PA 19103-2029
(215) 814-3360
(215) 814-3113 (Fax)

2.5 PADEP Representative

The PADEP site representative is Pamela Trowbridge, P.G. Ms. Trowbridge provides regulatory oversight to the project and represents the Commonwealth on environmental issues at fYNOP. In addition, Ms. Trowbridge is the PADEP primary lead for the One Cleanup program initiative. The business address and telephone number for Ms. Trowbridge are:

Pennsylvania Department of Environmental Protection
Southcentral Region
909 Elmerton Avenue
Harrisburg, PA 17110-8200
(717) 705-4851
(717) 705-4830 (Fax)

2.6 SAIC Program Manager

The SAIC Program Manager for the site (Stephen M. Snyder, PG) is responsible for the overall coordination of all project activities at fYNOP for SAIC. Mr. Snyder reports to the Harley-Davidson FPC. Mr. Snyder's business address and telephone number are:

Science Applications International Corporation
6310 Allentown Boulevard
Harrisburg, PA 17112
(717) 901-8840
(717) 901-8102 (Fax)

2.7 SAIC Quality Assurance Manager

The SAIC QA Manager (Glenn Cowart) is responsible for the project QA/QC in accordance with the requirements of the project QAPP, other work plan documentation, and appropriate management guidance. The SAIC QA Manager, in coordination with the SAIC Project Managers, will be responsible for participating in the project field activity readiness review; approving variances during field activities before work continues; approving, evaluating, and documenting the disposition of Nonconformance Reports (NCRs); overseeing and approving any required project training; and designing audit/surveillance plans followed by supervision of these

activities. The SAIC QA Manager reports to the SAIC Program Manager. Mr. Cowart's business address and telephone number are:

Science Applications International Corporation
151 Lafayette Drive
P.O. Box 2501
Oak Ridge, TN 37831
(865) 481-4630
(865) 482-7257 (Fax)

2.8 SAIC Project Managers

The SAIC Project Managers are responsible for implementation and documentation of all project QA/QC protocols during field activities. This will include, but not be limited to, documentation of QAPP instructions to field personnel; oversight of field sampling and analytical activities; documentation of field QC activities; and oversight of field documentation. The SAIC Project Managers report to the SAIC Program Manager.

2.9 SAIC Health and Safety Manager

The SAIC Health and Safety Manager (Stephen Davis, CIH) is responsible for ensuring that health and safety procedures designed to protect personnel are maintained throughout the field activities. This will be accomplished by strict adherence to the project Site Safety and Health Plan (SSHP), which will be prepared as a separate document for each project. This individual, in conjunction with the Site Safety Officer, will have the authority to halt fieldwork if health or safety issues arise that are not immediately resolvable in accordance with the project SSHP. The Health and Safety Manager and Site Safety Officer report directly to the Project and Field Managers. Mr. Davis' business address and telephone number are:

Science Applications International Corporation
151 Lafayette Drive
P.O. Box 2501
Oak Ridge, TN 37831
(865) 481-4755
(865) 481-4770 (Fax)

2.10 SAIC Laboratory Coordinator

The SAIC Laboratory Coordinator (Rodney Myers) is responsible for coordination of sample shipment to the laboratory(ies) and subsequent chemical analysis and reporting performed by the subcontract laboratories, in accordance with the requirement defined in the QAPP. This individual will be responsible for obtaining required sample containers from the laboratories for use during field sample collection; resolving questions the laboratory may have regarding QAPP requirements and deliverables; and coordination of data reduction, review, and documentation activities related to sample data package deliverables received from the laboratories. The SAIC Laboratory Coordinator reports directly to the SAIC Program Manager. Mr. Myers' address and telephone number are:

Science Applications International Corporation
6310 Allentown Boulevard
Harrisburg, PA 17112
(717) 901-8836
(717) 901-8102 (Fax)

2.11 SAIC Sample Manager

The SAIC Sample Manager (Emily Wade) is responsible for coordination of received data from the subcontracted laboratory, in accordance with the requirement defined in the QAPP. This individual will be responsible for ensuring that chain-of-custody records are properly maintained and coordinating the management of the laboratory data (electronic and paper copies) into the SAIC system. The SAIC Sample Manager reports directly to the SAIC Program Manager and the SAIC Laboratory Coordinator. Ms. Wade's address and telephone number are:

Science Applications International Corporation
6310 Allentown Boulevard
Harrisburg, PA 17112
(717) 901-8112
(717) 901-8102 (Fax)

2.12 SAIC Data Manager

The SAIC Data Manager (Alan Miller) is responsible for entering all of the electronic laboratory data into the SAIC system. This includes comparison of electronic data submittals to the chain-of-custody, converting electronic data deliverables into an access database, and entering location identifiers for sampling points. The SAIC Data Manager reports directly to the SAIC Program Manager and the SAIC Sample Manager. Mr. Miller's address and telephone number are:

Science Applications International Corporation
6310 Allentown Boulevard
Harrisburg, PA 17112
(717) 901-8826
(717) 901-8102 (Fax)

2.13 SAIC Database Administrator

The SAIC Database Administrator (Knut Torgerson) is responsible for entering all of the electronic laboratory data into the ARC IMS database and the coordination of the fYNOP website. The SAIC Database Administrator reports directly to the SAIC Program Manager. Mr. Torgerson's address and telephone number are:

Science Applications International Corporation
12100 Sunset Hills Road
Reston, VA 20190
(703) 375-2084
(703) 709-1042 (Fax)

2.14 SAIC Data Validator

The SAIC Data Validator (Roger Myers, CHMM) is responsible for verification of laboratory data quality, as required by the project. This individual will conduct data validation procedures on selected data packages, in accordance with SAIC data validation procedures. The SAIC Data Validator reports directly to the Program Manager and coordinates with the Sample Manager. Mr. Myers' address and telephone number are:

Science Applications International Corporation
6310 Allentown Boulevard
Harrisburg, PA 17112
(717) 901-8831
(717) 901-8102 (Fax)

2.15 SAIC Field Managers

The Field Managers are responsible for implementing all field activities in accordance with project-specific work plans and the QAPP. These individuals are responsible for ensuring proper technical performance of field operations and sampling activities; adherence to required sample custody and other related QA/QC field procedures; coordination of field personnel and subcontractor activities; management of investigation-derived wastes (IDW); and checks of all field documentation, if required. The Field Managers report directly to the SAIC Project Managers, except in regard to QA/QC matters that are reported directly to the SAIC QA Manager.

2.16 SAIC Field Personnel

In addition to the Field Managers, other field personnel participating in the implementation of field activities are anticipated to be field staff and sampling technicians. These individuals, in coordination with field subcontractor personnel, will be responsible for performance of excavation activities, drilling operations, collection of soil, surface water samples, etc., and preparation of field logbooks and other required documentation. These individuals will be responsible for performing all field activities in accordance with the work plan(s) and QAPP and will report directly to the SAIC Field Managers.

2.17 Subcontracted Laboratory Support

The subcontract laboratory for this project is TestAmerica of Pittsburgh, Pennsylvania. The TestAmerica main point of contact for the work at Harley-Davidson is Carrie Gamber. The Laboratory QA Manager at TestAmerica is Nasreen DeRubeis, while the Laboratory Director at

TestAmerica is Albert (Rusty) Vicinie, III. The responsibilities of key personnel for the laboratory are described in the TestAmerica-Pittsburgh Laboratory QA Plan. The subcontracted laboratory shall report to the SAIC Laboratory Coordinator or his or her designee. The contact information for TestAmerica is:

TestAmerica-Pittsburgh
301 Alpha Drive
Pittsburgh, PA 15238
(412) 963-7058
(412) 963-2468 (Fax)

3.0 DATA QUALITY OBJECTIVES

The overall project objective is to complete the RI to allow implementation of the feasibility study (FS) and selected final remedy(ies) at the fYNOP site. Various site- or area-specific investigations or cleanups may be implemented during this process. During the course of these activities, the project must develop and implement procedures for field sampling, chain-of-custody, laboratory analysis, and reporting which will provide information for evaluation, assessment, and remediation. Data must be technically sound and legally defensible. Procedures for sampling, chain-of-custody, laboratory instrument calibration, laboratory analysis, reporting of data, internal QC, audits, preventive maintenance of field equipment, and corrective action are described in other sections of this QAPP. The purpose of this section is to address the objectives for data accuracy, precision, completeness, representativeness, and comparability.

Data Quality Objectives (DQOs) are qualitative and quantitative statements that specify the quality of data required to support decisions made during investigation activities and are based on the end uses of the data being collected.

3.1 Project Objectives

Site- or area-specific work plans will identify specific task objectives as they relate to investigation action levels and remediation. General analytical objectives are:

- To provide data of sufficient quality and quantity to support ongoing supplemental remedial investigation efforts.
- To provide data of sufficient quality and quantity to support area-specific remediation goals (when applicable).
- To provide data of sufficient quality to meet applicable Commonwealth of Pennsylvania and Federal (EPA, Region III) risk-based goals, as required under the One Cleanup program.

- To ensure samples are collected using approved techniques and are representative of existing site conditions.
- To utilize QA/QC procedures for both field and laboratory methods that meet the EPA, PADEP, and One Cleanup program guidance document requirements.

3.2 Quality Assurance Objectives for Measurement Data

An analytical DQO summary for these activities is presented in Tables 3-1 and 3-2. All QC parameters stated in the specific SW-846 methods (i.e., percent recoveries) will apply for each chemical listed.

As per the EPA guidance (1993a) and USACE EM 200-1-6, a combination of Screening Level and Definitive Level data will be required for this project. Screening data are generated by field operations or other relatively rapid turnaround analytical processes. Documentation and deliverables for screening data are expected to be minimal. Definitive data represent data generated under laboratory conditions using EPA or other nationally recognized analytical methodology. Data of this type, both qualitative and quantitative, are used for determination of source type and extent, for characterization to support evaluation of remedial technologies, and for final confirmatory analyses to document remedial actions. Documentation for definitive data is expected to be comprehensive.

3.2.1 Level of Quality Control Effort

To assess whether QA objectives have been achieved, analyses of specific field and laboratory QC samples will be required. These QC samples include field trip blanks, field duplicates, laboratory method blanks, laboratory control samples, laboratory duplicates, rinsate blanks, and matrix spike/matrix spike duplicate (MS/MSD) samples.

Table 3-1. Solid /Soil Gas Investigative DQO Summary

Data Use	Sample Type	Analytical Method	Precision (RPD)[a]		Accuracy	Accuracy	Completeness
			Field Dups	Lab Dups	Lab LCS	Lab MS	
Screening for H&S plus sample site selection, dust monitoring	Discrete	FID/PID Volatile organics MiniRam	± comparison	NA	NA	NA	95%
Confirmation of contamination removal	Discrete	SW-846 8260B Volatile organics	<50 RPD	<40 RPD	75-125% recovery	60-140% recovery	90%
Identification of VOC source areas using Soil Gas	Discrete Soil Gas samples	TO-15	<40 RPD	<25 RPD	70-130% recovery	60-140% recovery	90%
Contaminant Measurement	Discrete or composite	SW-846 8260B Volatile Organics	<50 RPD	<40 RPD	75-125%	60-140%	90%
		SW-846 8270C Semi-volatile organics	<50 RPD	<40 RPD	50-130% recovery	30-140% recovery	90%
		SW-846 8082A PCBs	<50 RPD	<40 RPD	50-130% recovery	40-140% recovery	90%
		SW-846 6020A/7471A Metals	<50 RPD	<35 RPD	90-110% recovery	75-125% recovery	90%
		Hexavalent Chromium SW-846 7196a	<50 RPD	<35 RPD	90-110% recovery	75-125% recovery	90%
		SW-846 9012a Total Cyanide	<50 RPD	<35 RPD	90-110% recovery	75-125% recovery	90%
Waste characterization	Discrete (VOCs) or composite	SW-846 1311 TCLP analytes and waste characteristics	NA	<40 RPD	80-120%	75-125% recovery	80%

[a] Relative percent differences at values within five times the reporting level comparison are acceptable if values are plus or minus three times the reporting level.

NA Not applicable.

Table 3-2. Liquid Investigative DQO Summary

Data Use	Sample Type	Analytical Method	Precision (RPD)[a] Field Dups	Precision (RPD)[a] Lab Dups	Accuracy Lab LCS	Accuracy Lab MS	Completeness
Screening for H&S plus sample site selection	Discrete	FID/PID Volatile organics (headspace)	NA	NA	± 0.1 ppm	NA	95%
Determination of basic water characteristics	Discrete	Conductivity - Horiba U22, field multi-meter OR EPA-120.1	<10 RPD	NA	± 0.1 µmhos/cm	NA	95%
		pH - Horiba U22, field multi-meter OR EPA-150.1	<10 RPD	NA	± 0.1 s.u.	NA	95%
		Temperature – Horiba U22, field multi-meter OR EPA-170.1	<10 RPD	NA	± 0.1 C	NA	95%
		Turbidity – Horiba U22, field multi-meter OR Turbidity meter	<10 RPD	NA	± 2 NTU	NA	95%
		Ox-red potential - Horiba U22, field multi-meter	<10 RPD	NA	± 30 eV	NA	95%
		Dissolved oxygen –Horiba U22, field multi-meter OR EPA-360.1	<10 RPD	NA	± 0.1 ppm	NA	95%
Contaminant Measurement	Discrete	SW-846 8260B Volatile organics	<30 RPD	<20 RPD	80-120% recovery	70-130% recovery	90%
	Discrete or composite	SW-846 8270C Semi-volatile organics	<30 RPD	<20 RPD	60-120% recovery	30-140% recovery	90%
		SW-846 8082A PCBs	<30 RPD	<20 RPD	60-120% recovery	40-140% recovery	90%
		SW-846 6020A/7470 TAL metals	<30 RPD	<20 RPD	90-110% recovery	75-125% recovery	90%
		Hexavalent Chromium SW-846 7196a	<30 RPD	<20 RPD	90-110% recovery	75-125% recovery	90%
		EPA 335.4 Total Cyanide	<30 RPD	<20 RPD	90-110% recovery	75-125% recovery	90%
		SM 4500 CN E Free Cyanide	<30 RPD	<20 RPD	90-110% recovery	75-125% recovery	90%
		Miscellaneous Anions	<30 RPD	<20 RPD	90-110% recovery	75-125% recovery	90%
IDW characterization	Composite	TCLP analytes and Miscellaneous	NA	<40 RPD	80-120% recovery	70-130% recovery	90%

[a] Relative percent differences at values within five times the reporting level comparison are acceptable if values are plus or minus three times the reporting level.

NA Not applicable.

Trip blanks and rinsate blanks will be submitted for analysis, along with field duplicate samples, to provide a means to assess the quality of the data resulting from the field sampling program. Trip blanks (employed for volatile organic compound [VOC] analysis only) are used to assess the potential for contamination of samples due to contaminant migration during sample shipment and storage. Rinsate blanks are used to assess the effectiveness of field decontamination processes in conjunction with field blanks of the site potable water source used for decontamination. Criteria and evaluation of blank determinations are provided in Tables 3-3 through 3-8 and Section 9.3. Field duplicate samples are analyzed to determine sample heterogeneity and sampling methodology reproducibility.

Laboratory method blanks and laboratory control samples are employed to determine the accuracy and precision of the analytical method implemented by the laboratory. Matrix spikes provide information about the effect of the sample matrix on the measurement methodology. Laboratory sample duplicates and MSDs assist in determining the analytical reproducibility and precision of the analysis for the samples of interest.

The general level of QC effort will be at least one field duplicate for every 20 investigative samples and at least one per matrix if there are less than 20 samples collected for a given matrix. One VOC analysis trip blank consisting of analyte-free water will be included along with each shipment of VOC soil or water samples.

MS/MSD samples are investigative samples. Soil MS/MSD samples require no extra volume for SVOCs or metals. However, soil VOC samples may require additional samples to be collected for these purposes. Aqueous MS/MSD samples must be collected at triple the volume for SVOC, pesticide/PCB, and metals parameters. One MS/MSD sample will be analyzed for at least every 20 samples submitted to the laboratory per sample matrix (i.e., groundwater, soil).

Table 3-3
Project Reporting Levels for Volatile Organic Compounds

Compound	Analytical Method		8260 Project Reporting Levels		8260 Low Level Project Reporting Levels	
	Liquid	Solid	Liquids (µg/L)	Solids (µg/kg)	Liquids (µg/L)	Solids (µg/kg)
1,1,1-Trichloroethane	5030/8260B	5035/8260B	5	5	1	NA
1,1,1,2-Tetrachloroethane	5030/8260B	5035/8260B	5	5	1	NA
1,1,2,2-Tetrachloroethane	5030/8260B	5035/8260B	5	5	1	NA
1,1,2-Trichloroethane	5030/8260B	5035/8260B	5	5	1	NA
1,1-Dichloroethane	5030/8260B	5035/8260B	5	5	1	NA
1,1-Dichloroethene	5030/8260B	5035/8260B	5	5	1	NA
1,2-Dibromoethane	5030/8260B	5035/8260B	5	5	1	NA
1,2-Dichloroethane	5030/8260B	5035/8260B	5	5	1	NA
Cis-1,2-Dichloroethene	5030/8260B	5035/8260B	5	5	1	NA
Trans-1,2-Dichloroethene	5030/8260B	5035/8260B	5	5	1	NA
1,2-Dichloropropane	5030/8260B	5035/8260B	5	5	1	NA
1,4-Dioxane	5030/8260B	5035/8260B	1000	1000	200	NA
2-Butanone	5030/8260B	5035/8260B	5	5	5	NA
2-Hexanone	5030/8260B	5035/8260B	5	5	5	NA
4-Methyl-2-pentanone (MIBK)	5030/8260B	5035/8260B	5	5	5	NA
Acetone	5030/8260B	5035/8260B	20	20	5	NA
Acrylonitrile	5030/8260B	5035/8260B	100	100	20	NA
Benzene	5030/8260B	5035/8260B	5	5	1	NA
Bromochloromethane	5030/8260B	5035/8260B	5	5	1	NA
Bromodichloromethane	5030/8260B	5035/8260B	5	5	1	NA
Bromoform	5030/8260B	5035/8260B	5	5	1	NA
Bromomethane	5030/8260B	5035/8260B	5	5	1	NA
Carbon disulfide	5030/8260B	5035/8260B	5	5	1	NA
Carbon tetrachloride	5030/8260B	5035/8260B	5	5	1	NA
Chlorobenzene	5030/8260B	5035/8260B	5	5	1	NA
Chloroethane	5030/8260B	5035/8260B	5	5	1	NA
Chloroform	5030/8260B	5035/8260B	5	5	1	NA
Chloromethane	5030/8260B	5035/8260B	5	5	1	NA
Cis-1,3-dichloropropene	5030/8260B	5035/8260B	5	5	1	NA
Dibromochloromethane	5030/8260B	5035/8260B	5	5	1	NA
Ethyl benzene	5030/8260B	5035/8260B	5	5	1	NA
Methylene chloride	5030/8260B	5035/8260B	5	5	1	NA
Methyl tertiary butyl ether	5030/8260B	5035/8260B	5	5	1	NA
Styrene	5030/8260B	5035/8260B	5	5	1	NA
Tetrachloroethene	5030/8260B	5035/8260B	5	5	1	NA
Toluene	5030/8260B	5035/8260B	5	5	1	NA
Trans-1,3-dichloropropene	5030/8260B	5035/8260B	5	5	1	NA
Trichloroethene	5030/8260B	5035/8260B	5	5	1	NA
Vinyl chloride	5030/8260B	5035/8260B	5	5	1	NA
Xylenes (total)	5030/8260B	5035/8260B	15	15	3	NA

Table 3-4. Project Reporting Levels for Semi-volatile Organic Compounds

Compound	Analytical Method		8270C Project Reporting Levels		8270C Low Level Project Reporting Levels	
	Liquid	Solid	Liquids (µg/L)	Solids (µg/kg)	Liquids (µg/L)	Solids (µg/kg)
1,2,4-Trichlorobenzene	3510C/8270C	3540C/8270C	2	67	0.2	6.7
1,2-Dichlorobenzene	3510C/8270C	3540C/8270C	2	67	0.2	6.7
1,3-Dichlorobenzene	3510C/8270C	3540C/8270C	2	67	0.2	6.7
1,4-Dichlorobenzene	3510C/8270C	3540C/8270C	2	67	0.2	6.7
2,4,5-Trichlorophenol	3510C/8270C	3540C/8270C	10	330	1	33
2,4,6-Trichlorophenol	3510C/8270C	3540C/8270C	10	330	1	33
2,4-Dichlorophenol	3510C/8270C	3540C/8270C	2	67	0.2	6.7
2,4-Dimethylphenol	3510C/8270C	3540C/8270C	10	330	1	33
2,4-Dinitrophenol	3510C/8270C	3540C/8270C	50	1700	5	170
2,4-Dinitrotoluene	3510C/8270C	3540C/8270C	10	330	1	33
2,6-Dinitrotoluene	3510C/8270C	3540C/8270C	10	330	1	33
1,4-Dioxane	3510C/8270C	3540C/8270C	NA	NA	NA	NA
2-Chloronaphthalene	3510C/8270C	3540C/8270C	2	67	0.2	6.7
2-Chlorophenol	3510C/8270C	3540C/8270C	10	330	1	33
2-Methylnaphthalene	3510C/8270C	3540C/8270C	2	67	0.2	6.7
2-Methylphenol	3510C/8270C	3540C/8270C	10	330	1	33
2-Nitroaniline	3510C/8270C	3540C/8270C	50	1700	5	170
2-Nitrophenol	3510C/8270C	3540C/8270C	10	330	1	33
3-Methylphenol	3510C/8270C	3540C/8270C	10	330	1	33
4-Methylphenol	3510C/8270C	3540C/8270C	10	330	1	33
3,3'-Dichlorobenzidine	3510C/8270C	3540C/8270C	10	330	1	33
3-Nitroaniline	3510C/8270C	3540C/8270C	50	1700	5	170
4,6-Dinitro-2-methylphenol	3510C/8270C	3540C/8270C	50	1700	5	170
4-Bromophenylphenyl ether	3510C/8270C	3540C/8270C	10	330	1	33
4-Chloro-3-methylphenol	3510C/8270C	3540C/8270C	10	330	1	33
4-Chloroaniline	3510C/8270C	3540C/8270C	10	330	1	33
4-Chlorophenylphenyl ether	3510C/8270C	3540C/8270C	10	330	1	33
4-Nitroaniline	3510C/8270C	3540C/8270C	50	1700	5	170
4-Nitrophenol	3510C/8270C	3540C/8270C	50	1700	5	170
Acenaphthene	3510C/8270C	3540C/8270C	2	67	0.2	6.7
Acenaphthylene	3510C/8270C	3540C/8270C	2	67	0.2	6.7
Anthracene	3510C/8270C	3540C/8270C	2	67	0.2	6.7
Benzo(a)anthracene	3510C/8270C	3540C/8270C	2	67	0.2	6.7
Benzo(a)pyrene	3510C/8270C	3540C/8270C	2	67	0.2	6.7
Benzo(b)fluoranthene	3510C/8270C	3540C/8270C	2	67	0.2	6.7
Benzo(g,h,i)perylene	3510C/8270C	3540C/8270C	2	67	0.2	6.7
Benzo(k)fluoranthene	3510C/8270C	3540C/8270C	2	67	0.2	6.7
Bis(2-chloroisopropyl)ether	3510C/8270C	3540C/8270C	2	67	0.2	6.7
Bis(2-chloroethoxy)methane	3510C/8270C	3540C/8270C	10	330	1	33
Bis(2-chloroethyl)ether	3510C/8270C	3540C/8270C	2	67	0.2	6.7
Bis(2-ethylhexyl)phthalate	3510C/8270C	3540C/8270C	10	330	1	33
Butylbenzylphthalate	3510C/8270C	3540C/8270C	10	330	1	33
Carbazole	3510C/8270C	3540C/8270C	2	67	0.2	6.7
Chrysene	3510C/8270C	3540C/8270C	2	67	0.2	6.7
Di-n-butylphthalate	3510C/8270C	3540C/8270C	10	330	1	33
Di-n-octylphthlalate	3510C/8270C	3540C/8270C	10	330	1	33
Dibenzo(a,h)anthrancene	3510C/8270C	3540C/8270C	2	67	0.2	6.7
Dibenzofuran	3510C/8270C	3540C/8270C	10	330	1	33
Diethylphthalate	3510C/8270C	3540C/8270C	10	330	1	33
Dimethylphthalate	3510C/8270C	3540C/8270C	10	330	1	33
Fluoranthene	3510C/8270C	3540C/8270C	2	67	0.2	6.7
Fluorene	3510C/8270C	3540C/8270C	2	67	0.2	6.7
Hexachlorobenzene	3510C/8270C	3540C/8270C	2	67	0.2	6.7
Hexachlorobutadiene	3510C/8270C	3540C/8270C	2	67	0.2	6.7
Hexachlorocyclopentadiene	3510C/8270C	3540C/8270C	10	330	1	33
Hexachloroethane	3510C/8270C	3540C/8270C	10	330	1	33
Indeno(1,2,3-cd)pyrene	3510C/8270C	3540C/8270C	2	67	0.2	6.7
Isophorone	3510C/8270C	3540C/8270C	10	330	1	33
n-Nitroso-di-n-propylamine	3510C/8270C	3540C/8270C	2	67	0.2	6.7
n-Nitroso-diphenylamine	3510C/8270C	3540C/8270C	2	67	0.2	6.7
Napthalene	3510C/8270C	3540C/8270C	2	67	0.2	6.7
Nitrobenzene	3510C/8270C	3540C/8270C	2	67	0.2	6.7
Pentachlorophenol	3510C/8270C	3540C/8270C	10	330	1	33
Phenanthrene	3510C/8270C	3540C/8270C	2	67	0.2	6.7
Phenol	3510C/8270C	3540C/8270C	2	67	0.2	6.7
Pyrene	3510C/8270C	3540C/8270C	2	67	0.2	6.7

Table 3-5
Project Reporting Levels for PCB Compounds

Compound	Analytical Method		8082 Project Reporting Levels		8082 Low Level Project Reporting Levels	
	Liquid	Solid	Liquids (µg/L)	Solids (µg/kg)	Liquids (µg/L)	Solids (µg/kg)
Arochlor-1016	3510C/8082	3540C/8082	0.4	16.667	0.0100	0.833
Arochlor-1221	3510C/8082	3540C/8082	0.4	16.667	0.0100	0.833
Arochlor-1232	3510C/8082	3540C/8082	0.4	16.667	0.0100	0.833
Arochlor-1242	3510C/8082	3540C/8082	0.4	16.667	0.0100	0.833
Arochlor-1248	3510C/8082	3540C/8082	0.4	16.667	0.0100	0.833
Arochlor-1254	3510C/8082	3540C/8082	0.4	16.667	0.0100	0.833
Arochlor-1260	3510C/8082	3540C/8082	0.4	16.667	0.0100	0.833

Table 3-6
Project Reporting Levels for Metals (ICP/MS)

Compound	Analytical Method		Project Reporting Levels	
	Liquid	Solid	Liquids (µg/L)	Solids (mg/kg)
Antimony	SW-846 6020	SW-846 6020	2	0.2
Arsenic	SW-846 6020	SW-846 6020	1	0.1
Barium	SW-846 6020	SW-846 6020	10	1
Beryllium	SW-846 6020	SW-846 6020	1	0.1
Cadmium	SW-846 6020	SW-846 6020	1	0.1
Chromium, total	SW-846 6020	SW-846 6020	2	0.2
Chromium, hexavalent	SW-846- 7196A	SW-846- 7196A	10	0.4
Copper	SW-846 6020	SW-846 6020	2	0.2
Lead	SW-846 6020	SW-846 6020	1	0.1
Mercury	SW-846-7470A	SW-846-7471A	0.2	0.033
Nickel	SW-846 6020	SW-846 6020	1	0.1
Selenium	SW-846 6020	SW-846 6020	5	0.5
Silver	SW-846 6020	SW-846 6020	1	0.1
Thallium	SW-846 6020	SW-846 6020	1	0.1
Vanadium	SW-846 6020	SW-846 6020	1	0.1
Zinc	SW-846 6020	SW-846 6020	5	0.5
Cyanide, total	EPA 335.4	SW-846 9012A	10	0.5
Cyanide, free	SM 4500 CN I	NA	10	NA

Table 3-7.
Project Reporting Levels for Waste Characteristics and Miscellaneous Parameters

Parameters	Analytical Methods	Project Reporting Levels[a]
Volatile Organic Compounds (VOCs) (TCLP Analyte List)	**SW 846-1311 (zero headspace ext.) SW-846 5030/8260B[b]**	**Leachate (µg/L)[c]**
Vinyl chloride		200
1,1-Dichloroethene		100
Chloroform		100
1,2-Dichloroethane		100
2-Butanone (methyl ethyl ketone)		200
Carbon tetrachloride		100
Trichloroethene		100
Benzene		100
Tetrachloroethene		100
Chlorobenzene		100
Semi-volatile Organic Compounds (SVOCs) (TCLP Analyte List)	**SW-846 1311 (extraction) SW-846 3510C/8270C[b]**	**Leachate (µg/L)[c]**
1,4-Dichlorobenzene		200
2-Methylphenol (o-cresol)		200
3-Methylphenol (m-cresol)		200
4-Methylphenol (p-cresol)		200
Hexachloroethane		200
Nitrobenzene		200
Hexachlorobutadiene		200
2,4,6-Trichlorophenol		200
2,4,5-Trichlorophenol		200
2,4-Dinitrotoluene		200
Hexachlorobenzene		200
Pentachlorophenol		1000
Pyridine		200

Parameters	Analytical Methods	Project Reporting Levels[a]
Pesticides **(TCLP Analyte List)**	**SW-846 1311 (extraction) SW-846 3520/8081[b]**	**Leachate (µg/L)**
gamma-BHC (Lindane)		1.0
Heptachlor		1.0
Heptachlor epoxide		1.0
Endrin		1.0
Methoxychlor		2.0
Chlordane (technical)		10
Toxaphene		40
Herbicide Compounds (TCLP Analyte List)	**SW-846 1311 (extraction) SW-846 8151A[b]**	**Leachate (µg/L)**
2,4-D		80
2,4,5-TP (silvex)		20
Metals (TCLP Analyte List)	**SW-846 1311 (extraction) 3010A/6020**	**Leachate (µg/L)**
Arsenic		20
Barium		200
Cadmium		20
Chromium		40
Lead		20
Mercury (CVAA)	SW-846 7470[b]	4
Selenium		100
Silver		20
Miscellaneous		
Cyanide, total	SW-846 9012A	0.5 mg/kg
Total Suspended Solids	EPA 160.2	4 mg/L
Total Petroleum Hydrocarbons	EPA 418.1	1 mg/kg
Total Organic Carbon	EPA 415.1	1 mg/L
Waste Characteristics		
pH	SW-846 9045[b]	NA
Cyanide Reactivity	SW-846 Chapter 7[b]	40 mg/kg
Sulfide Reactivity	SW-846 Chapter 7[b]	40 mg/kg
Ignitability	SW-846 1010[b]	NA

a These are expected quantitation limits based on reagent grade water or a purified solid matrix. Actual quantitation limits may be higher depending upon the nature of the sample matrix. The limit reported on final laboratory reports will take into account the actual sample volume or weight, percent solids (where applicable), and the dilution factor, if any. The quantitation limits for additional analytes to this list may vary, depending upon the results of laboratory studies.

b *Test Methods for Evaluating Solid Waste*, U.S. EPA, SW-846 Third Edition.

c Reporting Levels are set below regulatory levels at those normally provided by the assigned project laboratory.

d American Society for Testing and Materials, ASTM Standards, Vol. 04.08, Soil and Rock, 1995 and Vol. 11.04, Water and Environmental Technology, 1993.

TO-15 MDL Summary

Table 3-8
Project Reporting Levels for Soil Gas Sample Analysis

Volatile Organic Compounds in Air	TEST METHOD	PREP METHOD	MDL (ppbv)	RL (ppbv)
1,1,1-Trichloroethane	TO15	TO15 (6L)	0.058	0.20
1,1,1-Trichloroethane	TO15	TO15 (6L)	0.058	0.91
1,1,2,2-Tetrachloroethane	TO15	TO15 (6L)	0.071	0.20
1,1,2-Trichloroethane	TO15	TO15 (6L)	0.061	0.20
1,1-Dichloroethane	TO15	TO15 (6L)	0.054	0.20
1,2,4-Trichlorobenzene	TO15	TO15 (6L)	0.11	0.50
1,2,4-Trimethylbenzene	TO15	TO15 (6L)	0.046	0.20
1,2-Dibromoethane	TO15	TO15 (6L)	0.060	0.20
1,2-Dichlorobenzene	TO15	TO15 (6L)	0.064	0.20
1,2-Dichloroethane	TO15	TO15 (6L)	0.073	0.20
1,2-Dichloroethene (total)	TO15	TO15 (6L)	0.088	0.20
1,2-Dichloropropane	TO15	TO15 (6L)	0.080	0.20
1,2-Dichlorotetrafluoroethane	TO15	TO15 (6L)	0.046	0.20
1,3,5-Trimethylbenzene	TO15	TO15 (6L)	0.10	0.20
1,3-Butadiene	TO15	TO15 (6L)	0.17	0.50
1,3-Dichlorobenzene	TO15	TO15 (6L)	0.063	0.20
1,4-Dichlorobenzene	TO15	TO15 (6L)	0.080	0.20
1,4-Dioxane	TO15	TO15 (6L)	2.0	5.0
2,2,4-Trimethylpentane	TO15	TO15 (6L)	0.038	0.20
2-Chlorotoluene	TO15	TO15 (6L)	0.070	0.20
3-Chloropropene	TO15	TO15 (6L)	0.19	0.50
4-Ethyltoluene	TO15	TO15 (6L)	0.042	0.20
Acetone	TO15	TO15 (6L)	0.22	5.0
Benzene	TO15	TO15 (6L)	0.076	0.20
Bromodichloromethane	TO15	TO15 (6L)	0.066	0.20
Bromoethene	TO15	TO15 (6L)	0.055	0.20
Bromoform	TO15	TO15 (6L)	0.078	0.20
Bromomethane	TO15	TO15 (6L)	0.085	0.20
Carbon Disulfide	TO15	TO15 (6L)	0.070	0.50
Carbon Tetrachloride	TO15	TO15 (6L)	0.064	0.20
Chlorobenzene	TO15	TO15 (6L)	0.060	0.20
Chloroethane	TO15	TO15 (6L)	0.11	0.50
Chloroform	TO15	TO15 (6L)	0.031	0.20
Chloromethane	TO15	TO15 (6L)	0.18	0.20
cis, 1,3-Dichlororpropene	TO15	TO15 (6L)	0.087	0.20
cis-1,2-Dichloroethene	TO15	TO15 (6L)	0.083	0.20
Cyclohexane	TO15	TO15 (6L)	0.047	0.20
Dibromochloromethane	TO15	TO15 (6L)	0.057	0.20
Dichlorodifluoromethane	TO15	TO15 (6L)	0.047	0.50
Ethylbenzene	TO15	TO15 (6L)	0.091	0.20
Freon TF	TO15	TO15 (6L)	0.076	0.20
Hexachlorobutadiene	TO15	TO15 (6L)	0.060	0.20
Isopropyl Alcohol	TO15	TO15 (6L)	0.16	5.0
Methy tert-Butyl Ether	TO15	TO15 (6L)	0.097	0.50
Methyl Buytl Ketone	TO15	TO15 (6L)	0.082	0.50
Methyl Ethyl Ketone	TO15	TO15 (6L)	0.23	0.50
Methyl Isobutyl Ketone	TO15	TO15 (6L)	0.078	0.50
Methyl Methacrylate	TO15	TO15 (6L)	0.053	0.50
Methylene Chloride	TO15	TO15 (6L)	0.22	0.50
Naphthalene	TO15	TO15 (6L)	0.21	0.50
n-Heptane	TO15	TO15 (6L)	0.11	0.20
n-Hexane	TO15	TO15 (6L)	0.20	0.50
Styrene	TO15	TO15 (6L)	0.11	0.20
tert-Butyl Alcohol	TO15	TO15 (6L)	0.080	5.0
Tetrachloroethene	TO15	TO15 (6L)	0.096	0.20
Tetrahydrofuran	TO15	TO15 (6L)	0.095	5.0
Toluene	TO15	TO15 (6L)	0.076	0.20
trans, 1,3-Dichloropropene	TO15	TO15 (6L)	0.087	0.20
trans-1,2-Dichlroroethene	TO15	TO15 (6L)	0.072	0.20
Trichloroethene	TO15	TO15 (6L)	0.069	0.20
Trichlorofluoromethane	TO15	TO15 (6L)	0.041	0.20
Vinyl Chloride	TO15	TO15 (6L)	0.059	0.20
Xylene (m, p)	TO15	TO15 (6L)	0.19	0.50
Xylene (o)	TO15	TO15 (6L)	0.059	0.20

MDL= method detection limit

RL= reporting limit

ppbv= parts per billion by volume

The level of QC effort for testing and analysis of parameters will conform to accepted methods, such as EPA SW-846 protocols (EPA, 1993b), American Society for Testing and Materials (ASTM) protocols, and National Institute for Occupational Safety and Health (NIOSH) protocols. The QC effort for in-field measurements—including temperature, conductivity, pH, and organic vapor concentrations—will include daily calibration of instruments using traceable standards and documented instrument manufacturer procedures. Field instruments and their method of calibration are discussed further in Section 8.0 of this QAPP.

3.2.2 Accuracy, Precision, and Sensitivity

The fundamental QA objectives for accuracy, precision, and sensitivity of laboratory analytical data are the QC acceptance criteria of the analytical protocols. The accuracy and precision required for the specified analytical parameters are incorporated in Tables 3-1 and 3-2 and are consistent with SW-846 analytical protocols and USACE *Shell* requirements. The sensitivities required for the analyses are identified in Tables 3-3 through 3-8.

Accuracy and precision goals for field measurements of pH, conductivity, temperature, turbidity, and organic vapor concentration are listed in Table 3-2.

Analytical accuracy is expressed as the percent recovery of an analyte that has been added to a blank sample or environmental sample at a known concentration before analysis. Accuracy will be determined in the laboratory through the use of MS analyses and laboratory control sample (LCS) analyses. The percent recoveries for specific target analytes will be calculated and used as an indication of the accuracy of the analyses performed.

Precision will be determined through the use of spike analyses conducted on duplicate pairs of environmental samples (MS/MSD) or comparison of positive duplicate pair responses. The relative percent difference (RPD) between the two results will be calculated and used as an indication of the precision of the analyses performed.

Sample collection precision will be measured in the laboratory by the analyses of field duplicates. Precision will be reported as the RPD for two measurements.

3.2.3 Completeness, Representativeness, and Comparability

Completeness is a measure of the amount of valid data obtained from a measurement system compared to the amount expected to be obtained under normal conditions. It is expected that laboratories will provide data meeting QC acceptance criteria for all samples tested. Overall project completeness goals are identified in Tables 3-1 and 3-2.

Representativeness expresses the degree to which data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition. Representativeness is a qualitative parameter that depends upon the proper design of the sampling program and proper laboratory protocol. The sampling plan was designed to provide data representative of site conditions. During development of this plan, consideration was given to site history, past site practices, existing analytical data, physical setting and processes, and constraints inherent to this investigation. The rationale of the sampling design is discussed in detail in site-specific work plans.

Representativeness will be satisfied by ensuring that the work plan is followed, proper sampling techniques are used, proper analytical procedures are followed, and holding times of the samples are not exceeded. Representativeness will be determined by assessing the combined aspects of the QA program, QC measures, and data evaluations.

Comparability expresses the confidence with which one data set can be compared with another. The extent to which existing and planned analytical data will be comparable depends upon the similarity of sampling and analytical methods. The procedures used to obtain the planned analytical data are expected to provide comparable data. These new analytical data, however, may not be directly comparable to existing data because of differences in procedures and QA objectives.

4.0 OVERVIEW OF SAMPLE COLLECTION AND DATA MANAGEMENT PROCEDURES

4.1 Sample Planning (for Project Managers or Field Sampling Managers)

- Identify the number of soil or water samples desired for the project.
- Refer to Section 5.0 of the QAPP (August 2009) to determine the number of blanks, duplicates, or MS/MSD samples needed (typically one field duplicate and 1 MS/MSD sample for every 20 field samples, and one aqueous VOC trip blank for each daily shipment of samples).
- Refer to Section 5.0 of the QAPP to determine the acceptable laboratory methods for each analysis and the corresponding reporting limits needed. The QAPP provides the reporting limits for the standard analyses run at Harley-Davidson. If the project objectives require different reporting limits, the laboratory and Harley-Davidson should be contacted for approval of special conditions.
- Send e-mail to the TestAmerica point of contact, Carrie Gamber [Carrie.Gamber@testamericainc.com] to request bottles, coolers, and preservatives for the project. Copy e-mail to SAIC QA Manager (*Rodney Myers*) and SAIC Sample Manager (*Emily Wade*). Identify the number of samples, matrix (soil or aqueous), analytical methods needed (or simply refer to the QAPP list), when the samples are going to be collected and shipped, if you have any holding time issues, or if you need Saturday receipt of samples. Have bottles shipped to the SAIC field sampling manager at the Harrisburg office address.

4.2 Internal Access Database System

SAIC has created an internal Access database system for handling fYNOP laboratory and field data. It has been created for the project in order to reduce human errors and to save time and increase data accuracy. This database is administered by SAIC's Data Manager (*Alan Miller*)

and the SAIC Database Administrator (Knut Torgerson). Some of the features of this database are highlighted below:

- Has the ability to create an electronic chain-of-custody. This is now the preferred way to create sample custody records for all sampling at the fYNOP site.
- Has the ability to create and print bottle labels for all samples. It pre-populates bottle labels for the correct number of bottles and the correct preservative based on the laboratory method selected for that media, which can reduce the number of sampling errors in the field.
- It can store and process all of the field data collected using the personal digital assistant (PDA). It can then print the field data onto formatted monitoring forms for use in reports or for quick data evaluations by managers.
- The electronic chain-of-custody can also be used to confirm the laboratory sample receipt request.

4.3 Preparation of Chain-of-Custody and Sample Labels

The user can decide between using the Access database to creating an electronic chain-of-custody ahead of time or decide to use the hard copy chain-of-custody (see Figure 6-1). The electronic chain-of-custody can save time in the field and reduce errors, since one will only need to insert sample times and depths in the field. The electronic chain-of-custody will have the correct laboratory address, contact names and telephone numbers, and correct laboratory methods included. Use the Harley-Davidson sample nomenclature system identified in Table 5-3 of the QAPP when naming samples, which takes the form of XX-AAAA-mm-NNN-nn-z. Pay particular attention to the correct nomenclature of QC samples (duplicates, blanks, etc). Note that the "z" category is sample type (0 through 5), with an added category of "T" for Toxicity Characteristic Leaching Procedure (TCLP) analysis of waste samples. The method of filling out hard copies of chain-of-custody records in the field and filling out the sample bottle labels can still be used if desired. If this is done, the hard copy of the chain-of-custody must be converted to an electronic chain-of-custody at a later time using the Data Manager *(Alan Miller)*.

4.4 Collection of Samples and Field Data *(*Field Sampling Managers and Crew*)*

- Record sampling information in the field logbook per guidance in Section 6.1 of the QAPP.
- Well purging parameters will be entered into a hand-held device (PDA) in the field, which can be downloaded into the Access database. Training must be conducted on the device prior to its use in the field.
- Sample locations and depths must be documented properly in the field. In many cases, the X-Y coordinates can be obtained using the hand-held global positioning system (GPS) device (MobileMapper®). MobileMapper® should only be used after you have had training on this device. Initial operating instructions for the MobileMapper® device are included in Figure 4-1.
- New well locations and reference elevations must be surveyed. Groundwater samples must include a depth-to-water reading. Soil sampling depths should include an upper and lower depth range (nearest foot), which then becomes part of the sample nomenclature. At a minimum, field notes should include a sketch and triangulation measurements from the sampling location to the nearest recognizable map points (corner of building, nearest well, etc.).
- Sample location information (GPS coordinates, hand measurements, or mapped locations) must be forwarded to the Data Manager *(Alan Miller)* after each sampling event in order to populate the database.

4.5 Submit Samples to Laboratory (Field Sampling Managers)

- Double check to make sure that all bottles are preserved properly, labeled properly, and that the number of containers listed on the electronic chain-of-custody is the same number of bottles provided in the container.
- Make sure that bottles are wrapped securely (bubble wrapping for glass jars) so that breakage does not occur during shipment.

Figure 4-1

How to Record a Point using the MobileMapper CE with ArcPad 7.1

Step 1

- Turn on MM (MobileMapper CE) let satellites connect.
- To see progress of satellite connection:
  - click Start > > > Programs > > > GPS Utilities > > > GPS Status

Step 2

- Once you have connected to the satellites open ArcPad
  - Click: > > > Start > > > Programs > > > ArcPad 7.1

Step 3

- Now open the Base Map.apm (Map containing layers to edit)
  - \SD Card\Base Map.apm

Step 4

- Once you have the map open you first need to make sure that the ArcPad Program is connected to the GPS unit. So select the  button. Then select the 

GPS Active button. You will see a red  on the middle of the screen. This means that the program is not connected to the GPS unit. Once the symbol changes to a red crosshair then you are connected.
- Next you will need to make sure that you are in the editing mode and are editing the proper layer (should be editing and recording with the Record_points.shp)
- Click the  button (this is the start editing and stop editing button). Select the Record_points.shp file.
- Now click on the  capture point/vertex button. This will initiate the process to collect a point.
- Next a widow will pop up that contains the interface to record the information about the point.
  - The three pieces of information are:
    - 1.) Date… date of survey
    - 2.) Crew_initi…. Personnel recording information initials only
    - 3.) Locatio_ID…. Location id ex. ELF-SB-101 (50 character limit_
- Once the record process reaches 100% (see top portion of window for count) and you collect attribute information; you need to tap the ok button at the lower left portion of the screen. Once you complete the point has been recorded.
- Now repeat step 4 for additional locations.

- Make sure that enough ice is used to keep the samples at 4-degrees Celsius during shipment. Bagged ice dispensers are available at several locations throughout the Harley-Davidson facility for use by SAIC.
- Make sure that a bag liner is used in the cooler and the outside drain valve is taped shut.
- Make sure that a copy of the chain-of-custody is placed inside a zip-lock bag and taped to the top of the **inside** of the cooler.
- Make sure that the cooler is securely taped shut (wraps at two locations) and that signed custody seals are placed at opposite corners across the taped joints.
- Cooler shipping arrangements can be made using the TestAmerica sample courier or by shipping overnight via FedEx. If using FedEx, try first to obtain a FedEx shipping number from TestAmerica before using an SAIC shipping number. Make sure that the FedEx label is properly filled out with the laboratory address and project number.

4.6 Turn in Chain-of-Custody Record and Sample Locations (Project Managers)

- Submit electronic chain-of-custody or paper copy of hand-written chain-of-custody to the SAIC Data Manager *(Alan Miller)*, and a copy to the SAIC Sample Manager (*Emily Wade*).
- Submit sample location information to the SAIC Data Manager *(Alan Miller)*. Provide real world coordinates (in PA State Plane NAD 83, South, in feet). In lieu of coordinates, provide map or measurements for location of sample points.

4.7 Verify the Analytical Testing Requested with the Laboratory (Sample Manager)

- The Analytical Laboratory point of contact (*Carrie Gamber of TestAmerica*) will send an e-mail to the SAIC Sample Manager (*Emily Wade*) to verify whether the requested analysis and samples are correct (sample confirmation).
- The SAIC Sample Manager will compare the information on the sample confirmation e-mail with the electronic chain-of-custody to determine if the laboratory is conducting

the correct analysis. The SAIC Sample Manager may need to confirm any discrepancies with the Field Manager or the Project Manager before replying to the laboratory.

- The SAIC Sample Manager will reply to the laboratory point of contact to confirm the requested analytical work or make corrections to sample nomenclature or analytical requirements as necessary. The SAIC Sample Manager will copy the Field Manager or Project Manager with this e-mail confirmation.

4.8 Data Manager Forwards Electronic Chain-of-Custody to the Database Administrator to include in Database *(*Alan Miller forwards to Knut Torgerson in Reston*)*

4.9 Receipt of Data Package from Laboratory (Project Managers)

Upon completion of the analytical work, data packages from the laboratory should include a hard copy of the data and a disc which contains a .pdf of the entire data package, along with an electronic data deliverable (EDD) file (in .csv format). Forward entire data package to the SAIC Sample Manager (*Emily Wade*) for invoice checking, processing, and filing. The SAIC Sample Manager forwards EDD file and .pdf copy to the SAIC Data Manager *(Alan Miller)*. If data validation is to be performed, SAIC Sample Manager will forward hard copies of the report to the SAIC Data Validator *(Roger Myers)*.

4.10 Data are Placed on the Harrisburg Server by the Data Manager (Alan Miller)

The SAIC Data Manager *(Alan Miller)* puts a copy of the EDD and .pdf report on the Harrisburg server at H:\Jobs\Harley\Laboratory Electronic Reports. The data on the Harrisburg server are sorted by laboratory ID, sample matrix, date submitted, and by Sample Delivery Group (SDG) number. The SAIC Data Manager then reviews the EDD and checks data for formatting mistakes. The SAIC Data Manager forwards the EDD data electronically to the SAIC Database Administrator *(Knut Torgerson)* in Reston, Virginia.

4.11 Database Administrator (Knut Torgerson) Cross Checks Data with the Electronic Chain-of-Custody

4.12 Database Administrator (Knut Torgerson) Enters Data into ArcIMS Database System

The SAIC Database Administrator places the data into the web-based database called former York Naval Ordnance Plant (fYNOP) for viewing, or querying. To access this data, use the following web address: (https://www.fynop.com/login.aspx?ReturnUrl=%2fdefault.aspx)

4.13 Data Packages are Verified by the SAIC Data Validator (Roger Myers), as required

- The current QA procedures have SAIC verifying 10 percent of all of the data packages received from the laboratory. Representative data packages are selected from a data set for verification. In addition, all data are screened for holding time exceedances along with a review of all field blanks for blank contamination.
- The SAIC Sample Manager *(Emily Wade)* forwards a hard copy of data package to the SAIC Data Validator *(Roger Myers)* to conduct data validation per SAIC procedure TP DM 300-7 (see Appendix B).
- The SAIC Data Validator returns the completed validation summary and a list of data qualifiers to the SAIC Sample Manager for filing or inclusion in the report.
- The SAIC Data Validator or designee goes onto the fYNOP database to add qualifiers to the data package.

4.14 Data are Ready for Use

When tabulating data, use the preferred format and color scheme when comparing to existing standards (MSCs or RBCs). This color scheme is light turquoise for EPA RBC standards, light yellow for Direct Contact MSCs, and tan for Soil-to-Groundwater MSCs. Typically, only show detected VOC or SVOC compounds to limit table size. Show the detection limit (reporting limit) for all non-detects. Show any data validation qualifiers associated with the data.

5.0 SAMPLING LOCATIONS AND PROCEDURES

It is anticipated that investigations performed at the Harley-Davidson site will produce soil, soil gas, sediment, groundwater, and surface water and liquid/solid waste sample data of definitive quality and field measurements of screening quality. IDW samples may also be collected for analyses. Additional samples will be collected to complete field QC duplicate, field blank, and QA split sample analyses. Specific numbers of samples (including parameters and methods) are incorporated into the work plan(s). Investigation samples will require VOC, SVOC, PCBs, metal, and other general chemical determinations, as represented in Tables 3-1 through 3-8. Sampling procedures for the various media under investigation are discussed in the work plans, while relevant QA field sampling procedures for SAIC employees are included in Appendix A.

Identification of the primary field equipment and supporting materials to be used for these investigations is presented throughout the site-specific work plans. Several different types of field measurements will be performed during these investigations. Soil field measurements may determine soil classification and characteristics or volatile organic headspace gas concentrations (see FTP-750 in Appendix A). Groundwater field measurements may determine groundwater characteristics (pH, specific conductance, temperature, etc.) and static groundwater levels (see FTP-370 and 880 in Appendix A). A description of the field instruments and associated calibration requirements and performance checks to be used for field measurements is presented in Section 8.0 of this QAPP.

The locations of the sampling stations and sample media to be collected during these investigations, as well as the rationales for the selection of these stations, are presented in the area- or site-specific work plans.

5.1 General Information and Definitions

Contractor Laboratory

The laboratories subcontracted to perform analysis of samples have been selected through Harley-Davidson's procurement and review process prior to field mobilization.

QA and QC Samples

These samples are analyzed for the purpose of assessing the quality of the sampling effort and of the reported analytical data. QA and QC samples to be used for this project are duplicates, equipment rinsate blanks, trip blanks, and field blanks.

Field Duplicate QC Samples

These samples are collected by the sampling team for analysis by the contract laboratory. The identity of duplicate QC samples is held blind to the analysts, and the purpose of these samples is to provide site-specific, field-originated information regarding the homogeneity of the sampled matrix and the consistency of the sampling effort. These samples are collected concurrently with the primary environmental samples and equally represent the medium at a given time and location. Duplicate samples will be collected from each media addressed by a project and be submitted to the contractor laboratory for analysis.

Trip Blank Samples

These samples consist of containers of organic-free reagent water that are kept with the field sample containers from the time they leave the laboratory until the time they are returned for analysis. The purpose of trip blanks is to determine whether samples are being contaminated during transit or sample collection. For this project, one trip blank will be placed into each cooler used to store and ship water samples designated for volatile organic analysis.

Equipment Rinsate Blanks

These samples will be taken from the water rinsate collected from equipment decontamination activities (when applicable). They will comprise samples of analyte-free water which have been rinsed over decontaminated sampling equipment, collected, and submitted for analysis of the parameters of interest. They are employed to assess the effectiveness of the decontamination process, the potential for cross contamination between sampling locations, and incidental field contamination.

Field Blanks

When applicable, a sample from the site water supply used for equipment decontamination and other activities will be acquired and submitted for analysis with the primary samples. In addition, samples of on-site analyte-free water sources may also be submitted for analysis.

5.2 Sample Containers, Preservation Procedures, and Holding Times

Sample containers, sample preservation, and holding times for soils/solid samples and water samples collected during these investigations are described in Tables 5-1 and 5-2, respectively. The specific number of containers required for this study will be estimated and supplied by the analytical facilities. Additional sample volumes will be collected and provided, when necessary, for the express purpose of performing associated laboratory QC (laboratory duplicates, MS/MSD).

All sample containers will be provided by the analytical support laboratories, which will also provide the required types and volumes of preservatives with containers as they are delivered to the project. Temperature preservation will be maintained at 4 degrees Centigrade (°C) (±2°C) immediately after collection and will be maintained at this temperature until the samples are analyzed. In the event that sample integrity—such as holding times, cooler temperatures, etc.—is compromised, resampling will occur as directed by the SAIC Laboratory Coordinator. Any affected data will be flagged and qualified per data validation instructions and guidance.

Table 5-1. Container Requirements for Soil/Solid Samples and Soil Gas Samples

Analyte Group	Container	Minimum Sample Size	Preservative	Holding Time
Volatile Organic Compounds (VOC) for soil samples	4 – Encore™ sample containers with approx. 5 g of sample, and 1- 125 ml (4 oz) glass jar [for moisture determination]	5 g (Encore sampler)	Cool, 4°C	48 h for Encore™ samples
Volatile Organic compounds (VOC) for soil gas samples	Evacuated stainless steel SUMMA canister	6 Liters	None	7 d
Semi-volatile Organic Compounds	1 – 250 ml (8 oz) glass jar with Teflon®-lined cap	50 g	Cool, 4°C	14 d (extraction) 40 d (analysis)
Polychlorinated biphenyls (PCBs)	Use same container as SVOCs	50 g	Cool, 4°C	14 d (extraction) 40 d (analysis)
Metals and CN	1 – 250 ml (8 oz) wide mouth plastic or glass jar	200 g	Cool, 4°C	180 d
Mercury – SW-846 7471A	Use same container as Metals	25 g	Cool, 4°C	28 d
Hexavalent Chromium - SW-846 7196A	Use same container as Metals	20 g	Cool, 4°C	7 d
Full TCLP Analysis	1 – 32 oz glass jar with Teflon®-lined cap	500 g	Cool, 4°C	14 d (extraction)
Reactivity	Use same container as full TCLP	500 g	Cool, 4°C	14 d (extraction)
Ignitability	Use same container as full TCLP	500 g	Cool, 4°C	14 d (extraction)
Corrosivity (pH)	Use same container as full TCLP	500 g	Cool, 4°C	14 d (extraction)
TCLP – VOC	1 – 8 oz. glass jar, with a screw cap and a silicone rubber coated with Teflon® septa	6 oz.	Cool, 4°C	14 d (extraction)

Table 5-2. Container Requirements for Water Samples

Analyte Group	Container	Minimum Sample Size	Preservative	Holding Time
Volatile Organic Compounds	3 - 40 mL glass vials with Teflon®-lined septum (no headspace)	40 mL	1:1 HCL to pH <2 Cool, 4°C	14 d
Semi-volatile Organic Compounds	2 – L amber glass bottle with Teflon®-lined lid[a]	1000 mL	Cool, 4°C	7 d (extraction) 40 d (analysis)
Metals	1 - L glass or polybottle	500 mL, metals	HNO_3 to pH <2 Cool, 4°C	180 d
Mercury – SW-846 7470A	1 – 500 mL glass or polybottle	500 mL, metals	HNO_3 to pH <2 Cool, 4°C	28 d
Cyanide (total or free)	1 – L plastic or glass	500 mL	NaOH to pH >12, 0.6 gram ascorbic acid, Cool, 4°C	14 d
Hexavalent Chromium - SW-846 7196A	1- 250 mL high density polypropylene bottle or glass	150 mL[a]	Cool, 4°C	24 hr
TOC	200 mL glass bottle or 40 ml glass vials	100 mL	H_2SO_4 or HCl to pH <2 Cool, 4°C	28 d
pH	100 mL glass or polybottle	50 mL	None	Immediately in the field
TSS	500 mL – plastic or glass	250 mL	Cool, 4°C	7 d

[a] One investigative water sample in twenty will require an additional volume for the laboratory to perform appropriate laboratory QC analysis. [i.e., matrix spike/matrix spike duplicate (MS/MSD)].

5.3 Field Documentation

5.3.1 Field Logbooks

Sufficient information will be recorded in the logbooks to permit reconstruction of all field sampling and other activities conducted (see FTP-1215 in Appendix A). Information recorded on other project documents will not be repeated in the logbooks except in summary form where determined necessary. All field logbooks will be kept in the possession of field personnel responsible for completing the logbooks or in a secure place when not being used during fieldwork. Upon completion of the field activities, all logbooks will become part of the final project file.

5.3.2 Sample Numbering System

A unique sample numbering scheme will be used to identify each sample designated for laboratory analysis. The purpose of this numbering scheme is to provide a tracking system for the retrieval of analytical and field data on each sample. Sample identification numbers will be used on all sample labels or tags, field data sheets or logbooks, chain-of-custody records, and all other applicable documentation used during the project. A listing of all sample identification numbers will be maintained in the field logbook. The project database will be populated with sample numbers and information consistent with information found here and in the work plans.

The sample numbering scheme used for field samples will be employed for duplicate samples and other field QC such that they will not be readily discernible by the laboratory. A summary of the sample numbering scheme to be used for the project is presented in Table 5-3.

5.3.3 Documentation Procedures

Labels will be affixed to all sample containers during sampling activities. Information will be recorded on each sample container label at the time of sample collection. The information to be recorded on the labels will be as follows:

Table 5-3.
Sample Numbering Scheme

Sample Identification: XX-AAAA-mm-NNN-nn-z	
XX = Site Designator	Site designators used for the project will be as follows: Harley-Davidson Site =HD
AAAA= Area/Project Designator	An Area Designator will be used for a specific area investigation. Example project or area designators are as follows: Cyanide Spill (MW-2) Area = CSA Reforested Area = RA Site Perimeter Area = SPA Northeast Property Boundary Area = NPBA Former Lagoon Area = FLA Bunkers and Shell Ranges = B&SR North End Test Track = NETT Magnesium Burn Area = MGBA North Plant Area = NPA Old Waste Containment Area = OWCA Metal Chip Bin Area = MCBA South Property Boundary Area = SPBA West Parking Lot = WPL Burn Pile Area = BPA Eastern Landfill area = ELF Drum Storage Area = DSA Building 66 Chrome/Nickel/Zinc Plater = B66P North End of Building 4 – Former Northern Degreaser = B4ND North End of Building 4 – Former Southern Degreaser = B4SD North End of Building 4 – Former Methylene Chloride Area = B4MC North End of Building 4 – Wastewater Tanks = NB4W North End of Building 4 – Zinc Plater area = B4ZP Fire Water Pond area = FWP Building 2 Wastewater Sump Area = B2WW Building 2 Former Cutting Oil Tank Area = B2CO Building 2 Former Bomb Line Area Settling Tanks = B2BL Building 2 TCA Area = TCA Building 41 North Access Road = B41N Former Coal Storage Area (NW Bldg 10) = FCSA Building 67 Container Storage Area = B67C Building 41, IWTP = IWTP Building 40, Hazardous Waste Storage Area (Tank Farm) = B40T Building 16, Former Degreaser Area = B16D Building 57, Former Metals Fabrication = B57C Building 51, Former <90 day hazardous waste storage area = B51H

mm = Sample Station/Media Type	Examples Soil Boring = SB Surface Soil Sample = SS Sediment Sample = SD Test Pit = TP Monitoring Well = MW (or CW) Residential Well = RW Surface Water Sample = SW Spring = SP Soil Gas = SG Roll-off = RO Waste Characterization = WC Quality Control sample = QC
NNN = Sample Number	The Field Manager will maintain a listing of three digit station identifiers and correlate them to specific sampling/station locations.
nn/nn = Sample Interval in Feet Below Ground Surface (for soils), or Feet below measuring point (for water)	Examples Soil Sampling: 12/15= Top of interval is 12 feet and bottom of interval is 15 feet below ground surface. Water Sampling: 12/12= Pump depth/intake depth set at 12 feet below measuring point. 0/0 = indicates that intake depth is unknown. Roll Off or Soil Pile Sampling: 0/0.5 = surface soil sample taken from top 6 inches. X/X = depth for composite sampling.
z = Sample Type	Examples 0 = Primary Investigative Sample 1 = Field Duplicate Sample 2 = Trip Blank 3 = Equipment Rinsate 4 = Site Source Water Blank 5 = Investigation Derived Waste (IDW) (total analysis) 5T= Investigation Derived Waste (IDW) (TCLP analysis)

- Contractor name;
- Sample identification number;
- Sample type (discrete or composite);
- Site name and sample station number;
- Analysis to be performed;
- Type of chemical preservative present in container;
- Date and time of sample collection; and
- Sampler's name and initials.

Sample logbooks and chain-of-custody records will contain the same information as the labels affixed to the containers. These records will be maintained and record all information related to the sampling effort and the process employed (see FTP-625 and 650 in Appendix A).

5.3.4 Field Variance System

Procedures cannot fully encompass all conditions encountered during a field investigation. Variances from the operating procedures, field sampling plan, and/or safety and health plan may occur. All variances that occur during the field investigation will be documented on a field change request (FCR) form or a NCR and will be noted in the appropriate field logbooks. Examples of the FCR (Figure 5-1) and NCR (Figure 11-1) forms to be used for these investigations are presented in this QAPP. If a variance is anticipated (i.e., because of a change in the field instrumentation), the applicable procedure will be modified and the change noted in the field logbooks.

5.4 Decontamination of Sampling Equipment

Non-dedicated sampling equipment that comes into contact with contaminated soil, waste, or groundwater will require decontamination (see FTP-400 in Appendix A). Typically, disposable sampling equipment will be used, and decontamination will not be needed for many sampling activities.

Field Change Request (FCR)

FCR NO._____ DATE INITIATED_____

PROJECT_____

CONTRACT NO._____

REQUESTOR IDENTIFICATION

NAME_____ ORGANIZATION_____ PHONE_____

TITLE_____ SIGNATURE_____

BASELINE IDENTIFICATION

BASELINE(S) AFFECTED ○ Cost ○ Scope ○ Milestone ○ Method of Accomplishment
AFFECTED DOCUMENT (TITLE, NUMBER AND SECTION)_____
DESCRIPTION OF CHANGE:

JUSTIFICATION:

IMPACT OF NOT IMPLEMENTING REQUEST:

PARTICIPANTS AFFECTED BY IMPLEMENTING REQUEST:

COST ESTIMATE ($)_____ ESTIMATOR SIGNATURE_____

PHONE_____ DATE_____

PREVIOUS FCR AFFECTED ○ YES ○ NO; IF YES, FCR NO. _____

CLIENT PROJECT MANAGER _____ DATE_____

CLIENT QA SPECIALIST _____ DATE _____

SAIC H&S MANAGER SIGNATURE (IF APPLICABLE)_____ DATE _____

When sampling from test pits, the backhoe bucket will be decontaminated between test pits by physically removing all loose materials from the bucket. A more thorough decontamination with water will be conducted prior to demobilization and between locations, at the discretion of the Field Manager. Rinsate from the backhoe decontamination must be containerized and may be placed into roll-offs along with contaminated soil/solids.

Down-hole Geoprobe® tools will be decontaminated between boring locations. The non-disposable tools will be cleaned with a brush, water, detergent, and a final deionized water rinse. Water level indicators and non-dedicated or disposable groundwater sampling equipment will be decontaminated with deionized water between measurements/sampling locations. If possible, measurements and sampling should be conducted from wells which are least contaminated first, followed by those which have higher contaminant concentrations to avoid potential cross-contamination. Water from these decontamination efforts will be collected into a bucket or other suitable container and returned to the on-site groundwater treatment plant for treatment.

6.0 SAMPLE CUSTODY AND HOLDING TIMES

It is the policy and intent of this investigation procedure to follow EPA policy regarding sample custody and chain-of-custody protocols as described in *NEIC Policies and Procedures* (EPA, 1985). This custody is in three parts: sample collection, laboratory analysis, and final evidence files. Final evidence files, including originals of laboratory reports and electronic files, are maintained under document control in a secure area. A sample or evidence file is under your custody when it is:

- In your possession;
- In your view, after being in your possession;
- In your possession and you place them in a secured location; or
- In a designated secure area.

6.1 Sample Documentation

The sample packaging and shipment procedures summarized below will ensure that samples will arrive at the laboratory with the chain-of-custody intact. The protocol for specific sample numbering using case numbers and traffic report numbers (if applicable) and other sample designations will be followed.

6.1.1 Field Procedures

The field sampler is responsible for the care and custody of the samples until they are transferred or properly dispatched. As few people as possible should handle the samples. Each sample container will be labeled with a sample number, date and time of collection, sampler, and sampling location. Sample labels are to be completed for each sample. The Project Manager, in conjunction with the QA Manager, will review all field activities to determine whether proper custody procedures were followed during the fieldwork and to decide if additional samples are required.

6.1.2 Field Logbooks/Documentation

Samples will be collected following the sampling procedures documented in the work plan. When a sample is collected or a measurement is made, a detailed description of the location shall be recorded. The equipment used to collect samples will be noted, along with the time of sampling, sample description, depth at which the sample was collected, volume, and number of containers. A sample identification number will be assigned before sample collection. Field duplicate samples and QA split samples, which will receive an entirely separate sample identification number, will be noted under sample description. Equipment employed to make field measurements will be identified, along with their calibration dates.

6.1.3 Transfer of Custody and Shipment Procedures

Samples are accompanied by a properly completed chain-of-custody form. The sample numbers and locations will be listed on the chain-of-custody form. When transferring the possession of samples, the individuals relinquishing and receiving will sign, date, and note the time on the record in accordance with FTP-625 in Appendix A. This record will document transfer of custody of samples from the sampler to another person, to a mobile laboratory, to the permanent laboratory, or to/from a secure storage area. An example of the chain-of-custody form to be used for these investigations is illustrated on Figure 6-1.

All shipments will be accompanied by the chain-of-custody record identifying the contents. The original record will accompany the shipment, and copies will be retained by the sampler for return to project management and the project file.

All shipments will be made through FedEx, in compliance with applicable U.S. Department of Transportation (DOT) regulations for environmental samples. The Field Manager and Laboratory Coordinator will discourage the shipping of samples on Fridays unless it is absolutely necessary, and the laboratory has assured the project that personnel will be present on Saturdays to receive and effect any necessary processing within the analytical holding times.

Chain of Custody Record

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

TAL-4142 (0907)

Client	Project Manager	Date	Chain of Custody Number 364410
Address	Telephone Number (Area Code)/Fax Number	Lab Number	Page ____ of ____

City	State	Zip Code	Site Contact	Lab Contact	Analysis (Attach list if more space is needed)
Project Name and Location (State)			Carrier/Waybill Number		
Contract/Purchase Order/Quote No.					

Sample I.D. No. and Description (Containers for each sample may be combined on one line)	Date	Time	Matrix: Air	Aqueous	Sed.	Soil		Containers & Preservatives: Unpres.	H2SO4	HNO3	HCl	NaOH	ZnAc/NaOH														Special Instructions/ Conditions of Receipt

Possible Hazard Identification
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

Sample Disposal
☐ Return To Client ☐ Disposal By Lab ☐ Archive For ______ Months (A fee may be assessed if samples are retained longer than 1 month)

Turn Around Time Required
☐ 24 Hours ☐ 48 Hours ☐ 7 Days ☐ 14 Days ☐ 21 Days ☐ Other ______

QC Requirements (Specify)

1. Relinquished By	Date	Time	1. Received By	Date	Time
2. Relinquished By	Date	Time	2. Received By	Date	Time
3. Relinquished By	Date	Time	3. Received By	Date	Time

Comments

DISTRIBUTION: WHITE - Returned to Client with Report; CANARY - Stays with the Sample; PINK - Field Copy

6.2 Laboratory Chain-of-Custody Procedures

Laboratory custody procedures will be described in the subcontract laboratory QA Plan (see Appendix B). This document identifies the laboratory custody procedures for sample receipt and log-in, sample storage, tracking during sample preparation and analysis, and laboratory storage of data.

6.3 Final Evidence Files Custody Procedures

The Project Manager is the custodian of the evidence file and will maintain the contents of evidence files for this investigation, including all relevant records, reports, logs, field notebooks, pictures, subcontractor reports, correspondence, laboratory logbooks, and chain-of-custody forms. The evidence file will be stored in a secure, limited-access area and under custody of the Field Manager during the field sampling effort.

Analytical laboratories will retain all original raw data information (both hard copy and electronic) in a secure, limited-access area and under custody of the Laboratory Project Manager.

7.0 ANALYTICAL PROCEDURES

All samples collected during the investigation activities will be analyzed by laboratories with current certifications by the Commonwealth of Pennsylvania.

7.1 Laboratory Analysis

Samples collected during the project will be analyzed by EPA SW-846 methods and other documented EPA or nationally recognized methods. Laboratory standard operating procedures (SOPs) are based on the methods as published by the EPA in *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods SW846*, Third Edition (November 1986; Revision 1, July 1992; Revision 2, November 1992; and Updates 1, 2, and 3). Analytical parameters, methods, and project reporting levels are listed in Tables 3-3 through 3-8.

The principal laboratory facility (TestAmerica-Pittsburgh) will not subcontract or transfer any portion of this work to another facility, unless expressly permitted to do so in writing by the Project Manager and Laboratory Coordinator.

If contaminant concentrations are high, or for matrices other than normal waters and soils, analytical protocols may be inadequate. In these cases, sample analysis may require modifications to defined methodology. All analytical method variations will be identified in investigation-specific addenda. These may be submitted for regulatory review and approval when directed by the laboratory coordinator.

These SOPs must be adapted from and reference standard EPA SW-846 methods or appropriate national standard and thereby specify:

- Procedures for sample preparation;
- Instrument start-up and performance check;
- Procedures to establish the actual and required detection limits for each parameter;

- Initial and continuing calibration check requirements;
- Specific methods for each sample matrix type; and
- Required analyses and QC requirements.

7.2 Field Screening Analytical Protocols

Procedures for field measurement of pH, specific conductivity, temperature, photoionization detector (PID), and combustible gas monitoring are described in Section 8.0 of this QAPP and included in Appendix A. Tabulation of the methodologies appears in Tables 3-1 and 3-2.

8.0 CALIBRATION PROCEDURES AND FREQUENCY

This section describes procedures for maintaining the accuracy of all the instruments and measuring equipment that are used for conducting field tests and laboratory analyses. These instruments and equipment shall be calibrated before each use or on a scheduled, periodic basis according to manufacturer instructions.

8.1 Field Instruments/Equipment

Instruments and equipment used to gather, generate, or measure environmental data will be calibrated with sufficient frequency and in such a manner that accuracy and reproducibility of results are consistent with the manufacturers' specifications. All field instruments for this purpose will have unique identifiers, and each instrument will be logged in the Measuring and Testing Equipment (M&TE) Logbook before use in the field. The site safety and health officer (SSHO) or his/her designate will be responsible for performing and documenting daily calibration/checkout records for instruments used in the field.

Equipment to be used during the field sampling will be examined to certify that it is in operating condition. This will include checking the manufacturers' operating manual and instructions for each instrument to ensure that all maintenance requirements are being observed. Field notes from previous sampling trips will be reviewed so that the notation on any prior equipment problems will not be overlooked, and all necessary repairs to equipment will be carried out. Spare parts or duplication of equipment will be available to the sampling effort.

Calibration of field instruments is governed by the specific SOP for the applicable field analysis method, and it will be performed at the intervals specified in the SOP. If no SOP is available, calibration of field instruments will be performed at intervals specified by the manufacturer or more frequently, as conditions dictate. Calibration procedures and frequency will be recorded in a field logbook.

Field instruments may include a pH meter, temperature probe, combustible gas monitor, particulate aerosol monitor, specific conductivity meter, and PID for organic vapor detection. If an internally calibrated field instrument fails to meet calibration/checkout procedures, it will be returned to the manufacturer for service, and a backup instrument will be calibrated and used in its place. Field instrument uses, detection levels, and calibration are summarized in Table 8-1.

Detailed instructions on the proper calibration and use of each field instrument follow the guidelines established by the manufacturer. The technical procedures for each instrument used on this project include the manufacturer's instructions detailing the proper use and calibration of each instrument.

8.1.1 pH Meter Calibration

The pH meter will be calibrated according to the manufacturer's instructions using traceable standard buffer solutions before work in the field commences. Calibration will consider the following: that the temperature of sample and buffer solutions is equivalent; that at least two buffer solutions are utilized to calibrate the instrument; that readings are allowed to stabilize for a consistent period of time; that the electrode is properly rinsed between readings; and that the pH meter is recalibrated every time it is turned off and turned back on, or if it starts giving erratic results.

Before use in the field, calibration of the pH meter will be checked against two standard buffer solutions. Calibration procedures, lot numbers of buffer solutions, and other pertinent calibration or checkout information will be recorded in the M&TE Logbook for the project. The calibrations performed, standard used, and sample pH values are to be recorded in the field notebook. Appropriate new batteries will be purchased and kept with the meters to facilitate immediate replacement in the field, as necessary.

Table 8-1.
Field Instrument Uses, Detection Limits, and Calibration

Instrument	Uses	Detection Limits	Calibration	Comments
Total Organic Vapor Meters	Sample screening for VOCs	PID - 0.2 ppm isobutylene	1 point – PID isobutylene daily	Action level must be stated in Health and Safety Plan
	Health and safety screening	FID - 1.0 ppm methane	1 point – FID methane daily	Instrument cannot differentiate naturally occurring compounds from contaminants
			Verification check every 20 samples	PID cannot detect compounds with ionization potentials > 11 eV
MiniRam	Aerosol and airborne particulate monitoring	0.05 – 99 mg/m^3	Set by manufacturer	None.
Horiba U22 or Specific pH Meters	Field screening of waters	N/A	2 point with standards at pH 7.0 and 4.0 or pH 7.0 and 10.0 daily	Accuracy is to +/- 0.5 pH units
Combustible Gas Meter (CGM)	Monitoring combustible compounds level in air	Varies by instrument	To manufacturer instructions	None.
Horiba U22 or Temperature Meter	Determining water temperature	N/A	To manufacturer instructions	None.
Horiba U22 or Conductivity Meter	Determining conductivity of water	N/A	1 point in KCL solution	Calculations and acceptance criteria must be available in the field

PID = photoionization detector
FID = flame ionization detector
N/A = not applicable

8.1.2 Temperature Calibration

Temperature measurements are carried out using a temperature probe. Mercury thermometers must be inspected before use to ensure that there is no mercury separation. Thermometers should be rechecked in the field before and after each use to see if the readings are logical and the mercury is still intact. All temperature probes should be checked biannually for calibration by immersing them in a bath of known temperature until equilibrium is reached. Temperature probes should be replaced if found to have more than 10 percent error. The reference thermometer used for bath calibration should be National Institute of Standards and Testing (NIST) traceable. Temperatures will be recorded in the M&TE Logbook, the Sample Logbook, or the Cooler Logbook, as appropriate.

8.1.3 Conductivity Meter Calibration

The conductivity cells of the specific conductivity meter will be cleaned according to manufacturer's recommendations and specifications and calibrated against known conductivity standard solutions before each sampling event. The instrument will be checked daily with NIST-traceable standard solutions. If the instrument is more than 10 percent out of calibration when compared with standard solutions, the instrument will be recalibrated. If this cannot be done in the field, the instrument will be returned to the manufacturer or supplier for recalibration, and a backup instrument will be used in its place. Daily calibration readings and other relevant information will be recorded daily in the M&TE Logbook.

Daily checks should be as follows:

- Fill a sample cup with the conductivity calibration standard solution.
- Set temperature knob for temperature of standard solution.
- Turn to appropriate scale and set the instrument for the value of calibration standard.
- Rinse out the cup with distilled water.

8.1.4 Organic Vapor Detector

Organic vapor detectors will be checked daily according to the manufacturer's instructions. PIDs will be calibrated daily with a gas of known concentration. All daily calibration information will be recorded in the M&TE Logbook.

8.1.5 Particulate Aerosol Monitor

Particulate (dust) aerosol monitors will be checked daily according to the manufacturer's instructions. Zeroing should be performed in a clean climate-controlled room or utilizing one of the accessories provided by the manufacturer. All other calibrations cannot be performed in the field and require factory modifications. All daily calibration information will be recorded in the M&TE Logbook.

8.1.6 Combustible Gas Monitor

The combustible gas monitor provides field readings on explosive gases in the atmosphere and the percent of oxygen in the atmosphere. Many different combinations of sensors are available. The unit should be intrinsically safe, have an audible alarm when dangerous conditions are encountered, and be capable of operating for a full work shift without recharging of the battery. Calibration of these units is usually performed at the factory.

8.2 Laboratory Instruments

Calibration of laboratory instruments will be based on approved written procedures as documented in the laboratory QA manual (see Appendix B for TestAmerica). Records of calibration, repairs, or replacement will be filed and maintained by laboratory personnel performing QC activities. These records will be filed at the location where the work is performed and will be subject to QA audit. Procedures and records of calibration will follow the laboratory-specific QA Plans.

In all cases where analyses are conducted according to the SW-846 protocols, the calibration procedures and frequencies specified in the applicable methods will be followed. For analyses governed by SOPs, refer to the appropriate SOP for the required calibration procedures and frequencies. All analytical calibrations and method QC will be consistent with the TestAmerica Quality Assurance Manual, January 1, 2009 (see Appendix B).

Records of calibration will be kept as follows:

- Each instrument will have a record of calibration with an assigned record number.
- A label will be affixed to each instrument showing identification numbers, manufacturer, model numbers, date of last calibration, signature of calibrating analyst, and due date of next calibration. Reports and compensation or correction figures will be maintained with instrument.
- A written stepwise calibration procedure will be available for each piece of test and measurement equipment.
- Any instrument that is not calibrated to the manufacturer's original specification will display a warning tag to alert the analyst that the device should not be used.

9.0 INTERNAL QUALITY CONTROL CHECKS

9.1 Field Sample Collection

The assessment of field sampling precision and accuracy will be made by collecting field duplicates and trip blanks in accordance with the procedures described in the project work plan(s).

9.2 Field Measurement

QC procedures for most field measurements (pH, conductivity, temperature, headspace, etc.) are limited to checking the reproducibility of the measurement by obtaining multiple readings on a single sample or standard and by calibrating the instruments. Refer to Section 8.0 of this QAPP and Appendix A (FTP-750, 752, 880, 910, and 955) for more information regarding these measurements.

9.3 Laboratory Analysis

Analytical QC procedures for these investigations are specified in the individual method descriptions. These specifications include the types of QC checks normally required: method blanks, LCS, MS, MSD, calibration standards, internal standards, surrogate standards, tracer standards, calibration check standards, and laboratory duplicate analysis. Calibration compounds and concentrations to be used and the method of QC acceptance criteria for these parameters have been identified in the laboratory methods.

To ensure the production of analytical data of known and documented quality, laboratories associated with these investigations will implement all method QA and QC checks.

9.3.1 QA Program

All subcontracted analytical laboratories will have a written QA program that provides rules and guidelines to ensure the reliability and validity of work conducted at the laboratory (see Appendix B for QA program at TestAmerica). Compliance with the QA program is coordinated and monitored by the laboratory's QA department, which is independent of the operating departments. For these investigations, selected support laboratory QA plans will be referenced and implemented in their entirety.

The stated objectives of the laboratory QA program are to:

- Properly collect, preserve, and store all samples;
- Maintain adequate custody records from sample collection through reporting and archiving of results;
- Use properly trained analysts to analyze all samples by approved methods within holding times;
- Produce defensible data with associated documentation to show that each system was calibrated and operating within precision and accuracy control limits;
- Accurately calculate, check, report, and archive all data using the Laboratory Information Management System; and
- Document all the above activities so that all data can be independently validated.

All laboratory procedures are documented in writing as SOPs, which are edited and controlled by the QA department. Internal QC measures for analysis will be conducted with their SOPs and the individual method requirements specified.

9.3.2 QC Checks

Implementation of QC procedures during sample collection, analysis, and reporting ensures that the data obtained are consistent with their intended use. Both field QC and laboratory QC

checks are performed throughout the work effort to generate data confidence. Analytical QC measures are used to determine if the analytical process is in control, as well as to determine the sample matrix effects on the data being generated.

Specifications include the types of QC required (duplicates, sample spikes, surrogate spikes, reference samples, controls, blanks, etc.), the frequency for implementation of each QC measure, compounds to be used for sample spikes and surrogate spikes, and the acceptance criteria for this QC.

Laboratories will provide documentation in each data package that both initial and ongoing instrument and analytical QC functions have been met. Any nonconforming analysis will be reanalyzed by the laboratory, if sufficient sample volume is available. It is expected that sufficient sample volumes will be collected to provide for reanalyses, if required.

9.3.2.1 Analytical Process QC

9.3.2.1.1 Method Blanks

A method blank is a sample of a non-contaminated substance of the matrix of interest (usually distilled/deionized water or silica sand) that is then subjected to all of the sample preparation (digestion, distillation, extraction) and analytical methodology applied to the samples. The purpose of the method blank is to check for contamination from within the laboratory that might be introduced during sample preparation and analysis that would adversely affect analytical results. A method blank must be analyzed with each analytical sample batch.

Analytical sensitivity goals are identified in Tables 3-3 through 3-8 as project reporting levels. Method blank levels should be below these levels for all analytes; criteria are established at 2X these levels.

9.3.2.1.2 Laboratory Control Samples (LCS)

The LCS contains known concentrations of analytes representative of the contaminants to be determined and is carried through the entire preparation and analysis process. Commercially available LCSs or those from EPA may be used. LCS standards that are prepared in-house must be made from a source independent of that of the calibration standards. Each LCS analyte must be plotted on a control chart. The primary purpose of the LCS is to establish and monitor the laboratory's analytical process control. An LCS must be analyzed with each analytical sample batch.

9.3.2.2 Matrix and Sample-Specific QC

9.3.2.2.1 Laboratory Duplicates

Laboratory duplicates are separate aliquots of a single sample that are prepared and analyzed concurrently at the laboratory. This duplicate sample should not be a method blank, trip blank, or field blank. The primary purpose of the laboratory duplicate is to check the precision of the laboratory analyst, the sample preparation methodology, and the analytical methodology. If there are significant differences between the duplicates, the affected analytical results will be reexamined. One in 20 samples will be a laboratory duplicate, with fractions rounded to the next whole number.

9.3.2.2.2 Surrogate Spikes

A surrogate spike is prepared by adding a pure compound to a sample before extraction. The compound in the surrogate spike should be of a similar type to that being assayed in the sample. The purpose of a surrogate spike is to determine the efficiency of recovery of analytes in the sample preparation and analysis. The percent of recovery of the surrogate spike is then used to gauge the total accuracy of the analytical method for that sample.

9.3.2.2.3 Isotopic Tracers

An isotopic tracer is prepared by adding a unique isotope of the same or similar element to a sample before preparation and analysis. The purpose of this isotopic tracer is to determine the efficiency of recovery of the targeted isotope or isotopes in the sample preparation and analysis. The percent of recovery of the tracer is then used to gauge the total accuracy of the analytical method for that sample and to compensate for the quantification of the analyte of interest.

9.3.2.2.4 Matrix Spike (MS) and Matrix Spike Duplicates (MSD)

An MS is an aliquot of a sample spiked with known quantities of analytes and subjected to the entire analytical procedure. It is used to indicate the appropriateness of the method for the matrix by measuring recovery or accuracy. Accuracy is the nearness of a result or the mean of a set of results to the true or accepted value. An MSD is a second aliquot of the same sample with known quantities of compounds added. The purpose of the MSD, when compared to the MS, is to determine method precision. Precision is the measure of the reproducibility of a set of replicate results among themselves or the agreement among repeat observations made under the same conditions. MSs and MSDs are typically performed per 20 samples of similar matrix.

9.3.2.2.5 Method-Specific QC

The laboratory must follow specific quality processes as defined by the method. These will include measures such as calibration verification samples, instrument blank analysis, internal standards implementation, tracer analysis, method of standard additions utilization, serial dilution analysis, post-digestion spike analysis, chemical carrier evaluation, etc.

10.0 CALCULATION OF DATA QUALITY INDICATORS

10.1 Field Measurements Data

Field data will be assessed by the Field Manager. The Field Manager will review the field results for compliance with the established QC criteria that are specified in the QAPP and work plan(s). Accuracy of the field measurements will be assessed using daily instrument calibration, calibration check, and analysis of blanks. Precision will be assessed on the basis of reproducibility by multiple reading of a single sample.

Field data completeness will be calculated using Equations (1a) and (1b).

Sample Collection (1a):

$$\text{Completeness} = \frac{\text{Number of Sample Points Sampled}}{\text{Number of Sample Points Planned}} \times 100\% \quad \textbf{(1a)}$$

Field Measurements (1b):

$$\text{Completeness} = \frac{\text{Number of Valid Field Measurements Made}}{\text{Number of Field Measurements Planned}} \times 100\% \quad \textbf{(1b)}$$

10.2 Laboratory Data

Laboratory results will be assessed for compliance with required precision, accuracy, completeness, and sensitivity as follows.

10.2.1 Precision

The precision of the laboratory analytical process will be determined through evaluation of LCS analyses. The standard deviation of these measurements over time will provide confidence that implementation of the analytical protocols was consistent and acceptable. These measurements will establish the precision of the laboratory analytical process.

Investigative sample matrix precision will be assessed by comparing the analytical results between MS/MSD for organic analysis and laboratory duplicate analyses for inorganic analysis. The RPD will be calculated for each pair of duplicate analysis using Equation (2) and produce an absolute value for RPD. This precision measurement will include variables associated with the analytical process, influences related to sample matrix interferences, and sample heterogeneity.
Where:

$$RPD = \frac{S - D}{\frac{(S + D)}{2}} x\ 100, \qquad \textbf{(2)}$$

S = first sample value (original or MS value),
D = second sample value (duplicate or MSD value).

10.2.2 Accuracy

The accuracy of the laboratory analytical measurement process will be determined by comparing the percent recovery (%R) for the LCS versus its documented true value.

Investigative sample accuracy will be assessed for compliance with the established QC criteria that are described in Section 3.0 of this QAPP using the analytical results of method blanks, reagent/preparation blank, MS/MSD samples, field blank, and bottle blanks. The %R of MS samples will be calculated using Equation (3). This accuracy will include variables associated with the analytical process, influences related to sample matrix interferences, and sample heterogeneity.
Where:

$$\%R = \frac{A - B}{C} x\ 100, \qquad \textbf{(3)}$$

A = the analyte concentration determined experimentally from the spiked sample,
B = the background level determined by a separate analysis of the unspiked sample,
C = the amount of the spike added.

10.2.3 Completeness

Data completeness of laboratory analyses will be assessed for compliance with the amount of data required for decision making. The completeness is calculated using Equation (4).

$$\text{Completeness} = \frac{\text{Number of Valid Laboratory Measurements Made}}{\text{Number of Laboratory Measurements Planned}} \times 100\% \quad \textbf{(4)}$$

10.2.4 Sensitivity

Achieving method detection limits (MDLs) depends on sample preparation techniques, instrumental sensitivity, and matrix effects. Therefore, it is important to determine actual method detection limits through the procedures outlined in 40 *CFR* 136, Appendix C. MDLs should be established for each major matrix under investigation (i.e., water, soil) through multiple determinations, leading to a statistical evaluation of the MDL.

It is important to monitor instrument sensitivity through calibration blanks and low concentration standards to ensure consistent instrument performance. It is also critical to monitor the analytical method sensitivity through analysis of method blanks, calibration check samples, LCSs, etc.

10.3 Project Completeness

Project completeness will be determined by evaluating the planned versus actual data. Consideration will be given for project changes and alterations during implementation. All data not flagged as rejected by the review, verification, validation, or assessment processes will be considered valid. Overall, the project completeness will be assessed relative to media, analyte, and area of investigation. Completeness objectives are listed in Table 3-1 (solid) and Table 3-2 (liquid).

10.4 Representativeness/Comparability

Representativeness expresses the degree to which data accurately reflect the analyte or parameter of interest for the environmental media examined at the site. It is a qualitative term most concerned with the proper design of the sampling program. Factors that affect the representativeness of analytical data include appropriate sample population definitions, proper sample collection and preservation techniques, analytical holding times, use of standard analytical methods, and determination of matrix or analyte interferences. Sample collection, preservation, analytical holding time, analytical method application, and matrix interferences will be evaluated by reviewing project documentation and QC analyses.

Comparability, like representativeness, is a qualitative term relative to a project data set as an individual. These activities will employ narrowly defined sampling methodologies, site audits/surveillances, use of standard sampling devices, uniform training, documentation of sampling, standard analytical protocols/procedures, QC checks with standard control limits, and universally accepted data reporting units to ensure comparability to other data sets. Through proper implementation and documentation of these standard practices, the project will establish confidence that data will be comparable to other project and programmatic information.

Additional input to determine representativeness and comparability may be gained through statistical evaluation of data populations, chemical charge balances, compound evaluations, or dual measurement comparisons.

11.0 CORRECTIVE ACTIONS

Corrective actions may be required for two major types of problems: analytical/equipment problems and noncompliance with criteria. Analytical and equipment problems may occur during sampling, sample handling, sample preparation, laboratory instrumental analysis, and data review.

Noncompliance with specified criteria and analytical/equipment problems will be documented through a formal corrective action program at the time the problem is identified. The person identifying the problem is responsible for notifying the SAIC Project Manager. When the problem is analytical in nature, information on these problems will be promptly communicated to the SAIC Laboratory Coordinator. Implementation of corrective action will be confirmed in writing.

Any nonconformance with the established QC procedures in the work plan will be identified and corrected in accordance with the QAPP. The QA Manager or his/her designee will issue an NCR for each nonconforming condition, Figure 11-1.

Corrective actions will be implemented and documented in the field record book. No staff member will initiate corrective action without prior communication of findings through the proper channels. If corrective actions are deemed insufficient, work may be stopped through a stop-work order issued by the SAIC Project Manager and the Harley-Davidson FPC.

11.1 Sample Collection/Field Measurements

Technical staff and project personnel will be responsible for reporting all suspected technical and QA nonconformances or suspected deficiencies of any activity or issued document by reporting the situation to the QA Manager or his/her designee. The QA Manager will be responsible for assessing the suspected problems in consultation with the Field Manager to make a decision based on the potential for the situation to impact the quality of the data. When it is determined that the situation warrants a reportable nonconformance and corrective action, then an NCR will be initiated by the QA Manager.

NONCONFORMANCE REPORT

DATE OF NCR

NCR NUMBER

LOCATION OF NONCONFORMANCE

PAGE ____ OF ____

INITIATOR (NAME/ORGANIZATION/PHONE)

FOUND BY

DATE FOUND

RESPONSIBLE ORGANIZATION/INDIVIDUAL

PROGRAM

PROJECT

DESCRIPTION OF NONCONFORMANCE

CATEGORY: _____ _____ _____ _____ _____

A

INITIATOR _____ DATE _____

QA/QC OFFICER _____ DATE _____

CAR REQ'D YES ☐ NO ☐

DISPOSITION:

PROBABLE CAUSE:

ACTIONS TAKEN TO PREVENT RECURRENCE:

B

PROPOSED BY: _____ NAME _____ DATE

JUSTIFICATION FOR ACCEPTANCE

C

INITIATOR: _____ NAME _____ DATE

VERIFICATION OF DISPOSITION AND CLOSURE APPROVAL

REINSPECTION/RETEST REQUIRED YES ☐ NO ☐ IF YES; _____ DATE _____ RESULT

D

QUALITY ASSURANCE: _____ NAME _____ DATE

The QA Manager will be responsible for ensuring that corrective actions for nonconformances are initiated by:

- Evaluating all reported nonconformances;
- Controlling additional work on nonconforming items;
- Determining disposition or action to be taken;
- Maintaining a log of nonconformances;
- Reviewing NCRs and corrective actions taken; and
- Ensuring that NCRs are included in the final site documentation project files.

If appropriate, the QA Manager will ensure that no additional work dependent on the nonconforming activity is performed until the corrective actions are completed.

Corrective action for field measurements may include:

- Repeating the measurement to check the error;
- Checking for all proper adjustments for ambient conditions such as temperature;
- Checking the batteries;
- Recalibrating equipment;
- Checking the calibration;
- Modifying the analytical method including documentation and notification (i.e., standard additions);
- Replacing the instrument or measurement devices; and
- Stopping work (if necessary).

The Field Manager or his/her designee is responsible for all site activities. In this role, he/she may at times be required to adjust the site activities to accommodate site-specific needs. When it becomes necessary to modify a program, the responsible person notifies the Project Manager of the anticipated change and implements the necessary changes after obtaining the approval of the SAIC Project Manager. All changes in the program will be documented on the Field Change

Order (FCO) that will be signed by the initiators and the SAIC Project Manager. The FCO for each document will be numbered serially as required. The FCO shall be attached to the file copy of the affected document. The SAIC Project Manager must approve the change in writing or verbally before field implementation. If unacceptable, the action taken during the period of deviation will be evaluated in order to determine the significance of any departure from established program practices and action taken.

The Field Manager is responsible for the controlling, tracking, and implementation of the identified changes. Reports on all changes will be distributed to all affected parties. Harley-Davidson will be notified whenever program changes in the field are made.

11.2 Laboratory Analyses

Each project investigation laboratory QA plan provides systematic procedures to identify out-of-control situations and corrective actions. Corrective actions shall be implemented to resolve problems and restore malfunctioning analytical systems. Laboratory personnel have received QA training and are aware that corrective actions are necessary when:

- QC data are outside warning or control windows for precision and accuracy;
- Blanks contain target analytes above acceptable levels and must be investigated;
- Undesirable trends are detected in spike recoveries or RPD between duplicates;
- There are unusual changes in detection limits;
- Deficiencies are detected by internal audits, external audits, or from performance evaluation samples results; and
- Inquiries concerning data quality are received.

Corrective action procedures are often handled at the bench level by the analyst who reviews the preparation or extraction procedure for possible errors and checks the instrument calibration, spike and calibration mixes, instrument sensitivity, and so on. If the problem persists or cannot be identified, the matter is referred to the Laboratory Supervisor, Laboratory Manager, and/or

Laboratory QA Department for further investigation. Once resolved, full documentation of the corrective action procedure is filed with project records and the Laboratory QA Department, and the information is summarized within case narratives.

Corrective actions may include:

- Reanalyzing the samples, if holding time criteria permit;
- Evaluating blank contaminant sources, elimination of these sources, and reanalysis;
- Modifying the analytical method (i.e., standard additions) with appropriate notification and documentation;
- Resampling and analyzing;
- Evaluating and amending sampling procedures; or
- Accepting data and acknowledging the level of uncertainty.

If resampling is deemed necessary due to laboratory problems, the Project Manager will identify the necessary cost recovery approach to implement the additional sampling effort.

The following corrective action procedures will be required:

- Problems noted during sample receipt will be documented in the appropriate laboratory letter of receipt (LOR). The SAIC Project Manager will be contacted immediately to determine problem resolution. All corrective actions will be thoroughly documented.
- When sample extraction/digestion or analytical holding times are not within method required specifications, the SAIC Project Manager will be notified immediately to determine problem resolution. All corrective actions will be thoroughly documented.
- All initial and continuing calibration sequences that do not meet method requirements will result in a review of the calibration. When appropriate, reanalysis of the standards or reanalysis of the affected samples back to the previous acceptable calibration check is warranted.

- All appropriate measures will be taken to prepare and clean up samples in an attempt to achieve the practical quantitation limits as stated. When difficulties arise in achieving these limits, the laboratory will notify the SAIC Project Manager and the SAIC Laboratory Coordinator to determine problem resolution. All corrective actions will be thoroughly documented.
- Any dilutions impacting the practical quantitation limits will be documented in case narratives along with revised quantitation limits for those analytes affected. Analytes detected above the method detection limits, but below the practical quantitation limits, will be reported as estimated values.
- Failure of method-required QC to meet the requirements specified in this project QAPP shall result in review of all affected data. Resulting corrective actions may encompass those identified earlier. The SAIC Project Manager and Laboratory Manager will be notified as soon as possible to discuss possible corrective actions, particularly when unusual or difficult sample matrices are encountered.
- When calculation and reporting errors are noted within any given data package, reports will be reissued with applicable corrections. Case narratives will clearly state the reasons for reissuance of reports.

12.0 DATA REDUCTION, ASSESSMENT, AND REPORTING

12.1 Data Reduction

12.1.1 Field Measurements and Sample Collection

Raw data from field measurements and sample collection activities will be appropriately recorded in field logbooks. Data to be used in project reports will be reduced and summarized. The methods of data reduction will be documented.

The Field Manager or his/her designee is responsible for data review of all field-generated data. This includes verifying that all field descriptive data are recorded properly, that all field instrument calibration requirements have been met, that all field QC data have met frequency and criteria goals, and that field data are entered accurately in all logbooks and worksheets.

12.1.2 Laboratory Services

All samples collected for these investigations will be sent to qualified laboratories. Data reduction, evaluation, and reporting for samples analyzed by the laboratory will be performed according to specifications outlined in the laboratory's QA plan (see Appendix B). Laboratory reports will include documentation verifying analytical holding time compliance.

Laboratories will perform in-house analytical data reduction under the direction of the Laboratory QA Officer. The Laboratory QA Officer is responsible for assessing data quality and informing the SAIC Laboratory Coordinator and Project Manager of any data which are considered "unacceptable" or require caution on the part of the data user in terms of data reliability. Data will be reduced, evaluated, and reported as described in the laboratory QA plan. Data reduction, review, and reporting by the laboratory will be conducted as follows:

- Raw data are produced by the analyst who has primary responsibility for the correctness and completeness of the data. All data will be generated and reduced following the QAPP defined methods and implementing laboratory SOP protocols.
- Level 1 technical data review is completed relative to an established set of guidelines by a peer analyst. The review shall ensure the completeness and correctness of the data while assuring all method QC measures have been implemented and were within appropriate criteria.
- Level 2 technical review is completed by the Area Supervisor or Data Review Specialist. This review includes the data for attainment of QC criteria as outlined in the established methods and for overall reasonableness. The Level 2 review ensures that all calibration and QC data are in compliance by checking at least 10 percent of the data calculations. This review shall document that the data package is complete and ready for reporting and archival.
- Upon acceptance of the raw data by the Area Supervisor, the report is generated and sent to the Laboratory Project Manager for Level 3 administrative data review. This review will ensure consistency and compliance with all laboratory instructions, the laboratory QA plan, the project laboratory scope of work (SOW), and the project QAPP.
- The Laboratory Project Manager will complete a thorough review of all reports.
- Final reports will be generated and signed by the Laboratory Project Manager.
- Data will then be delivered to the project for data assessment.

The data review process will include identification of any out-of-control data points and data omissions, as well as interactions with the laboratory to correct data deficiencies. Decisions to repeat sample collection and analyses may be made by the SAIC Project Manager based on the extent of the deficiencies and their importance in the overall context of the project. The laboratory will provide flagged data to include items such as: 1) concentration below required detection limit; 2) estimated concentration due to poor spike recovery; and 3) concentration of chemical also found in laboratory blank.

The laboratory will prepare and retain full analytical and QC documentation for the project. Such retained documentation will be both hard (paper) copy and electronic storage media (i.e., magnetic tape) as dictated by the analytical methodologies employed. As needed, laboratories will supply hard copies and electronic copies of the retained information.

Laboratories will provide the following information to the project in each analytical data package submitted:

- Cover sheets listing the samples included in the report and narrative comments describing problems encountered in analysis;
- Tabulated results of inorganic, organic, and miscellaneous parameters identified and quantified;
- Analytical results for QC sample spikes, sample duplicates, initial and continuous calibration verifications of standards and blanks, standard procedural blanks, LCSs, and other deliverables as identified in Section 12.3; and
- Tabulation of instrument detection limits determined in pure water.

12.2 Data Quality Assessment

12.2.1 Data Assessment Approach

A systematic process for data verification and assessment will be performed to ensure that the precision and accuracy of the analytical data are adequate for their intended use. The greatest uncertainty in a measurement is often a result of the sampling process and inherent variability in the environmental media rather than the analytical measurement. Therefore, analytical data assessment will be performed only to the level necessary to minimize the potential of using false-positive or false-negative results in the decision-making process (i.e., to ensure accurate identification of detected versus non-detected compounds). This approach is consistent with the DQOs for the project, with the analytical methods, and for determining chains-of-custody and calculating risk.

Samples will be analyzed through implementation of “definitive” analytical methods. “Definitive

data" will be reported consistent with the deliverables identified in Section 12.3, Tables 12-1 and 12-2. This report content is consistent with what is understood as a comprehensive data deliverable (data forms including laboratory QC, calibration information, and raw data). This "definitive data" will then be evaluated through the review process presented in Section 12.2.2. DQOs identified in Section 3.0 and method-specified criteria will be reviewed. Complete analytical documentation will be retained by the subcontract laboratory.

Data assessment will be accomplished by comparing the contents of the data packages and QA/QC results to requirements contained in the requested analytical methods. The assessment support staff will be responsible for these activities. It will be the practice of SAIC to conduct data verification on 10 percent of the data packages received from the laboratory using knowledgeable assessment support staff. In addition, the SAIC assessment support staff will review all of the laboratory data for holding times and for field blank contamination.

Assessment support staff will conduct a systematic review of 10 percent of the data for compliance with the established QC criteria in accordance with procedures TP DM 300-6 and 300-7 (in Appendix A) and based on the following categories:

- Holding times;
- Blanks;
- LCSs;
- Surrogate recovery (organic methods);
- Internal standards (primarily organic methods);
- Inductively coupled plasma (ICP) or atomic absorption QC;
- Calibration;
- Sample reanalysis;
- Secondary dilutions; and
- Laboratory case narrative.

Consistent with the data quality requirements as defined in the DQOs, all project data and associated QC will be evaluated on these categories and qualified as per the outcome of the review.

Table 12-1. Standard Data Deliverables (Hard Copy)

Method Requirements	Deliverables
Requirements for all methods:	
- Holding time information and methods requested	Signed chain-of-custody forms
- Discussion of laboratory analysis, including any laboratory problems	Case narratives
- LCS (run with each batch of samples processed)	Results (control charts when available)
Organics: GC/MS analysis	
- Sample results, including TICs	EPA Form 1 or equivalent
- Surrogate recoveries	EPA Form 2 or equivalent
- Matrix spike/spike duplicate data	EPA Form 3 or equivalent
- Method blank data	EPA Form 4 or equivalent
- GC/MS tune	EPA Form 5 or equivalent
- GC/MS initial calibration data	EPA Form 6 or equivalent
- GC/MS continuing calibration data	EPA Form 7 or equivalent
- GC/MS internal standard area data	EPA Form 8 or equivalent
Organics: GC analysis	
- Sample results	EPA Form 1 or equivalent
- Surrogate recoveries	EPA Form 2 or equivalent
- Matrix spike/spike duplicate data	EPA Form 3 or equivalent
- Method blank data	EPA Form 4 or equivalent
- Initial calibration data	EPA Form 6 or equivalent
If calibration factors are used	A form listing each analyte, the concentration of each standard, the relative calibration factor, the mean calibration factor, and the %RSD
- Calibration curve if used	Calibration curve and correlation coefficient
- Continuing calibration data	EPA Form 9 or equivalent
- Positive identification (second column confirmation)	EPA Form 10 or equivalent
Metals	
- Sample results	EPA Form 1 or equivalent
- Initial and continuing calibration	EPA Form 2 or equivalent, dates of analyses and calibration curve, and the correlation coefficient factor
- Method blank	EPA Form 3 or equivalent and dates of analyses
- ICP interference check sample	EPA Form 4 or equivalent and dates of analyses
- Spike sample recovery	EPA Form 5A or equivalent
- Postdigestion spike sample recovery for ICP metals	EPA Form 5B or equivalent
- Postdigestion spike for GFAA	EPA Form 5B or equivalent
- Duplicates	EPA Form 6 or equivalent
- LCS	EPA Form 7 or equivalent
- Standard additions (when implemented)	EPA Form 8 or equivalent
- Holding times	EPA Form 13 or equivalent
- Run log	EPA Form 14 or equivalent
Wet Chemistry	
- Sample results	Report result
- Matrix spike recovery	% Recovery
- Matrix spike duplicate or duplicate	% Recovery and % RPD
- Method blank	Report results
- Initial calibration	Calibration curve and correlation coefficient
- Continuing calibration check	Recovery and % difference
- LCS	LCS result and control criteria

GC = gas chromatography
ICP = inductively coupled plasma
MS = mass spectrometry
RPD = relative percent difference
TIC = tentatively identified compound
GFAA = graphite furnace atomic absorption
LCS = laboratory control standard
PCB = polychlorinated biphenyl
RSD = relative standard deviation

Table 12-2. Standard Electronic Data Deliverables (EDD)

EDD Fields (Max Length)	Description
SMP_ID (15)	The original client sample identification number. For Lab QC samples this field may be left empty or filled with a place holder like 'QC' or 'NA' for LCS and blanks. The original client sample ID should be used for MS, MSD, and SUR samples.
LAB_ID (15)	The laboratory's sample identification number.
DATE_SMP (10)	The date the sample was collected in the field (MM/DD/YYYY).
TIME_SMP (10)	The time the sample was collected in the field (MM/DD/YYYY).
DATE_REC (10)	The date the sample was received by the laboratory (MM/DD/YYYY).
DATE_EXT (10)	The date the sample was extracted (MM/DD/YYYY). The extraction refers to any preparatory techniques such as extraction, digestion, and separation.
DATE_ANA(10)	The date the sample was analyzed (MM/DD/YYYY).
TIME_ANA(5)	The time the sample was analyzed (HH:MM).
MATRIX (10)	The sample matrix. Valid values are Water, Solid, or Air.
METHOD (21)	The method requested by the client (i.e., SW846 8080). This should not be the lab method number.
RES_TYPE (4)	The laboratory result type. Currently the loading routine only handles the following values:
	REG-results of a primary analysis of a client sample
	REA- results of a reanalysis of a client sample
	DIL- results of an analysis of a diluted client sample
	LCS-results of a laboratory control sample as %recovery
	LCST-expected (true) result of a laboratory control sample as a concentration
	LCSF-actual (final) result of a laboratory control sample as a concentration
	SUR-surrogate recovery as % recovery
	MS-matrix spike recovery as a % recovery
	MST- expected (true) result of a matrix spike sample as a concentration
	MSF- actual (final) result of a matrix spike sample as a concentration
	MSD-matrix spike duplicate recovery as relative percent difference
	MSDT- expected (true) result of a matrix spike duplicate sample as a concentration
	MSDF- actual (final) result of a matrix spike duplicate sample as a concentration
	BLK-result of a laboratory blank sample.
CAS_NUM (15)	The CAS number or blank if no CAS number is available.
PARAMTR (50)	Chemical name for the analytic parameter.
RESULTS (N)	The analytic result
UNITS (15)	The units for the result.
LABQUAL (6)	The qualifiers assigned by the laboratory.
DET_LIMIT (N)	The Contract-Required Detection Limit for the analyte being measured. It should be reported in the same units as the result.
REP_LIMIT (N)	The Contract-Required Reporting Limit for the analyte being measured. It should be reported in the same units as the result.
UNC (N)	The 2 sigma error in the net count rate for radiological analyses. Should be expressed in the same units as the analytic result.
DILUTION (N)	The overall dilution of the sample aliquot. A value of one should correspond to nominal conditions for the method. Values less than one correspond to concentrations.
SMP_WT (N)	The weight or volume of the sample used for the analysis.
WT_UNITS (2)	The units for the sample weight or volume.
FILTERED (1)	Must have 'F' if the sample was filtered either by the lab or in the field.
PCT_SOL (N)	Percent solids
TIC (10)	Enter 'TIC' or retention time for tentatively identified compound. Blank if not a TIC.

The laboratory EDD may be delivered either as an Excel spreadsheet or as a comma or tab delimited file readable by Excel. The file name must include the SDG number or equivalent. For example, if multiple files were submitted for the same SDG, the filename could be the SDG number followed by a sequential number for each file in the SDG. A file cannot contain more than one SDG. Multiple analytic fractions may be present in the file. The first row of the file should contain the field names. The expected field names and comments about them are listed below. Fields do not have to be present in the order specified and additional fields may be included; however, columns must be present for all fields identified below. N-Indicates that the field requires a numeric entry.

12.2.2 Primary Analytical Data Assessment Categories

12.2.2.1 Holding Times

Evaluation of holding times ascertains the validity of results based on the length of time from sample collection to sample preparation or sample analysis. Verification of sample preservation must be confirmed and accounted for in the evaluation of sample holding times. The evaluation of holding times is essential to establishing sample integrity and representativeness. Concerns regarding physical, chemical, or biochemical alteration of analyte concentrations can be eliminated or qualified through this evaluation.

12.2.2.2 Blanks

The assessment of blank analyses is performed to determine the existence and magnitude of contamination problems. The criteria for evaluation of blanks applies to any blank associated with the samples, including field, trip, equipment, and method blanks. Contamination during sampling or analysis, if not discovered, results in false-positive data.

Blanks will be evaluated against reporting levels as specified in Tables 3-3 through 3-8. Analytical method blanks should be below 2X these levels. Field, trip, and equipment rinsate blanks will be evaluated against 5X these levels for most analytes and 10X these levels for common laboratory solvent analytes.

12.2.2.3 Laboratory Control Samples

The LCS serves as a monitor of the overall performance of the analytical process, including sample preparation, for a given set of samples. Evaluation of this standard provides confidence in or allows qualification of results based on a measurement of process control during each sample analysis.

12.2.2.4 Surrogate Recovery

System compounds are added to every sample, blank, MS, MSD, and standard. They are used to evaluate extraction, cleanup, and analytical efficiency by measuring recovery on a sample-specific basis. Poor system performance as indicated by low surrogate recoveries is one of the most common reasons for data qualification. Evaluation of surrogate recovery is critical to the provision of reliable sample-specific analytical results.

12.2.2.5 Internal Standards

Internal standards are utilized to evaluate and compensate for sample-specific influences on the analyte quantification. They are evaluated to determine if data require qualification due to excessive variation in acceptable internal standard quantitative or qualitative performance measures. For example, a decrease or increase in internal standard area counts for organics may reflect a change in sensitivity that can be attributed to the sample matrix. Because quantitative determination of analytes is based on the use of internal standards, evaluation is critical to the provision of reliable analytical results.

12.2.2.6 Furnace Atomic Absorption QC

Duplicate and furnace post-digestion spikes are evaluated to establish precision and accuracy of individual analytical determinations. Because of the nature of the furnace atomic absorption technique and because of the detailed decision tree and analysis scheme required for quantitation of the elements, evaluation of the QC is critical to ensuring reliable analytical results.

12.2.2.7 Calibration

The purpose of initial and continuing calibration verification analyses is to verify the linear dynamic range and stability of instrument response. Relative instrument response is used to

quantify the analyte results. If the relative response factor is outside acceptable limits, the data quantification is uncertain and requires appropriate qualification.

12.2.2.8 Sample Reanalysis

When instrument performance-monitoring standards indicate an analysis is out of control, the laboratory is required to reanalyze the sample. If the reanalysis does not solve the problem (i.e., surrogate compound recoveries are outside the limits for both analyses), the laboratory is required to submit data from both analyses. An independent review is required to determine which one is the appropriate sample result.

12.2.2.9 Secondary Dilutions

When the concentration of any analyte in any sample exceeds the initial calibration range, a new aliquot of that sample must be diluted and reanalyzed. The laboratory is required to report data from both analyses. When this occurs, an independent review of the data is required to determine the appropriate results to be used for that sample. An evaluation of each analyte exceeding the calibration range must be made, including a review of the dilution analysis performed. Results chosen in this situation may be a combination of both the original results (i.e., analytes within initial calibration range) and the secondary dilution results.

12.2.2.10 Laboratory Case Narratives

Analytical case narratives are reviewed for specific information concerning the analytical process. This information is used to direct the data validator to potential problems with the data.

12.3 Project Analytical Data Set

Analytical data for this project will be screened electronically and reviewed by qualified chemists. Flags signifying the usability of data will be noted and entered into an analytical

database. Deficiencies in data deliverables will be corrected through direct communication with the field or laboratory, generating immediate response and resolution. All significant data discrepancies noted during the validation process will be documented through NCRs, which are sent to the laboratory for clarification and correction. Decisions to repeat sample collection and analyses may be made by the SAIC Project Manager based on the extent of the deficiencies and their importance in the overall context of the project.

All data generated for investigations will be computerized in a format organized to facilitate data review and evaluation. The computerized data set will include data flags in accordance with the above-referenced protocols, as well as additional comments of the Data Review Team. The associated data flags will include such items as: 1) estimated concentration below required reporting limit; 2) estimated concentration due to poor calibration, internal standard, or surrogate recoveries; 3) estimated concentration due to poor spike recovery; and 4) estimated concentration of chemical that was also determined in the laboratory blank.

Data assessment will be accomplished by the joint efforts of the data assessor and the QA Manager. Data assessment by data management will be based on the criteria that the sample was properly collected and handled according to the work plan(s) and Sections 5.0 and 6.0 of this QAPP. An evaluation of data accuracy, precision, sensitivity, and completeness, based on criteria in Section 10.0 of this QAPP, will be performed by a data assessor. This data quality assessment will indicate that data are: 1) usable as a quantitative concentration; 2) usable with caution as an estimated concentration; or 3) unusable due to out-of-control QC results. Project investigation data sets will be available for controlled access by the SAIC Project Manager and authorized personnel. Each data set will be incorporated into investigation reports as required.

12.4 Data Reporting

The laboratory will prepare and submit analytical and QC data reports to the project in compliance with the requirements of this QAPP, including data forms listed in Table 12-1. The laboratory EDD may be delivered either as an Excel® spreadsheet or as a comma- or tab-

delimited file readable by Excel®. The file name must include the SDG number or equivalent. For example, if multiple files were submitted for the same SDG, the file name could be the SDG number followed by a sequential number for each file in the SDG. A file cannot contain more than one SDG. Multiple analytic fractions may be present in the file. The first row of the file should contain the field names. The expected field names and comments about them are listed in Table 12-2. Fields do not have to be present in the order specified, and additional fields may be included; however, columns must be present for all fields identified below. An acceptable configuration is presented in Table 12-2 with all QA/QC sample data being provided in a companion ASCII file.

The subcontract analytical laboratory will prepare and retain full analytical and QC documentation. Such retained documentation will include all hard copies and other storage media (i.e., magnetic tape). As needed, the subcontract analytical laboratory will make available all retained analytical data information.

12.5 Records Retention

All project records and files should be retained in compliance with EPA policy. For retention of RCRA Corrective Action, the retention period should be for up to five years following the closure of the RCRA unit. These files may be destroyed 10 years following the closure of those units. Any records pertaining to the treatment, storage, or disposal facilities at Harley-Davidson must be retained until the facility closes. National Pollutant Discharge Elimination System (NPDES) compliance records need only to be retained for a period of three years (five years for sewage sludge records).

13.0 PREVENTIVE MAINTENANCE PROCEDURES

13.1 Field Instruments and Equipment

The field equipment for this project may include temperature probes, pH meters, conductivity meters, dust meters, organic vapor detectors (i.e., PID), and geophysical equipment. Specific preventive maintenance procedures to be followed for field equipment are those recommended by the manufacturers. These procedures are included in the technical procedures governing the use of these instruments.

Field instruments will be checked and/or calibrated before they are shipped or carried to the field. Each field instrument will be checked daily against a traceable standard or reference with a known value to ensure that the instrument is in proper calibration. Instruments found to be out of calibration will be recalibrated before use in the field. If the instrument cannot be calibrated, it will be returned to the supplier or manufacturer for recalibration, and a backup instrument will be used in its place. Calibration checks and calibrations will be documented on the Field Meter/Calibration Log Sheets in the M&TE Logbook. Any maintenance conducted on field equipment must be documented in the M&TE Logbook.

Critical spare parts such as tapes, papers, pH probes, electrodes, and batteries will be kept on-site to minimize downtime of malfunctioning instruments. Backup instruments and equipment should be available on-site or within one-day shipment to avoid delays in the field schedules.

13.2 Laboratory Instruments

As part of their QA/QC Program, a routine preventive maintenance program will be conducted by all investigation-associated laboratories to minimize the occurrence of instrument failure and other system malfunctions. All laboratory instruments will be maintained in accordance with manufacturers' specifications and the requirements of the specific method employed. This maintenance will be carried out on a regular scheduled basis and will be documented in the

laboratory instrument service logbook for each instrument. Emergency repair or scheduled manufacturers' maintenance will be provided under a repair and maintenance contract with factory representatives.

14.0 PERFORMANCE AND SYSTEM AUDITS

Performance and system audits of both field and laboratory activities will be conducted to verify that sampling and analysis are performed in accordance with the procedures established in the work plan(s) and QAPP. Audits of laboratory activities will include both internal and external audits.

14.1 Field Audits

Internal audits of field activities (sampling and measurements) will be conducted by the QA Officer and/or QA Manager, as deemed appropriate by the QA Officer. The audits will include examination of field sampling records, field instrument operating records, sample collection, handling and packaging in compliance with the established procedures, maintenance of QA procedures, chain-of-custody, etc.

Performance audits will follow to ensure deficiencies have been corrected and to verify that QA practices/procedures are being maintained throughout the duration of the project work effort. These audits will involve reviewing field measurement records, instrumentation calibration records, and sample documentation.

14.2 Laboratory Audits

Internal performance and system audits of laboratories will be conducted by the Laboratory QA Officer as directed in the laboratory QA plan. These system audits will include examination of laboratory documentation of sample receiving, sample log-in, sample storage, chain-of-custody procedures, sample preparation and analysis, instrument operating records, etc. Internal performance audits are also conducted on a regular basis. Single-blind performance samples are prepared and submitted along with project samples to the laboratory for analysis. The Laboratory QA Officer will evaluate the analytical results of these single-blind performance samples to ensure that the laboratory maintains acceptable performance.

15.0 QUALITY ASSURANCE REPORTS TO MANAGEMENT

15.1 Quality Control Reports

During large environmental inspection activities or large construction/remediation projects performed at this facility, Quality Control Reports (QCRs) may be prepared. These reports will be signed and dated by the Field Manager. An example of the QCR format to be used is illustrated on Figure 15-1. The contents of each QCR will include a summary of activities performed at the project site, weather information, activities performed including field instrument calibrations, departures from the approved Work Plan, problems encountered during field activities, and any instructions received from government personnel. Any deviations that may affect the project data quality objectives will be immediately conveyed to the SAIC Laboratory Manager.

15.2 Laboratory Quality Assurance Reports

Each laboratory will provide LORs and analytical QC summary statements (case narratives) with each data package. All chain-of-custody forms will be compared with samples received by the laboratory, and an LOR will be prepared and sent to the project describing any differences in the chain-of-custody forms and the sample labels or tags. All deviations will be identified on the receiving report such as broken or otherwise damaged containers. This report will be forwarded to the Project Laboratory Coordinator within 24 hours of sample receipt and will include the following: a signed copy of the chain-of-custody form; itemized project sample numbers; laboratory sample numbers; cooler temperature upon receipt; and itemization of analyses to be performed.

Summary QC statements will accompany analytical results as they are reported by the laboratory in the form of case narratives for each sample delivery group.

Figure 15-1
QUALITY CONTROL/INSPECTION REPORT
Environmental Inspection Activities
Harley-Davidson Motor Company
York, Pennsylvania

Report No.
Page 1 of __

SAIC Project No. _____ Day: _____ Date: _____

	Weather	Temperature	Precipitation	Wind
AM				
Noon				
PM				

1. Key Personnel On-Site:
   Harley-Davidson:
   SAIC:

   Contractor(s):

   Visitor(s) [include time and purpose of visit]:

2. Work Performed Today by Contractors:

   Primary Equipment On-Site:

3. Health and Safety Meetings, Levels and Activities:

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HARLEY-DAVIDSON MOTOR CYCLES

Figure 15-1
QUALITY CONTROL/INSPECTION REPORT
Environmental Inspection Activities
Harley-Davidson Motor Company
York, Pennsylvania

4. Environmental Observations (attach & reference additional information/maps as needed) -_____

List Inspection Type (indicate whether: I - Initial, F - Follow-up, or S – Sampling), Location, Observation and Action(s) to be Taken:

Type	Location	Observation	Action

List Sample Reference (Chain-of-Custody [COC] No.), Sample ID, Type (S- Soil, GW- Groundwater, SW- Surface water, W- Waste), Location/Depth Where Collected, Analyses Requested or General Results of Previous Tests:

COC No.	Sample ID	Type	Location/Depth	Analyses/Results

5. Problems Encountered/Corrective Action Taken:_____

6. Special Notes/Remarks:_____

7. Tomorrow's Expectations:_____

SAIC On-Site Inspector:_____ Checked By:

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An Employee-Owned Company

MOTOR HARLEY-DAVIDSON CYCLES

Any departures from approved plans will receive prior approval from the Laboratory Coordinator and will be documented with field change orders. These field change orders will be incorporated into the project evidence file.

The project will maintain custody of the project evidence file and will maintain the contents of files for this project, including all relevant records, reports, logs, field logbooks, pictures, subcontractor reports, correspondence, and chain-of-custody forms until this information is requested or transferred to the Harley-Davidson FPC. These files will be stored under the custody of the SAIC Project Manager. The analytical laboratory will retain all original analytical raw data information (both hard copy and electronic) in a secure, limited-access area and under custody of the laboratory Project Manager.

16.0 REFERENCES

ASTM (American Society of Testing and Materials). 1996. Annual Book of ASTM Standards, Volume 04.08, Soil and Rock.

EPA (U. S. Environmental Protection Agency) 1985. NEIC Policies and Procedures, EPA-300/ 9-78DDI-R, Revised June.

EPA 1991. Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans, QAMS-005/80.

EPA 1993a. Data Quality Objectives Process, EPA-540-R-93-071, September.

EPA 1993b. Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, Third Edition, Revision 1, Update 1.

EPA 1994a. EPA Requirements for Quality Assurance Project Plans for Environmental Data Operations, EPA QA/R-5, January.

Langan Engineering and Environmental Services, Inc. 2002. Draft Interim Site-Wide Remedial Investigation Report, Harley-Davidson Motor Company York, Pennsylvania Facility, July.

TestAmerica, 2009. Laboratory Quality Management Plan, TestAmerica Laboratories, Inc., Pittsburgh, Pennsylvania, March.

USACE (U. S. Army Corps of Engineers) 1994. Requirements for the Preparation of Sampling and Analysis Plans, EM 200-1-3, September.

USACE (1997). Chemical Quality Assurance for HTRW Projects, EM 200-1-6, October.

APPENDIX A

SAIC Standard Operation Procedures

SCIENCE APPLICATIONS INTERNATIONAL CORPORATION

CONTROLLED DOCUMENTS

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Manual Name: **Quality Assurance Technical Procedures Volume II: Field Standard Operating Procedures**

Document Number: FTP-105

Revision Number: 1

Date Printed: _____

Person Checking the Revision Number: _____

SCIENCE APPLICATIONS INTERNATIONAL CORPORATION FIELD TECHNICAL PROCEDURE			
Title: Field Reconnaissance			
Procedure No: FTP-105	**Revision: 1**	**Date: 11/18/2008**	**Page 1 of 3**
Business Unit General Manager: Date: 12/8/08		**QA/QC Officer: Date:** 11/18/2008	

R

1.0 PURPOSE

The purpose of this procedure is to establish a method for accomplishing a variety of field objectives during the initial phases of a project.

2.0 SCOPE

This procedure applies to surveying a site to obtain qualitative information that can include data on non-biotic components of the environment (air, water, soil) and ecologic components (terrestrial or aquatic life).

3.0 REFERENCES, RELATED READING, AND DEFINITIONS

3.1 REFERENCES

See Common References at the front of the FTP Manual. R

3.2 DEFINITIONS

None

4.0 RESPONSIBILITIES

4.1 See Common Responsibilities at the front of the FTP Manual. R

4.2 FIELD MANAGER

The Field Manager is responsible for:

4.2.1 Ensuring that all personnel perform their assigned duties in accordance with this procedure when it is applicable;

4.2.2 Ensuring compliance with the sampling and analysis plan (SAP) or other work-controlling document; and R

4.2.3 Overall management of field activities.

R

5.0 GENERAL

5.1 Any deviation from specified requirements will be justified to and authorized by the Project Manager and/ or the relevant Program Manager.

5.2 Deviations from requirements will be sufficiently documented to allow re-creation of the modified process.

5.3 Refer to the site- or project specific Health and Safety (H&S) plan for relevant H&S requirements.

5.4 Refer to the project/task-specific SAP or other work-controlling document for relevant sampling and analysis requirements.

5.5 SAIC and subcontractor personnel who use this procedure must provide documented evidence of having been trained on the procedure to the Program or Project Manager for transmittal to the designated records system.

R

5.6 Inclement weather, such as rain, snow, or impending lightning storms, will be avoided.

6.0 PROCEDURE

6.1 Obtain documents and maps of the study area to ascertain the nature of the terrain.

6.2 Parallel transect lines are drawn over the study area at a distance of 100 to 200 fee apart or as specified in the work plan. These lines begin at one edge of the study area and continue to the opposite side of the area.

R

6.3 Persons walking the transects use a tape measure at the beginning of a transect walk to be sure they are the required distance from the last transect.

6.4 A compass is used to ensure they are walking in the right direction. While walking, they record significant information required by the project in the field notebook or field form.

R

6.5 Where major obstacles in transects are encountered, survey walkers walk around them, taking care to return to as close to the original transect as possible, once the obstacle is behind them.

6.6 A new compass reading may be required to ensure that the walkers remain on the preassigned transect.

6.7 Complete field logbook in accordance with FTP-1215.

R

7.0 RECORDS

Documentation generated as a result of this procedure is submitted to the designated records system maintained in accordance with Section 17.0 of the Business Unit QAP.

R

8.0 ATTACHMENTS

None

SCIENCE APPLICATIONS INTERNATIONAL CORPORATION

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Manual Name: **Quality Assurance Technical Procedures Volume II: Field Standard Operating Procedures**

Document Number: FTP-235

Revision Number: 1

Date Printed: _____

Person Checking the Revision Number: _____

SCIENCE APPLICATIONS INTERNATIONAL CORPORATION FIELD TECHNICAL PROCEDURE			
Title: Soil Gas Sampling			
Procedure No: FTP-235	**Revision: 1**	**Date: 11/18/2008**	**Page 1 of 5**
Business Unit General Manager: Date: 12/8/08		**QA/QC Officer: Date:** C.D. Cowart 11/18/2008	

R

1.0 PURPOSE

The purpose of this procedure is to describe methods for obtaining soil gas samples.

2.0 SCOPE

This procedure, which applies to soil gas sampling and analysis, is used as a rapid field screening technique for health and safety evaluation prior to the excavation of potentially contaminated soil, to aid in the placement of monitoring well, to determine the area extent of soil contamination or plume of contaminated groundwater, and to estimate the effectiveness of remedial measures.

3.0 REFERENCES, RELATED READING, AND DEFINITIONS

3.1 REFERENCES

3.1.1 See Common References at the front of the FTP Manual. R

3.1.2 Environmental Investigations Standard Operating Procedures and Quality Assurance Manual, U.S. Environmental Protection Agency.

3.1.3 Science Applications International Coporation (SAIC) Field Technical Procedure (FTP) 400, Equipment Decontamination.

3.1.4 Science Applications International Corporation Field Technical Procedure (SAIC FTP) 625, Chain-of-Custody.

3.1.5 Science Applications International Corporation Field Technical Procedure (SAIC FTP) 650, Labeling, Packaging, and Shipping of Environmental Field Samples.

4.0 RESPONSIBILITIES

4.1 See Common Responsibilities at the front of FTP Manual. R

R

4.2 FIELD MANAGER

The Field Manager is responsible for:

4.2.1 ensuring compliance with the Sampling and Analysis Plan (SAP);

4.2.2 ensuring that all personnel perform their assigned duties in accordance with this procedure when it is applicable; and

4.2.3 overall management of field activities.

5.0 GENERAL

5.1 Any deviations from specified requirements will be justified to and authorized by the Project Manager and/or the relevant Program Manager.

5.2 Deviations from requirements will be sufficiently documented to allow re-creation of the modified process.

5.3 Refer to the site- or project-specific Health and Safety (H&S) Plan for relevant H&S requirements. R

5.4 Refer to the project/task-specific SAP for relevant sampling and analysis requirements.

5.5 SAIC and subcontractor personnel who use this procedure must provide documented evidence of having been trained on the procedure. R

5.6 Sampling tools and equipment are protected from sources of contamination prior to sampling and decontaminated prior to and between sampling locations as specified in FTP-400, Equipment Decontamination.

5.7 Soil gas sampling must be accompanied by a program of borings to obtain soil, waste, or groundwater samples (or all three) to correlate the soil gas analytical data with field conditions. Interpretation of soil gas data is qualitative, even though the results are quantitative based on the following limitations:

5.7.1 Only certain contaminants (primarily volatile organic compounds with low molecular weights) can be detected through soil gas sampling.

5.7.2 Soil gas release is affected by soil mineralogy (certain clays absorb organics), by the temperature of the soil and the contaminant plume (if any), by barometric pressure (high pressure suppresses soil gases), by precipitation (infiltrating rainfall will suppress soil gas or cause it to go into solution), or by rising and falling water tables. Information relative to these variables is recorded at the time of sampling.

R

5.7.3 Soil gas is not homogenous, varying with both time and distance from the contaminant source. Because soil gas can travel significant distances through interstitial pores, fissures and cracks, burrows or root holes, or abandoned or poorly constructed boreholes or wells, interpretation of soil gas data must consider such conditions relative to the movement and variability of the soil gas data.

5.7.4 The type(s) of collecting devices and analytical techniques used contribute to the uncertainties of interpreting soil gas data.

5.7.5 Appropriate manufacturers' calibration and maintenance instructions should be attached to the equipment.

5.8 An optional field checklist is provided as a full size form immediately following this procedure. R

6.0 PROCEDURE

6.1 PREPARATION

6.1.1 Use plastic sheeting as ground cover for staging of equipment and/or materials as necessary to prevent equipment from coming in contact with potentially contaminated surfaces.

6.1.2 Clear the locale to be sampled of grass, leaves, or debris; be careful not to walk or drive over the area.

6.1.3 Using a decontaminated hole maker (a steel drive bar), make a hole into the ground to the desired depth (usually 3 feet). If refusal occurs significantly before the sampling depth is reached, remove and decontaminate the drive bar. Clear another sampling point within 1 foot of the first point and insert the hole maker again. If refusal occurs, eliminate the area within ten square feet as a sampling point.

6.1.4 Once the sampling depth is reached, make a logbook entry of the depth, time, location, etc. Withdraw the drive bar; cover the hole with a "collar" [made of a weighted down sheet of aluminum foil (dull side down), a laboratory stopper, a cork covered with foil, or other suitable object]. Allow hole to "breathe" for ten minutes or so (up to an hour). Depending on field conditions and manufacturer's instructions.

6.1.5 Collect a soil gas sample or measurement using one of the following methods:

a) Insert the probe of a field instrument, specified in the SAP, into the hole. The probe is fitted with a collar capable of sealing the hole.

R

Keep the field instrument in place for the minimum time necessary to obtain a response or as specified in the SAP.

b) Insert a collar (rubber stopper wrapped in aluminum) fitted with a rigid tube through its center into the hole, sealing it. The rigid tube is fitted at its upper end with a flexible tubing, clamped shut. The lower end of the rigid tube is open to the borehole. After the appropriate interval of time for outgassing specified in the SAP has elapsed, unclamp the flexible tubing. A reading is taken by attaching the specified field instrument to the flexible tubing or a sample is collected using a low flow air sampling device.

6.2 PETREX TUBE INSTALLATION

6.2.1 Seal any dug or drilled hole immediately with an aluminum foil plug.

6.2.2 Attach a length of wire (usually 24 inches) to the Petrex tube for easy retrieval.

6.2.3 Install open end down.

6.2.4 Cap the borehole with an aluminum foil plug. Quite often, the best approach is to cap off the hole at the surface with quick-plug cement.

6.2.5 Flag the hole.

6.3 After the appropriate interval (usually two weeks), carefully excavate the tube and remove it from the ground.

6.4 Wipe the tube threads clean with lab wipes. Cap the tube.

6.5 Tamp the hole shut.

6.6 Samples are placed in containers defined according to the analytical needs and then, when appropriate, packed with ice as soon as practical. Packaging, labeling, and preparation for shipment area implemented in accordance with FTP-650, Labeling, Packaging and Shipping of Environmental Field Samples.

R

6.7 Complete field logbook and chain-of-custody forms accordance with procedures FTP-1215, Field Logbooks and Field Forms and FTP-625 Chain-of-Custody.

R

7.0 RECORDS

Documentation generated as a result of this procedure is submitted to the designated records system in accordance with Section 17 of the Business Unit QAP. R

8.0 ATTACHMENTS

None

Field Checklist

- ☐ Hole Maker
- ☐ Analytical Instruments
- ☐ Gas Collection Bags
- ☐ Air Sampling Pumps
- ☐ Logbooks
- ☐ Sample Containers with Septum
- ☐ Soil Gas Collectors
- ☐ Safety Glasses or Monogoggles
- ☐ Gloves
- ☐ Labels
- ☐ Plastic Sheets
- ☐ Lab Wipes
- ☐ Decontamination Equipment
- ☐ Chain-of-Custody Forms
- ☐ Custody Seals or Evidence Tape
- ☐ Sampling and Analysis Plan
- ☐ Health and Safety Plan
- ☐ Appropriate Containers for Waste and Equipment

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Manual Name: **Quality Assurance Technical Procedures Volume II: Field Standard Operating Procedures**

Document Number: FTP-370

Revision Number: 1

Date Printed: _____

Person Checking the Revision Number: _____

SCIENCE APPLICATIONS INTERNATIONAL CORPORATION FIELD TECHNICAL PROCEDURE			
Title: Groundwater Sampling Procedures: Water Level Measurement			
Procedure No: FTP-370	**Revision: 1**	**Date: 11/18/2008**	**Page 1 of 5**
Business Unit General Manager: A. Ed Grumski **Date:** 12/8/08		**QA/QC Officer:** C. A. Coward **Date:** 11/18/2008	

R

1.0 PURPOSE

The purpose of this procedure is to describe methods used to obtain water level measurements in completed wells or piezometers, and to specify limitations of the respective methods.

2.0 SCOPE

This procedure gives overall technical guidance for obtaining piezometric head measurements in wells through the use of conducting probe and a weighted steel or fiberglass tape.

3.0 REFERENCES, RELATED READING, AND DEFINITIONS

3.1 REFERENCES

3.1.1 See Common References at the front of the FTP Manual.

3.1.2 Environmental Investigation Standard Operating Procedures and Quality Assurance Manual, U.S. Environmental Protection Agency. R

3.1.3 Science Applications International Corporation Field Technical Procedure (SAIC FTP) 400, Equipment Decontamination.

3.2 DEFINITIONS

Piezometric head - The height to which water will rise in a cased well.

4.0 RESPONSIBILITIES

4.1 See Common Responsibilities at the front of the FTP Manual. R

4.2 FIELD MANAGER

The Field Manager is responsible for:

4.2.1 ensuring compliance with the Sampling and Analysis Plan (SAP);

4.2.2 ensuring that all personnel perform their assigned duties in accordance with this procedure when it is applicable; and

4.2.3 overall management of field activities.

5.0 GENERAL

5.1 Any deviations from specified requirements will be justified to and authorized by the Project Manager and/or the relevant Program Manager.

5.2 Deviations from requirements will be sufficiently documented to allow re-creation of the modified process.

5.3 Refer to the site- or project-specific Health and Safety (H&S) Plan for relevant H&S requirements. R

5.4 Refer to the SAP for project/task-specific sampling and analysis requirements.

5.5 SAIC and subcontractor personnel who use this procedure must provide documented evidence of having been trained on the procedure to the Program or Project Manager. R

5.6 Initial monitoring of the well headspace and breathing zone concentrations using a photon ionization detector (PID), flame ionization detector (FID), and combustible gas meters will be evaluated by the H & S Officer to determine required levels of protection.

5.7 All groundwater level measurements are made to the nearest 0.01 foot, and recorded in the field logbook or groundwater sampling form.

5.8 In measuring groundwater levels, there will be a clearly-established reference point of known altitude, which is normally identified by a painted mark at one point on the upper edge of the inner well casing.

5.9 The recorded field notes must clearly describe the reference used.

5.10 After a monitoring or groundwater observation well has been installed and the groundwater level has stabilized, the initial depth to the water is measured and recorded. The date and time of the reading is recorded.

5.11 Information related to precipitation is included in the data.

5.12 The total depth of the well is measured and recorded, if possible.

5.13 Cascading water within a borehole can cause false readings with some types of sounding devices. If this condition is observed, it is noted in the logbook.

5.14 Oil layers may cause problems in determining the true water level in a well; if the condition exists, it is noted in the logbook.

5.15 Water level readings are taken regularly, as required by the Field Manager.

5.16 All water level measurements at a site used to develop a groundwater contour map must be made in the shortest time practical.

5.17 Groundwater with dilute ionic content may not conduct enough current between the electrodes of the electronic water level indicator to activate the instrument.

5.18 Measuring tapes usually have a limit of about 100 feet and a weighted end. The weight will be stainless steel or an inert material specified by the SAP.

5.19 Sampling tools and equipment are protected from sources of contamination prior to sampling and decontaminated prior to and between sampling as specified in FTP-400, Equipment Decontamination.

5.20 An optional field checklist is provided as a full size form immediately following this procedure. R

6.0 PROCEDURE

6.1 PREPARATION

6.1.1 Don clean gloves, check the well with organic vapor analyzer (OVA), PID, and/or Rad meters. Unlock and open the well; note the condition of the well.

6.1.2 Record sampling station number, date, time, and any other pertinent information, as is applicable.

6.2 WATER LEVEL MEASUREMENTS

Locate reference mark at top of the inner well casing.

6.2.1 If reference mark is not present, make one on the highest side of the inner well casing.

6.2.2 Make a scratch on the outside edge of the well casing with a file or suitable instrument, being careful that cuttings do not fall into the well casing.

6.2.3 If reference mark is not present, alert Field Manager.

6.3 ELECTRONIC WATER-LEVEL INDICATOR

Collect water level measurements with electronic water-level indicator.

6.3.1 Check battery on decontaminated electronic water-level indicator and on alarm.

6.3.2 Lower an electronic water-level-indicator probe into the well, making sure that the cord or the probe does not scrape the sides of the well casing.

6.3.3 When the alarm sounds and/or the red light illuminates, stop lowering the probe.

6.3.4 Pull up the probe until alarm no longer sounds.

6.3.5 Lower probe again slowly. Stop at the instant the alarm sounds and/or the light illuminates and remains illuminated.

6.3.6 Hold cord to side of casing where reference mark is etched.

6.3.7 Mark cord with thumb where it touches reference mark.

6.3.8 Use a measuring device to determine distance from last marked increment to marked point on cord. The total depth is the distance from top of inner casing to the water level.

6.3.9 Record measurement to within 0.01 feet as Depth to Water in field logbook.

6.3.10 Repeat steps 6.3.2 through 6.3.10, two to three times for consistency. Measurement should remain constant.

6.3.11 Pull electronic water-level indicator from well and decontaminate.

6.3.12 Close and lock the well cap.

6.4 STEEL OR FIBERGLASS TAPE

Collect water level measurements with steel or fiberglass tape.

6.4.1 Inspect decontaminated tape and determine any measurement correction required for missing tape.

6.4.2 Chalk one or two feet of tape; lower measuring tape through well.

6.4.3 Listen for the sound of the tape hitting the water. **Note**: reading at measuring point on top of the well. To determine the elevation of the groundwater or the depth below the surface, the elevation of the mark or the stick-up of the mark above the ground surface (respectively) must be known or measured, and subtracted or added as is appropriate.

6.4.4 Remove tape from well and note wet cut on tape.

6.4.5 Subtract wet cut from measuring point reading and record measurement to within 0.01 foot in field logbook.

6.4.6 Repeat steps 6.4.2 through 6.4.5 above. Measurement should remain constant within 0.01 foot.

6.4.7 Pull tape from well and decontaminate as specified in FTP-400. R

6.4.8 Close and lock well cap.

6.4.9 Record information in field logbook in accordance with FTP-1215. R

7.0 RECORDS

Documentation generated as a result of this procedure is submitted to the designated records system in accordance with Section 17 of the Business Unit QAP. R

8.0 ATTACHMENTS

None

Field Checklist

- ☐ Electronic Water-Level Indicator (Conducting Probe)
- ☐ Steel or Fiberglass Tape Measure with Raised Markings
- ☐ Keys to Unlock Wells
- ☐ Logbook
- ☐ Black Indelible Pen
- ☐ Appropriate Containers for Waste and Equipment
- ☐ Gloves
- ☐ Safety Shoes
- ☐ Safety Glasses or Monogoggles
- ☐ Health and Safety Plan
- ☐ Decontamination Equipment (As specified in FTP-400)
- ☐ Sampling and Analysis Plan
- ☐ Plastic Sheeting
- ☐ Decontamination Equipment
- ☐ Manufacturer's Calibration and Instrument Manual
- ☐ Monitoring Equipment (PID, OVA, and Rad Meters)

SCIENCE APPLICATIONS INTERNATIONAL CORPORATION

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Manual Name: **Quality Assurance Technical Procedures Volume II: Field Standard Operating Procedures**

Document Number: FTP-376

Revision Number: **2**

Date Printed: _____

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SCIENCE APPLICATIONS INTERNATIONAL CORPORATION FIELD TECHNICAL PROCEDURE			
Title: Aquifer Testing by Slug Test Method			
Procedure No: FTP-376	**Revision: 2**	**Date: 11/18/2008**	**Page 1 of 4**
Business Unit General Manager: A. Gruenke **Date:** 12/8/08		**QA/QC Officer:** C. G. Conant **Date:** 11/18/2008	

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1.0 PURPOSE

The purpose of this procedure is to describe the slug test method for determining the capacity of an aquifer to yield water.

2.0 SCOPE

This test applies to tests which provide data on hydraulic conductivity.

3.0 REFERENCES, RELATED READING, AND DEFINITIONS

3.1 REFERENCES

3.1.1 See Common References at the front of the FTP Manual.

3.1.2 Environmental Investigations Standard Operating Procedures and Quality Assurance Manual, U.S. Environmental Protection Agency.

3.1.3 Groundwater and Wells, Second Edition.

3.1.4 Applied Hydrogeology, Third Edition.

3.1.5 The Design, Performance, and Analysis of Slug Tests. James J. Butler Jr.

3.1.6 The Handbook of Groundwater Engineering.

3.1.7 Science Applications International Corporation Field Technical Procedure (SAIC FTP) 400, Equipment Decontamination.

3.1.8 Science Applications International Corporation Field Technical Procedure (SAIC FTP) 625, Chain-of-Custody.

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3.2 DEFINITIONS

None.

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4.0 RESPONSIBILITIES

4.1 See Common Responsibilities at the front of the FTP Manual. R

4.2 FIELD MANAGER

The Field Manager is responsible for:

4.2.1 ensuring that all personnel perform their assigned duties in accordance with this procedure when it is applicable;

4.2.2 ensuring compliance with the Sampling and Analysis Plan (SAP); and

4.2.3 overall management of field activities.

5.0 GENERAL

5.1 Any deviation from specified requirements will be justified to and authorized by the Project Manager and/or the relevant Program Manager.

5.2 Deviations from the requirements will be sufficiently documented to allow re-creation of the modified process.

5.3 Refer to the site- or project-specific Health and Safety (H&S) Plan for relevant H&S requirements. R

5.4 Refer to the SAP for project/task-specific sampling and analysis requirements.

5.5 SAIC and subcontractor personnel who use this procedure must provide documented evidence of having been trained on the procedure. R

5.6 Information on the well design, including total depth, depth to water, screen length and depth, riser and screen diameters, and diameter of sand pack is required prior to testing. In addition, other information regarding the aquifer should also be obtained (e.g., aquifer thickness).

5.8 During testing, water is withdrawn from or added to a well and the subsequent rise or decline of the water level within the well is recorded.

5.9 During the slug test, a known volume of water (referred to as a slug) is either injected into or withdrawn from a well.

5.10 The rate at which the water level rises or falls after introducing or withdrawing the slug is recorded in a depth-versus-time plot. The measurements are made either manually, using a electronic water level indicator, or with a pressure

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transducer system. The rate of change is controlled by the characteristics of the formation.

5.11 Sampling tools and equipment will be protected from sources of contamination prior to testing and decontaminated prior to and between testing locations as specified in FTP-400, Equipment Decontamination.

6.0 PROCEDURE

6.1 PREPARATION

6.1.1 Don appropriate personal protective equipment prior to any field activities.

6.1.2 Place plastic sheeting around work area to prevent equipment from coming into contact with potentially contaminated surfaces.

6.1.3 Obtain the following information about the well to be pumped/purged:

a) well location;
b) well specifications (diameter, depth, extent and location of screened interval etc.;
c) depth to groundwater in well; and
d) description of material in which the well is screened.

6.1.4 If the slug test is to be conducted using pressure transducers, all associated equipment, including data logger(s), will be obtained for use in pumping/observation well prior to installing pressure transducers.

6.1.5 If the slug test is to be conducted using electronic water level indicator, this measuring device is lowered into the well until the water surface is located. The level is then obtained by measuring the distance from the reference point and readings recorded.

6.2 SLUG TEST

6.2.1 The slug test is not conducted until at least a minimum of 24 hours after well development.

6.2.2 Appropriate arrangements must be made for discharge of the water (to the ground, to a 55-gallon drum, etc.).

6.2.3 If a pump must be utilized, a discharge line will also be necessary.

6.2.4 The slug tests are conducted using either an electronic water level indicator to measure water level change or a pressure transducer

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connected to a digital data logger. The static water level is measured and a slug of known volume is placed into, or withdrawn from, the well. For a slug withdrawal test, the test is indicated only after the water level returns to 90% of the static water level. This will cause the water level in the well to increase or decrease accordingly. The test is continued until the water level reaches at least 90% of the static water level. The time intervals for taking water level measurements will be stated in the SAP.

6.2.5 The data stored in the data logger or manual measurements are transferred into a computer. The data are evaluated using one or more slug test programs based on Hvorslev and/or Bouwer and Rice theories of aquifer characteristics. If a tested monitoring well is screened across the water table, only the Bouwer and Rice method is used to evaluate the data. The results are checked with hand calculations.

6.2.6 Complete field logbook and chain-of-custody forms in accordance with procedures FTP-1251 and FTP-625 respectively.

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6.2.7 Sampling tools, instruments, and equipment are protected from sources of contamination prior to use and decontaminated after use as specified in FTP-400.

7.0 RECORDS

Documentation generated as a result of this procedure is submitted to the designated records system in accordance with Section 17 of the Business Unit QAP.

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8.0 ATTACHMENTS

None

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Manual Name: **Quality Assurance Technical Procedures Volume II: Field Standard Operating Procedures**

Document Number: FTP-400

Revision Number: 2

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SCIENCE APPLICATIONS INTERNATIONAL CORPORATION FIELD TECHNICAL PROCEDURE			
Title: Equipment Decontamination			
Procedure No: FTP-400	**Revision: 2**	**Date: 11/18/2008**	**Page 1 of 17**
Business Unit General Manager: Date: 12/8/08		**QA/QC Officer: Date:** C.D. Coward 11/18/2008	

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1.0 PURPOSE

The purpose of this procedure is to describe decontamination methods and related issues involving the physical removal of chemical and radioactive contaminants from equipment.

2.0 SCOPE

This procedure applies only to the decontamination of equipment used in field investigations which may be associated with sampling activities, but which does not directly contact the samples. Sample collection devices, which directly contact the samples, are addressed in Procedure FTP-405, "Cleaning and Decontaminating Sample Containers and Sampling Equipment."

This procedure on Equipment Decontamination includes the following:

a) field test equipment (e.g., flowmeters);
b) equipment to which sample devices may be attached (e.g., drill rig, drill rod);
c) well drilling equipment;
d) miscellaneous field support equipment which may be subjected to incidental exposure to contaminants; and
e) shipping containers.

This procedure does not include the following:

a) chemical analysis equipment, such as the portable gas chromatograph;
b) health and safety equipment;
c) protective clothing; and
d) sample containers and sample collection devices.

3.0 REFERENCES, RELATED READING, AND DEFINITIONS

3.1 REFERENCES

3.1.1 See Common References at the front of the FTP Manual.

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3.1.2 Environmental Investigations Standard Operating Procedures and Quality Assurance Manual, U.S. Environmental Protection Agency.

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3.1.3 Science Applications International Corporation Field Technical Procedure (SAIC FTP) 405, Cleaning and Decontaminating Sample Containers and Sampling Equipment.

3.2 DEFINITIONS

3.2.1 Deionized Water - Tap Water treated by passing through a standard deionizing resin column. The deionized water should contain no heavy metals or other inorganic compounds (i.e., at or above analytical detection limits) as defined by a standard Inductively Coupled Plasma Spectrophotometer (or equivalent) scan. Deionized water must be stored in clean glass, stainless steel, or plastic containers that can be closed prior to use. It can be applied from plastic squeeze bottles.

3.2.2 Equipment - Those items (variously referred to as "field equipment" or "sampling equipment") necessary for sampling activities, which do not directly contact the samples.

3.2.3 Laboratory Detergent - A standard brand of phosphate-free laboratory detergent, such as Liquinox, or the equivalent. Laboratory detergent must be kept in clean plastic, metal, or glass containers until used. It will be poured directly from the container during use.

3.2.4 Organic-free Water - Tap water treated with activated carbon and deionizing units or water from a Milli-Q water purification system (or equivalent). This water should contain no detectable pesticides, herbicides, extractable organic compounds, or volatile organic compounds. Organic free water will be stored only in glass, Teflon, or stainless steel containers and dispensed from only Teflon squeeze bottles.

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3.2.5 Sampling Devices - Utensils and other implements used for sample collection and processing that directly contact actual samples.

3.2.6 Solvent - Pesticide grade isopropanol is the standard solvent used for decontamination in most instances. The use of any other solvent must be justified and approved by the responsible project personnel and documented in the field logbooks. Solvent must be stored out of direct sunlight in the unopened original containers until used. They may be applied using a low pressure nitrogen system fitted with a Teflon nozzle or using Teflon squeeze bottles.

3.2.7 Tap Water - This refers to water from a tested and approved water system. Tap water may be stored in clean tanks, hand pressure sprayers, squeeze bottles, or applied directly from a hose.

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Note: Hand pump sprayers are generally not acceptable storage or application containers for the above materials (with the exception of tap water). This also applies to stainless steel sprayers. All hand sprayers have internal oil coated gaskets and black rubber seals that may contaminate the solutions. Solvents, laboratory detergent, and rinse water used to clean equipment will not be reused during field decontamination. Use of such equipment should be evaluated to assure that project objectives will not be compromised.

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4.0 RESPONSIBILITIES

4.1 See Common Responsibilities at the front of the FTP Manual.

4.2 FIELD MANAGER

The Field Manager or designee is responsible for:

4.2.1 ensuring that all personnel perform their assigned duties in accordance with this procedure when it is applicable;

4.2.2 ensuring compliance with the Sampling and Analysis Plan (SAP);

4.2.3 overall management of field activities;

4.2.4 selecting the decontamination method in conformance with SAP guidelines and regulatory requirements; and

4.2.5 ensuring that equipment decontamination is performed safely.

5.0 GENERAL

5.1 Any deviations from specified requirements will be justified and authorized by the Project Manager and/or the relevant Program Manager, and will be documented on the appropriate field change forms.

5.2 Deviations from requirements will be sufficiently documented to allow re-creation of the modified process.

5.3 As a minimum, safety glasses or goggles, and nitrile or equivalent gloves will be worn while decontaminating equipment. Uncoated Tyvek coveralls, laboratory coat, or splash apron will be worn if justified by contaminant concentration and potential adverse effects. Face shield, heavy duty PVC or equivalent gloves, coated Tyvek or equivalent coveralls will be worn while cleaning with steam or high temperature water. Ground fault circuit interrupters will be used to supply power to any portable electrical equipment in the equipment decontamination area. Solvent rinsing operations will be

conducted in an open, well ventilated area or under a fume hood. No eating, smoking, drinking, chewing, or hand to mouth contact will be permitted during decontamination activities. Refer to the site- or project-specific H&S plan for other relevant H&S requirements. A fifteen minute eyewash will be available within 100 feet of corrosive (concentrated acids or base) decontamination fluids being used.

5.4 Refer to the site-, or project/ task-specific SAP for particular decontamination methods and schedules required.

5.5 SAIC and subcontractor personnel who use this procedure must provide documented evidence of having been trained in the procedure to the Program or Project Manager for records purposes.

5.6 Procedures for packaging and disposal of all waste generated during field activities will be described in the project-specific SAP, Waste Management Plan, or other applicable document.

5.7 Contamination control (e.g., use of plastic wrappings, use of strippable or decontaminable coatings) may be used for delicate instruments and materials that are not easily decontaminated (e.g., porous or oddly shaped materials or delicate surfaces.

5.8 Paint or any other coatings must be removed from downhole drilling equipment. After removal of such coating(s), the equipment must then be decontaminated by the appropriate method.

5.9 Decontamination of equipment will be performed in a designated decontamination area, removed from any sampling location. This designated area will also be in a location free of direct exposure to airborne and radiological surface contaminants.

5.10 Decontaminated field equipment will be stored upwind of all decontamination activities. If the equipment is not to be immediately re-used, it will be covered with plastic sheeting, wrapped in aluminum foil or other measures will be used, as appropriate, to prevent re-contamination. The area where the equipment is stored must be free of contamination.

5.11 The objectives of decontamination are: to remove contamination from contaminated surfaces, to minimize the spread of contamination to uncontaminated surfaces, to avoid any cross-contamination of samples, and to minimize personnel exposures. The intent is to accomplish the required level of decontamination while minimizing the generation of additional solid and liquid waste.

5.12 Required decontamination supplies and apparatus are dependent upon the nature of the contaminant and the decontamination method selected.

5.13 For any of the specific decontamination methods that may be used, the substitution of higher grade water is permitted (e.g., the use of organic-free water in place of deionized water). However, it must be noted that deionized water and organic-free water are less effective than tap water in rinsing away the detergent film during the initial rinse.

5.14 When appropriate, it may be required that decontaminated equipment be surveyed, inspected, and tagged by designated personnel.

5.15 Contaminated or dirty equipment will not be stored with clean equipment.

5.16 Documentation of all decontamination activities is to be recorded in the field logbook.

5.17 An optional field checklist is provided as a full size form immediately following this procedure.

6.0 PROCEDURES

6.1 GUIDELINES FOR SELECTING SPECIFIC DECONTAMINATION SCHEDULES AND PROCEDURES

Note: The following is intended only as a general guideline for understanding the relevant concerns pertaining to equipment decontamination. The actual selection of all decontamination methods and schedules must be based on requirements within the site- or project-specific SAP and the discretion of the Field Manager.

6.1.1 Each decontamination task must be individually assessed based on characteristics of equipment to be cleaned:

a) equipment surfaces and materials;
b) size of equipment;
c) fragility of equipment; and
d) equipment use.

6.1.2 Assessment will also be based on the characteristics of the media to be removed by decontamination: oily sludge, heavy clay, etc.

6.1.3 Assessment must take into account potential contaminants of concern (e.g., radioactive versus chemical contaminants), levels of contamination, and related H&S issues.

6.1.4 The Field Manager selects the method deemed most appropriate for a particular task. If results are unsatisfactory, proceed step-by-step in selecting a more extensive method, as required, to successfully complete the decontamination. Deviation from plan will be documented in an appropriate field logbook and by a field change process appropriate to the project.

6.1.5 If the item has not been successfully decontaminated or cannot be monitored due to its shape (such as the inside of a pipe), a decision as to further decontamination measures is made by the Field Manager.

6.1.6 As a general guideline for selecting decontamination schedules and procedures, it is helpful to discriminate among three categories of field equipment. These three categories of equipment can be distinguished by the degree to which they may come into contact with contaminated media and their potential to indirectly affect sample integrity. Consequently, each of these three categories will usually require different consideration in terms of decontamination schedules and methods used:

a) The first category includes equipment that should not contact the sample, should not affect sample integrity, and need not contact the contaminated media. The need to decontaminate this equipment can generally be avoided by keeping it away from incidental contact with contaminated media (e.g., placing equipment on clean plastic drop cloths). Following incidental contamination of this equipment, it would require decontamination in order to minimize the spread of contamination off-site and to minimize personnel exposures, and not out of concern for sample integrity.

Examples of equipment within this category include: ambient air thermometers and certain other air monitoring instruments, emergency equipment, and other miscellaneous field support equipment.

b) The second category includes equipment that will contact the contaminated media, but need not contact the sample, nor affect sample integrity. This equipment would require decontamination in order to minimize the spread of contaminants to uncontaminated surfaces and to minimize personnel exposures, not out of concern for sample integrity. This category of equipment generally is decontaminated between sample locations and decontaminated or packaged before being removed from the site.

An example can be found in the use of flowmeters used in conjunction with surface water sampling. For ongoing use in the field, when moving from sample location to sample location, the flowmeter would generally require only a tap water rinse. This would be acceptable, since use of the flowmeter downstream from each sample location would remove any chance of cross-contaminating samples. When finished using this equipment, the flowmeter would then require more extensive decontamination prior to transporting it off-site.

c) The third category includes equipment that may have an impact on sample integrity due to its function in close proximity to the sample before and during sample collection. This type of equipment generally requires more extensive decontamination procedures and usually requires decontamination to be scheduled prior to arriving on-site, between each sample location, and more often if deemed necessary to prevent cross-contamination (e.g., when drilling or digging through a contaminated area into an uncontaminated area).

Examples of this category of equipment can be found in the use of a drill rig, drill rods and auger flights used in drilling the borehole to sample depth prior to soil sample collection.

6.1.7 Other factors influencing selection of decontamination procedures and schedules include:

a) Consideration must be given to the effect of various decontamination solutions on the material(s) of which the equipment is composed (see Attachment I). Before selecting a cleaning method for specific field test equipment/instrumentation, consult the manufacturer's instructions in order to avoid the possibility of damage to instrument components.

b) For the first two basic categories of equipment (described in 6.1.6 a & 6.1.6 b), a distinction should be made between requirements for decontamination in the field between sample locations and the requirements prior to storage off-site. For the first two categories of equipment, in most instances, there will be a need for more extensive decontamination procedures before equipment is stored off-site.

6.2 CHEMICAL DECONTAMINATION

Equipment and materials that come into contact with known or suspected chemical contaminants are considered chemically contaminated. The item is released for unrestricted use if, after decontamination, it is free of visible contamination. If organic contamination is a concern, the equipment will be scanned with appropriate instruments (e.g., PID or FID) before release off-site.

6.3 RADIOACTIVE DECONTAMINATION

6.3.1 The method for decontamination of equipment, tools, and materials is based on the material contaminated (e.g., mud, grease), the radiation levels, and the specific radionuclides to be removed.

6.3.2 Criteria for releasing decontaminated equipment for unrestricted use is contained in site specific criteria found in the SAP. See Attachment II for an example of standard criteria for release of equipment exposed to surface radioactive contamination.

6.3.3 Porous materials (e.g., aged wood, hollow concrete block, rubberized coatings, etc.), and equipment and materials which have surfaces inaccessible to the surveyor (e.g., electric motors, small diameter pipes, etc.), and items with surface coatings that could bind or cover the contamination (e.g., mud, grease, strip-coat paints, etc.) are considered on a case-by-case basis and released on authorization from the field H&S Officer or authorized designee.

6.4 MISCELLANEOUS EQUIPMENT DECONTAMINATION PROCEDURES

6.4.1 Well Sounders or Tapes Used to Measure Ground Water Levels

a) Wash with laboratory detergent and tap water.
b) Rinse with tap water.
c) Rinse with deionized water.
d) Allow to air dry overnight. (doesn't apply to field cleaning)
e) Wrap equipment in aluminum foil with the shiny side of the foil facing outward (with tab for easy removal), seal in plastic, and date.

6.4.2 Submersible Pumps and Hoses Used to Purge Ground Water Wells

a) Pump a sufficient amount of soapy water through the hose to flush out any residual purge water.
b) Using a brush, scrub the exterior of the contaminated hose and pump with soapy water. Rinse the soap from the outside of the

hose with tap water. Next rinse the hose with deionized water and recoil onto the spool.

c) Pump a sufficient amount of tap water through the hose to flush out soapy water (approximately one gallon).
d) Pump a sufficient amount of deionized water through the hose to flush out the tap water, then purge with the pump in reverse mode.
e) Rinse the outside of the pump housing and hose with deionized water (approximately 1/4 gal.)
f) Equipment will be placed in a polyethylene bag or wrapped with polyethylene film to prevent contamination during storage or transit. Ensure that a set of rotors, fuses, and cables are attached to each cleaned pump.

The same procedure applies whether this equipment is cleaned in the field equipment warehouse or in the field.

6.4.3 Portable Power Augers such as the Little Beaver

a) The engine and power head will be cleaned with a power washer, steam jenny, or hand washed with a brush using detergent (does not have to be laboratory detergent but should not be a degreaser) to remove oil, grease, and hydraulic fluid from the exterior of the unit. These units will be rinsed thoroughly with tap water.
b) All auger flights and bits will be cleaned utilizing the procedures outlined in 6.4.7.

6.4.4 Miscellaneous Flow Measuring Equipment

a) Before being stored, miscellaneous flow measuring equipment will be washed with laboratory detergent, rinsed with tap water, followed by a thorough deionized water rinse.
b) Allow to air dry.
c) Wrap equipment in aluminum foil with the shiny side facing outward.

6.4.5 ISCO Flow Meters, Field Analytical Equipment, and Other Field Instrumentation

The exterior of sealed, watertight equipment such as ISCO flow meters will be washed with a mild detergent (for example, liquid dishwashing detergent) and rinsed with tap water before storage. The interior of such equipment may be wiped with a damp cloth if necessary. For ongoing use in the field, flow measuring equipment such as weirs, staff gages, and velocity meters may be cleaned with tap water after use between measuring locations, if necessary.

Other field instrumentation will be wiped with a clean, damp cloth. pH meter probes, conductivity probes, DO meter probes, etc., will be rinsed with deionized water before storage. Before selecting a cleaning method for specific field instruments, consult the manufacturer's instructions in order to avoid the possibility of damage to instrument components.

The desiccant in flow meters and other equipment will be checked and replaced if necessary each time the equipment is cleaned.

6.4.6 Ice Chests and Shipping Containers

All ice chests and reusable containers will be washed with laboratory detergent (interior and exterior), rinsed with tap water and air dried before storage. In the event that an ice chest becomes severely contaminated, in the opinion of the field investigator, with concentrated waste or other toxic material, it will be cleaned as thoroughly as possible, rendered unusable, and properly disposed.

6.4.7 Large Soil Boring and Drilling Rigs and Associated Equipment

a) All drilling rigs, drilling equipment, backhoes, and all other associated equipment involved in the drilling activities (auger flights and bits)
will be cleaned and decontaminated before entering the designated drill site.
b) The drill rig and/or other equipment associated with the drilling and sampling activities will be inspected to insure that all oil, grease, hydraulic fluid, etc., has been removed, that all seals and gaskets are intact and that there are no fluid leaks.
c) Any portion of the drill rig, backhoe, etc., that is over the borehole (kelly bar or mast, backhoe buckets, drilling platform, hoist or chain pulldowns, spindles, cathead, etc.) will be steam cleaned and wire brushed before being brought on the site to remove all rust, soil, and other material which may have come from other hazardous waste sites.
d) No oils or grease will be used to lubricate drill stem threads or any other drilling equipment being used over the borehole or in the borehole without client approval.
e) If drill stems have a tendency to tighten during drilling, Teflon string can be used on the drill stem threads.
f) The drill rig(s) may be steam cleaned prior to drilling each borehole when required.
g) In addition, all downhole drilling and associated equipment that will come into contact with the downhole equipment and sample

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medium will be cleaned and decontaminated by the following procedures.

- Clean with tap water and laboratory grade, phosphate-free detergent, using a brush, if necessary, to remove particulate matter and surface films. Steam cleaning and/or high pressure hot water washing may be necessary to remove matter that is difficult to remove with the brush. Auger flights and drill rods that are used to drill down in preparation for sample collection must be decontaminated thoroughly both on the outside and the inside, if applicable. The steam cleaner and/or high pressure hot water washer will be capable of generating a pressure of at least 2500 PSI and producing hot water and/or steam (200 deg F plus).
- Rinse thoroughly with tap water (potable). Tap water may be applied with a pump sprayer. All other decontamination liquids (deionized water, organic-free water, and solvents), however, must be applied with non-interfering containers. These containers will be made of glass, Teflon, or stainless steel. This aspect of the decontamination procedures used by the driller will be inspected by the site geologist and/or other responsible person prior to beginning of operations. Remove from the decontamination pad and cover with clean, unused plastic. If stored overnight, the plastic should be secured to ensure that it stays in place.
- All downhole augering, drilling, and sampling equipment will be sandblasted before Step #1 if painted, and/or if there is a buildup of rust, hard or caked matter, etc., that can not be removed by steam and/or high pressure cleaning. All sandblasting will be performed prior to arrival on site.
- All well casing, tremie tubing, etc., that arrive on-site with printing and/ or writing on them will have the printing and/or writing removed before Step #1. Printing and/or writing that occurs on materials within and below the bentonite seal will be removed to prevent potential cross-contamination from water soluble ink. Emery cloth or sand paper can be used to remove the printing and/or writing. Most well material suppliers can supply materials without the printing and/or writing if specified when materials are ordered.
- Well casing, tremie tubing, etc., that are made of plastic (PVC) will not be solvent rinsed during the cleaning and decontamination process. Used plastic materials that cannot be cleaned are not acceptable and will be discarded.
- Cleaning and decontamination of all equipment will occur at a designated area on the site, downgradient, and downwind from the clean equipment drying and storage area in a

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location believed to be free of surface contamination. The cleaning and decontamination area will contain a wash water and/or waste pit. The pit and surrounding area will be lined with heavy duty plastic sheeting and designed to promote runoff of the wash/rinse water into the pit. If a pit cannot be excavated, a catch basin can be constructed out of wood and lined with plastic to contain the waste/rinse water until it can be containerized. All cleaning of drill rods, auger flights, well screen, and casing, etc., will be conducted above the plastic sheeting using saw horses or other appropriate means. Sawhorses or racks will be high enough above the ground to prevent equipment from being splashed. At the completion of the drilling activities, the pit will be backfilled with the appropriate material designated by the site project leader, but only after the pit has been sampled, and the waste/ rinse water has been pumped into 55-gallon drums for disposal. No solvent rinsates will be placed in the pit unless prior approval is granted. All solvent rinsates will be collected in separate containers for proper disposal.

- Tap water (potable) brought on the site for drilling and cleaning purposes will be contained in a pre-cleaned tank of sufficient size so that drilling activities can proceed without having to stop and haul water.

7.0 RECORDS

Documentation generated as a result of this procedure is submitted to the designated records system in accordance with Section 17 of the Business Unit QAP.

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8.0 ATTACHMENTS

8.1 Attachment I - Summaries of Additional Decontamination Methods

8.2 Attachment II - Surface Radioactivity Guides

R

Attachment I

Summaries of Additional Decontamination Methods (page 1 of 4)

Method*	Surface	Action	Technique	Advantages	Disadvantages
Vacuum Cleaning	Dry surface	Removes contaminated dust by suction.	Use conventional vacuum techniques with efficient filter.	Good on dry, porous surfaces. Avoids water reactions	All dust must be filtered out or exhaust Machine is contaminated
Water	All nonporous surfaces (metal, painted, plastic, etc.)	Dissolves and erodes.	For large surfaces-hose with high-pressure water at an optimum distance of 15 to 20 feet. Spray vertical surfaces at an angle of incidence of 30° to 40°, work from top to bottom to avoid recontamination. Work upwind to avoid spray. Determine cleaning rate experimentally, if possible, otherwise, use a rate of 4 square feet per minute.	All water equipment may be utilized. Allows operation to be carried out from a distance. Contamination may be reduced by 50%. Water equipment may be used for solutions of other decontaminating agents.	Drainage must be controlled. Not suitable for porous materials. Dried surfaces cannot be decontaminated. Not applicable on any contaminated surfaces (use vacuum); not applicable on porous surfaces such as wood, concrete, canvas, etc. Spray will be contaminated.
	All surfaces	Dissolves and erodes.	For small surfaces-Blot liquid and handwipe with water and appropriate commercial detergent.	Extremely effective if done immediately after spill and on nonporous surfaces.	Of little value in the decontamination of large areas, long-standing contaminants, and porous surfaces.
Steam	Nonporous surfaces (especially painted or oiled surfaces)	Dissolves and erodes.	Work from top to bottom and from upwind. Clean surface area rate of 4 square feet per minute. The cleaning efficiency of steam will be greatly increased by using detergents.	Contamination may be reduced approximately 90% on painted surfaces.	**Steam subject to same limitations as water. Spray hazard makes the wearing of waterproof outfits necessary.**

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Attachment I

Summaries of Additional Decontamination Methods (page 2 of 4)

Method	Surface	Action	Technique	Advantages	Disadvantages
Detergents	Nonporous surfaces (metal, painted, glass, plastic, etc.)	Emulsifies contaminant and increases wetting power of water and cleaning efficiency of steam.	Rub surface 1 minute with a rag moistened with detergent solution, then wipe with dry rag; use clean surface of the rag for each application. Use a power rotary brush with pressure feed for more efficient cleaning. Apply solution from a distance with a pressure proportioner. Do not allow solution to drip onto other surfaces. Mist application is all that is necessary.	Dissolves industrial film and other materials which hold contamination. Contamination may be reduced by 90%	May require personal contact with surface. May not be efficient on longstanding contamination.
Complexing Agents	Nonporous surfaces (especially unweathered surfaces; i.e., no rust or calcareous growth)	Forms soluble complexes with contaminated material.	Complexing agent solution should contain 3% (by weight) of agent. Spray surface with solution. Keep surface moist 30 minutes by spraying with solution periodically. After 30 minutes, flush material off with water. Complexing agents may be used on vertical and overhead surfaces by adding chemical foam (sodium carbonate or aluminum sulfate).	Holds contamination in solution. Contamination may be reduced by 75% in 4 minutes on unweathered surfaces. Easily stored; carbonates and citrates are nontoxic, noncorrosive.	Requires application for 5 to 30 minutes. Little penetrating power; of small value on weathered surfaces.
Organic Solvents	Nonporous surfaces (greasy or coated surfaces, paints or plastic finishes, etc.)	Dissolves organic materials (oil, paint, etc.).	Immerse entire unit in solvent or apply by wiping procedure (see "Detergents").	Quick dissolving action. Recovery of solvent possible by distillation.	Requires good ventilation and fire precautions. Toxic to personnel. Material bulk

R

Attachment I

Summaries of Additional Decontamination Methods (page 3 of 4)

Method*	Surface	Action	Technique	Advantages	Disadvantages
Inorganic Acids	Metal surfaces (especially with porous deposits; i.e., rust or calcareous growth); circulatory pipe systems	Dissolves porous deposits.	Use dip-bath procedure for movable items. Acid should be kept at a concentrate of 1 to 2 normal (9 to 18% hydrochloric, 3 to 6% sulfuric acid). Leave on weathered surfaces for 1 hour. Flush surface with water, scrub with a water-detergent solution, and rinse. Leave in pipe circulatory system 2 to 4 hours; flush with plain water, a water-detergent solution, then again with plain water.	Corrosive action on metal and porous deposits. Corrosive action may be moderated by addition of corrosion inhibitors to solution.	Personal hazard. Wear goggles, rubber boots, gloves, and aprons. Good ventilation required because of toxicity and explosive gases. Acid mixtures should not be heated. Possibility of excessive corrosion if used without inhibitors. Sulfuric acid not effective on calcareous deposits.
Acid Mixtures: hydrochloric, sulfuric acetic citric acids acetates citrates	Nonporous surfaces (especially with porous deposits); circulatory pipe systems	Dissolves porous deposits.	Same as for inorganic acids. A typical mixture consist of 0.1 gal. hydrochloric acid, 0.2 lb. sodium acetate and 1 gal. water.	Contamination may reduce by 90% in 1 hour (unweathered surfaces). More easily handled than inorganic acid solution.	Weathered surfaces may require pretreatment. Same safety precautions as required for inorganic acids.
Caustics: lye (sodium hydroxide) calcium hydroxide potassium hydroxide	Painted surfaces (horizontal)	Softens paint (harsh method).	Allow paint-remover solution to remain on surface until paint is softened to the point where it may be washed off with water. Remove remaining paint with long-handled scrapers. Typical paint remover solution: 10 gal. water, 4 lb. lye, 6 lb. boiler compound, 0.75 lb cornstarch.	Minimum contact with contaminated surfaces. Easily stored.	Personal hazard (will cause burns). Reaction slow; thus, it is not efficient on vertical or overhead surfaces. Should not be used on aluminum or magnesium.

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Attachment I
Summaries of Additional Decontamination Methods (page 4 of 4)

Method	Surface	Action	Technique	Advantages	Disadvantages
Trisodium Phosphate	Painted surfaces (vertical, overhead)	Softens paint (mild method)	Apply hot 10% solution by rubbing and wiping procedure (see "Detergent").	Contamination may be reduced to tolerance in one or two applications.	Destructive effect on paint. Should not be used on aluminum or magnesium.
Abrasion	Nonporous surfaces	Removes surfaces.	Use conventional procedures, such as sanding, filing, and chipping; keep surface damp to avoid dust hazard	Contamination may be reduced to as low a level as desired	Impracticable for porous surfaces because of penetration by moisture
Sandblasting	Nonporous surfaces	Removes surfaces.	Keep sand wet to lessen spread of contamination. Collect used abrasive or flush away with water.	Practical for large surface areas	Contamination spread over area must be removed. Contamination dusts personnel hazard
Vacuum Blasting	Porous and nonporous surfaces	Removes surfaces; traps and controls contaminated waste.	Hold tool flush to surface to prevent escape of contamination.	Contaminated waste ready for disposal. Safest abrasion method.	Contamination of equipment.

Attachment II
Surface Radioactivity Guides

Nuclide	Average[b,c] (dpm/100 cm^2)	Maximum [b, d] (dpm/100 cm^2)	Removeable [b, e] (dpm/100 cm^2)
U-nat, U-235, U-238, and associated decay products	5,000 alpha	15,000 alpha	1,000 alpha
Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231, Ac-227, I-125, I-129	100	300	20
Th-nat, Th-232, Sr-90,Ra-223, Ra-234, U-232, I-126, I-131, I-133	1,000	3,000	200
Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above.	5,000 beta-gamma	15,000 beta-gamma	1,000 beta-gamma

a Where surface contamination by both alpha- and beta-gamma emitting nuclides exists, the limits established for alpha- and beta-gamma-emitting nuclides should apply independently.

b As used in this table, dpm (disintegrations per minute) means the rate of emission by radioactive material as determined by correcting the counts per minute observed by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation.

c Measurements of average contaminant should not be averaged over more than 1 square meter. For objects of less surface area, the average should be derived for each such object.

d The maximum contamination level applies to an area of not more than 100 cm^2.

e The amount of removable radioactive contamination per 100 cm^2 of the surface area should be determined by wiping the area with dry filter paper or soft absorbent paper, applying moderate pressure, and assessing the amount of radioactive material on the wipe with an appropriate instrument of known efficiency. When removable contamination on objects of less surface area is determined, the pertinent levels should be reduced proportionally and the entire surface area should be wiped.

Source: US NRC Regulatory Guide 1.86, June 1974.

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Manual Name: **Quality Assurance Technical Procedures Volume II: Field Standard Operating Procedures**

Document Number: FTP-525

Revision Number: **2**

Date Printed: _____

Person Checking the Revision Number: _____

SCIENCE APPLICATIONS INTERNATIONAL CORPORATION FIELD TECHNICAL PROCEDURE			
Title: Soil Sampling using an Auger			
Procedure No: FTP-525	**Revision: 2**	**Date: 11/18/2008**	**Page 1 of 4**
Business Unit General Manager: Date: 12/8/08		**QA/QC Officer: Date:** C.J. Conant 11/18/2008	

R

1.0 PURPOSE

The purpose of this procedure is to describe the standard method and equipment used to collect soil samples at the surface or in shallow excavations using an auger.

2.0 SCOPE

This procedure provides a disturbed sample. This procedure applies to a wide variety of soil types including sands, clays, and silts. The use of an auger is of limited value in rocky soil.

3.0 REFERENCES, RELATED READING, AND DEFINITIONS

3.1 REFERENCES

3.1.1 See Common References at the front of the FTP Manual.

3.1.2 Environmental Investigations Standard Operating Procedures and Quality Assurance Manual, U.S. Environmental Protection Agency. R

3.1.3 Science Applications International Corporation Field Technical Procedure (SAIC FTP) 650, Labeling, Packaging and Shipping of Environmental Field Samples.

3.1.4 Science Applications International Corporation Field Technical Procedure (SAIC FTP) 625, Chain-of-Custody.

3.1.5 Science Applications International Corporation Field Technical Procedures (SAIC FTP) 691, Composite Procedures.

3.2 DEFINITIONS

3.2.1 Hand-Operated Auger - A small, lightweight, metal auger. Diameters typically range between 1 and 4 inches. Augers normally are used in conjunction with 3 to 4 foot long metal shafts and T-handles.

3.2.2 Motor-Operated Auger - A metal auger attached to a shaft and powered by an internal combustion or electric motor. Typical auger diameters range from 1 to 48 inches. This auger may be hand held.

R

4.0 RESPONSIBILITIES

R

4.1 See Common Responsibilities at the front of the FTP Manual.

4.2 FIELD MANAGER

The Field Manager is responsible for:

4.2.1 ensuring that all personnel perform their assigned duties in accordance with this procedure when it is applicable;

4.2.2 ensuring compliance with the Sampling and Analysis Plan (SAP); and

4.2.3 overall management of field activities.

5.0 GENERAL

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5.1 Any deviations from specified requirements will be justified to and authorized by the Project Manager and/or the relevant Program Manager.

5.2 Deviations from requirements will be sufficiently documented to allow re-creation of the modified process.

5.3 Refer to the site- or project-specific Health and Safety (H&S) Plan for relevant H&S requirements. R

5.4 SAIC and subcontractor personnel who use this procedure must provide documented evidence of having been trained on the procedure to the Program or Project Manager for records purposes.

5.5 This procedure is not appropriate for taking samples at a discrete depth, but may be used to take samples at an approximate depth.

5.6 Sampling tools and equipment are protected from sources of contamination prior to sampling and decontaminated prior to, and between sampling, as specified in FTP-400, Equipment Decontamination.

5.7 The equipment required may include hand-operated, spiral-type, ship-type, open tubular, orchard-barrel, open spiral, closed spiral, post hole, clam shell, or machine-operated augers.

5.8 Augers plated with chrome or other materials, except Teflon, must be cleaned of those materials prior to use. Stainless steel is preferred.

R

5.9 An optional field equipment checklist is provided as a full size form immediately following this procedure. R

6.0 PROCEDURE

6.1 SOIL SAMPLING USING AN AUGER

6.1.1 Don clean gloves and using a stainless steel spoon, or other approved utensil, remove surface vegetation and debris from the immediate area around the marked sampling point.

6.1.2 Use plastic sheeting around work area, as necessary, to prevent equipment from coming in contact with potentially-contaminated surfaces.

6.1.3 Record the appropriate information and observations about the sample location in the field logbook.

6.1.4 Assemble decontaminated auger, extension, and T-handle, if necessary, and advance the auger into the soil to the desired depth.

6.1.5 Withdraw the auger from the soil.

6.1.6 If a sample is not desired, remove the soil from the auger and repeat steps 6.1.3 & 6.1.4. If a sample is to be taken in the next boring, replace the auger bucket with a decontaminated bucket and repeat steps 6.1.2 through 6.1.4.

6.1.7 Perform any H&S measurements as specified in the H&S plan.

6.1.8 Using a stainless steel Teflon spoon, spatula, or disposable scoop remove soil from the auger and place in a stainless steel bowl on a polyethylene sheet or a glass tray. The top two or three inches of soil in the auger are discarded. Remove aliquot for volatile organic analysis. Mix or composite soil in accordance with FTP-691, Composite Procedures and the project-specific SAP. Using a spoon or other approved utensil, remove any large rocks or other organic material (i.e., worms, grass, leaves, roots, etc.).

6.1.9 Using a decontaminated stainless steel or Teflon spoon, spatula, or disposable scoop, as appropriate, place soil samples in compatible containers. Packaging, labeling, and preparation for shipment are implemented in accordance with FTP-650, Labeling, Packaging and Shipping of Environmental Field Samples.

R

6.1.10 Samples are placed in containers defined according to analytical needs specified in the SAP, and then, when appropriate, packed in ice as soon as possible.

6.1.11 If changes in lithology are observed, consult the sampling and analysis plan.

6.1.12 Complete the field logbook and chain-of-custody forms in accordance with procedures, FTP-1215, Field Logbooks and Field Forms and FTP-625, Chain-of-Custody. R

6.1.13 The hole is filled with materials prescribed in the SAP, Waste Management Plan or other applicable guidelines to avoid future safety problems. Excavated materials are placed in containers for disposal or dealt with as specified.

7.0 RECORDS

Documentation generated as a result of this procedure is submitted to the designated records system in accordance with Section 17 of the Business Unit QAP. R

8.0 ATTACHMENTS

None.

Field Checklist

- ☐ Auger
- ☐ Auger Shafts and Handles
- ☐ Wrench
- ☐ Logbook
- ☐ Sample Containers with Lids
- ☐ Safety Glasses or Monogoggles
- ☐ Gloves
- ☐ Safety Shoes
- ☐ Ice/Cooler, as required
- ☐ Black, Indelible Pen
- ☐ Bowls
- ☐ Labels and Tags
- ☐ Plastic Sheets
- ☐ Lab Wipes
- ☐ Decontamination Equipment
- ☐ Chain-of-Custody Forms
- ☐ Custody Seals or Evidence Tape
- ☐ Sampling and Analysis Plan
- ☐ Health and Safety Plan
- ☐ Appropriate Containers for Waste and Equipment
- ☐ Monitoring Instruments
- ☐ Spoons, Scoops, etc.

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Manual Name: **Quality Assurance Technical Procedures Volume II: Field Standard Operating Procedures**

Document Number: FTP-577

Revision Number: **2**

Date Printed: _____

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SCIENCE APPLICATIONS INTERNATIONAL CORPORATION FIELD TECHNICAL PROCEDURE			
Title: Water Sampling Using a Dipper			
Procedure No: FTP-577	**Revision: 2**	**Date: 11/18/2008**	**Page 1 of 5**
Business Unit General Manager: L K Mumbi **Date:** 12/8/08		**QA/QC Officer:** C. J. Coward **Date:** 11/18/2008	

R

1.0 PURPOSE

The purpose of this procedure is to describe the standard methods used for sampling surface waters using a dipper.

2.0 SCOPE

This procedure applies to samples used to obtain physical, chemical, or radiological data. The resulting data may be qualitative or quantitative in nature and are approximate for use in preliminary surveys and confirmatory surveys.

3.0 REFERENCES, RELATED READING, AND DEFINITIONS

3.1 REFERENCES

3.1.1 See Common References at the front of the FTP Manual.

3.1.2 Environmental Investigations Standard Operating Procedures and Quality Assurance Manual, U.S. Environmental Protection Agency.

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3.1.3 Science Applications International Corporation Procedure Field Technical Procedure (SAIC FTP) 400, Equipment Decontamination.

3.1.4 Science Applications International Corporation Field Technical Procedure (SAIC FTP) 625, Chain-of-Custody.

3.1.5 Science Applications International Procedure (SAIC) Field Technical Procedure (FTP) 650, Labeling, Packing and Shipping of Environmental Field Samples.

3.2 DEFINITIONS

None.

R

4.0 RESPONSIBILITIES

R

4.1 See Common Responsibilities at the front of the FTP Manual

4.2 FIELD MANAGER

The Field Manager or designee is responsible for:

4.2.1 ensuring compliance with the Sampling and Analysis Plan (SAP);

4.2.2 ensuring that all personnel perform their assigned duties in accordance with this procedure when it is applicable; and

4.2.3 overall management of field activities.

5.0 GENERAL

5.1 Any deviations from specified requirements will be justified to and authorized by the Project Manager and/or the relevant Program Manager.

5.2 Deviations from requirements will be sufficiently documented to allow re-creation of the modified process.

5.3 Refer to the site- or project-specific Health and Safety (H&S) Plan for relevant H&S requirements. R

5.4 Refer to the SAP for project/task-specific sampling and analysis requirements.

5.5 SAIC and subcontractor personnel who use this procedure must provide documented evidence of having been trained in the procedure to the Program or Project Manager for records purposes.

5.6 A pond sampler, or extended dipper allows sampling of streams, ponds, waste pits, and lagoons as much as 15 feet from the bank or other secure footing for the sampling technicians, (See Attachment I).

5.7 Sampling tools and equipment are protected from sources of contamination prior to sampling, and decontaminated prior to and between sampling, as specified in FTP-400, Equipment Decontamination.

5.8 An optional field equipment checklist is provided as a full size form immediately following this procedure.

6.0 PROCEDURE

6.1 Use plastic sheeting as ground cover for staging of equipment and/or materials, as necessary, to prevent equipment from coming in contact with contaminated surfaces.

6.2 Don clean gloves and select appropriate sample bottles, add preservative if necessary, and place them ready for use.

6.3 If collecting the sample while in a boat or standing in a stream, ensure that the sample is collected upstream from sampler's position and upstream from where flow measurements were taken. New latex gloves are donned prior to collecting each sample.

6.4 Submerge a clean dipper slowly into the water to avoid splashing or mixing. Collect samples upstream from any area previously disturbed by sampling activity.

6.5 Slowly lift the dipper from the water surface. Unless specified in the SAP, avoid floating materials.

6.6 When volatile organic analysis (VOA) is to be performed, extreme care must be taken to avoid disturbing or aerating the sample.

6.7 This procedure will not be used when a significant amount of material might remain on the dipper when pouring into the sample bottle. In this situation, refer to the SAP.

6.8 Remove the cap from the sample bottle, and tilt the bottle slightly.

6.9 Pour the sample slowly from the dipper down the inside of the sample bottle. Avoid splashing of the sample.

6.10 Leave adequate air space in the bottle to allow for expansion, except for VOA vials.

6.11 Label the bottle carefully and clearly in accordance with FTP-650, Labeling, Packaging and Shipping of Environmental Field Samples. Enter all information accurately, and check to be sure it is legible.

6.12 Packaging, labeling, and shipment are implemented in accordance with FTP-650, Labeling, Packaging and Shipping of Environmental Field Samples.

R

6.13 Complete field logbook and chain-of-custody forms in accordance with procedures FTP-1215, Field Logbooks and Field Forms and FTP-625, Chain-of-Custody. R

7.0 RECORDS

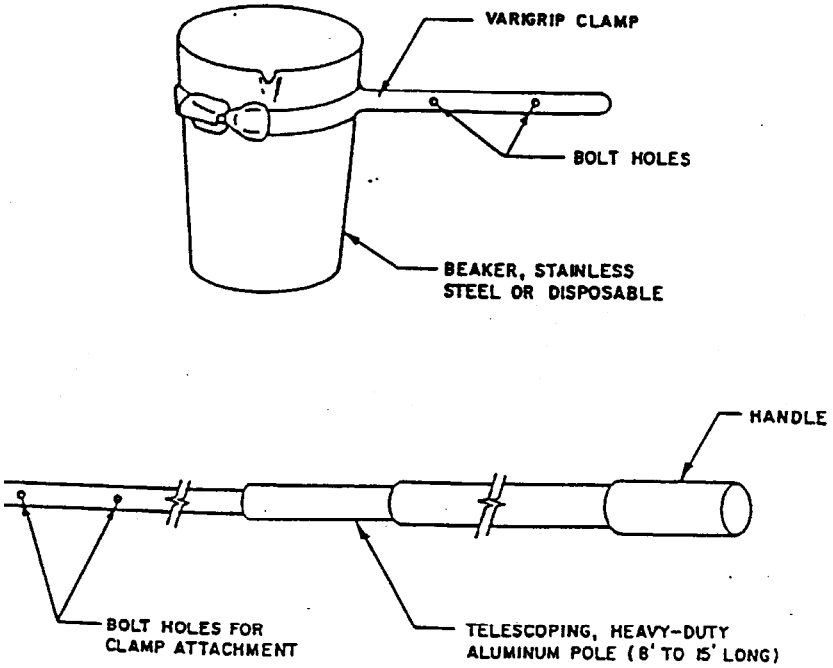
Documentation generated as a result of this procedure is submitted to the designated records system in accordance with Section 17 of the Business Unit QAP. R

8.0 ATTACHMENTS

8.1 Attachment I - Pond Sampler

R

Attachment I
Pond Sampler



Field Checklist

- ☐ Dipper
- ☐ Pond Sampler, if necessary
- ☐ Logbook
- ☐ Sample Bottles w/Lids
- ☐ Safety Equipment
- ☐ Ice/Cooler, as required
- ☐ Health and Safety Plan
- ☐ Sampling and Analysis Plan
- ☐ Appropriate Containers for Waste and Equipment
- ☐ Quality Assurance Project Plan (QAPjP)
- ☐ Work Plan
- ☐ Pipettes
- ☐ Litmus Paper
- ☐ Sample Tags
- ☐ Extra Sample Jars
- ☐ Black Indelible Pen
- ☐ Labels and Tags
- ☐ Lab Wipes
- ☐ Decontamination Equipment
- ☐ Chain-of-Custody Forms
- ☐ Custody Seals, as required
- ☐ Chemical Preservatives, as required
- ☐ Plastic Sheeting

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Manual Name: **Quality Assurance Technical Procedures Volume II: Field Standard Operating Procedures**

Document Number: FTP-600

Revision Number: **2**

Date Printed: _____

Person Checking the Revision Number: _____

SCIENCE APPLICATIONS INTERNATIONAL CORPORATION FIELD TECHNICAL PROCEDURE			
Title: Groundwater Sampling Procedures: Using a Bailer			
Procedure No: FTP-600	**Revision: 2**	**Date: 11/18/2008**	**Page 1 of 5**
Business Unit General Manager: Date:		**QA/QC Officer: Date:**	
12/8/08		11/18/2008	

R

1.0 PURPOSE

The purpose of this procedure is to describe the standard method for collecting groundwater samples using a bailer.

2.0 SCOPE

This procedure applies to collection of groundwater samples used to obtain physical, chemical, or radiological data.

3.0 REFERENCES AND DEFINITIONS

3.1 REFERENCES

3.1.1 See Common References at the front of the FTP Manual.

3.1.2 Environmental Investigations Standard Operating Procedures and Quality Assurance Manual, U.S. Environmental Protection Agency. R

3.1.3 Science Applications International Corporation (SAIC) Field Technical Procedure (FTP) 400, Equipment Decontamination.

3.1.4 Science Applications International Corporation (SAIC) Field Technical Procedure (FTP) 625, Chain-of-Custody.

3.1.5 Science Applications International Corporation (SAIC) Field Technical Procedure (FTP) 650, Labeling, Packaging and Shipping of Environmental Field Samples. R

3.2 DEFINITIONS

None

4.0 RESPONSIBILITIES

4.1 See Common Responsibilities at the front of the FTP Manual. R

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4.2 FIELD MANAGER

The Field Manager or designee is responsible for:

4.2.1 ensuring that all personnel perform their assigned duties in accordance with this procedure when it is applicable;

4.2.2 ensuring compliance with the Sampling and Analysis Plan (SAP); and

4.2.3 overall management of field activities.

5.0 GENERAL

5.1 Any deviations from specified requirements will be justified to and authorized by the Project Manager and/or the relevant Program Manager and will be sufficiently documented on the appropriate field change forms to allow re-creation of the modified process.

5.2 Refer to the site- or project-specific Health and Safety (H&S) Plan for relevant H&S requirements. R

5.3 Refer to the SAP for project/task-specific sampling and analysis requirements.

5.4 SAIC and subcontractor personnel who use this procedure must provide documented evidence of having been trained on the procedure to the Program or Project Manager for records purposes.

5.5 Bailers will be constructed of stainless steel or Teflon and will be bottom loading. Bailers with bottom emptying devices are used to reduce spillage and sample agitation (see Attachment I). The SAP typically specifies appropriate size of bailer. The Teflon bailer is recommended for collection of groundwater samples for volatile organic compound (VOC) analysis. R

5.6 The cord will be compatible with analytes (i.e., stainless steel, Teflon, nylon, polyethylene). Materials are typically specified in the SAP. Braided cord will not be reused or decontaminated, but may be dedicated.

5.7 Wells may have dedicated or disposable bailers to minimize cross-contamination.

5.8 Only unused, decontaminated, or dedicated cord will be used.

5.9 A decontaminated reel for winding the cord is useful in raising and lowering the bailer.

R

5.10 An optional field equipment checklist is provided as a full size form immediately following this procedure.

6.0 PROCEDURE

6.1 Don appropriate personal protective equipment prior to any field activities.

6.2 Place plastic sheeting around base of well and in work area to prevent equipment from coming in contact with contaminated surfaces.

6.3 Unlock and remove the well cap, note condition of well.

6.4 Prior to sampling, check the well with photoionization detector (PID), radiation meters, and/or other appropriate instruments. Record sampling station number, sample I.D., date, time, weather conditions, and any other well-specific, pertinent information (i.e., water level, presence of product).

6.5 Wells will be sampled immediately upon completion of purging operations. If the well is pumped dry during purging, the sample will be collected as soon as a sufficient volume of water has recovered. Refer to the SAP for additional approved sampling procedures.

6.6 Remove decontaminated bailer from protective covering or dedicated bailer from well casing, attach cord if necessary, allowing enough length for bailer to reach bottom of well.

6.7 Select appropriate sample bottle, add preservatives, if necessary, and place them ready for use. Lower bailer slowly to the interval from which the sample is to be collected.

6.8 Allow bailer to fill with a minimum of surface disturbance to prevent sample water aeration.

6.9 Slowly raise bailer to surface, feeding cord into container, reel, or place onto clean plastic sheeting. Do not allow bailer or bailer cord to contact ground.

6.10 Remove the cap from the sample bottle, and tilt the bottle slightly.

6.11 Pour the sample slowly down the inside of the sample bottle. Avoid splashing of the sample.

6.12 Leave adequate air space in the bottle to allow for expansion, except for volatile organic compound (VOC) vials which are filled with no air present and capped.

R

6.13 All samples preserved using a pH adjustment (except VOCs) must be checked, using pH strips, to ensure that they were adequately preserved. This is done by pouring a small volume of sample over the strip. Do not place the strip in the sample.

6.14 Label the bottle carefully, and clearly. Enter all information accurately, and check to be sure it is legible.

6.15 Samples are placed in containers defined according to needs, and then, when appropriate, packed in ice as soon as possible. Packaging, labeling, and preparation for shipment are implemented in accordance with FTP-650, Packaging and Shipping of Field Samples.

6.16 Complete field logbook and chain-of-custody forms in accordance with procedures FTP-1215, Field Logbooks and Field Forms and FTP-625, Chain-of-Custody. R

6.17 Replace bailer if dedicated; replace well cap and lock.

6.18 Sampling tools, instruments, and equipment are protected from sources of contamination prior to use and decontaminated after use as specified in FTP-400, Equipment Decontamination.

7.0 RECORDS

Documentation generated as a result of this procedure is submitted to the designated records system in accordance with Section 17 of the Business Unit QAP. R

8.0 ATTACHMENTS

8.1 Attachment I – Typical Bottom Loading Bailer R

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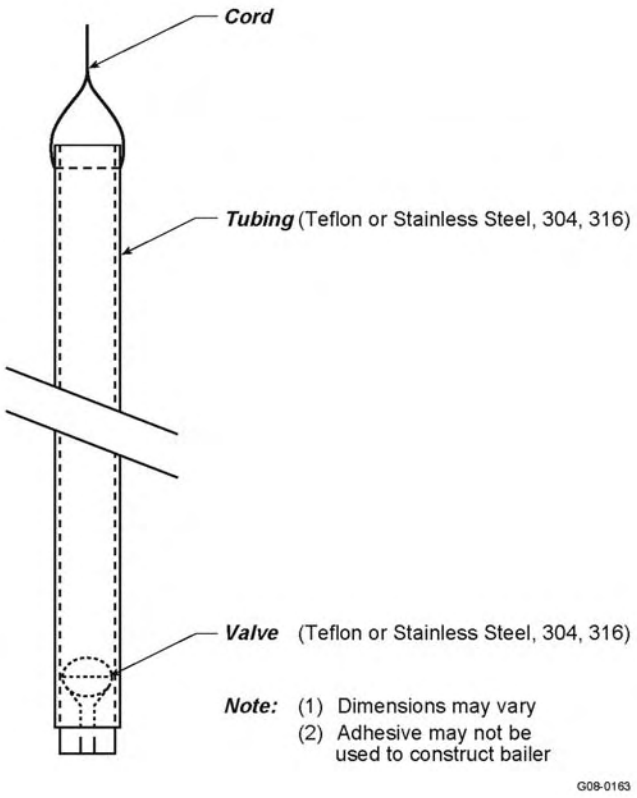
Attachment I
Typical Bottom Loading Bailer



Field Checklist

- ☐ Bailer
- ☐ Container, Reel or Plastic Sheeting to Collect Cord
- ☐ Cord*
- ☐ Logbook
- ☐ Sample Containers with Lids
- ☐ Safety Glasses or Monogoggles
- ☐ Safety Shoes, if required
- ☐ Ice/Cooler, as required
- ☐ Custody Seals, as required
- ☐ Plastic Sheeting
- ☐ Pipettes
- ☐ Bucket of Known Volume
- ☐ Black, Indelible Pen
- ☐ Labels and Tags
- ☐ Sampling and Analysis Plan
- ☐ Health and Safety Plan
- ☐ Waste Management Plan
- ☐ Decontamination Equipment
- ☐ Lab Wipes
- ☐ Appropriate Containers for Waste and Equipment
- ☐ Monitoring Equipment
- ☐ Preservatives
- ☐ pH Paper
- ☐ Sampling Forms
- ☐ Keys for Well Lock

*Refer to SAP for Approved Material

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Manual Name: **Quality Assurance Technical Procedures Volume II: Field Standard Operating Procedures**

Document Number: FTP-625

Revision Number: **2**

Date Printed: _____

Person Checking the Revision Number: _____

SCIENCE APPLICATIONS INTERNATIONAL CORPORATION FIELD TECHNICAL PROCEDURE			
Title: Chain-of-Custody			
Procedure No: FTP-625	**Revision: 2**	**Date: 11/18/2008**	**Page 1 of 9**
Business Unit General Manager: Date: 12/8/08		**QA/QC Officer: Date:** 11/18/2008	

R

1.0 PURPOSE

The purpose of this procedure is to outline methods to ensure the integrity of environmental samples, from collection to final disposition, by documenting possession. The documentation traces possession of samples from their collection through all transfers of custody until final disposition, including archiving, when required.

2.0 SCOPE

This procedure applies to all sampling activities in which the samples leave the sampler's possession.

3.0 REFERENCES AND DEFINITIONS

3.1 REFERENCES

3.1.1 See Common References at the front of the FTP Manual.

3.1.2 Environmental Investigations Standard Operating Procedures and Quality Assurance Manual, U.S. Environmental Protection Agency. R

3.2 DEFINITIONS

3.2.1 Chain-of-Custody Form - A form (usually pressure sensitive and duplicate or triplicate) used to document all transfers of possession of an environmental sample from time of collection until final disposition. A chain-of-custody form is identified by a unique number printed or entered on the form.

3.2.2 Field Logbook - A bound book with sequentially numbered pages that is used to create a permanent, real-time record of activities and conditions, significant events, observations, and measurements which occur during each day of field activities.

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3.2.3 Sample Container - Either an individual sample container, such as a bottle, or a shipping container, such as an ice chest, which may have or require an associated certification lot number.

3.2.4 Sample Container Label - A waterproof paper or plastic, pressure-sensitive, gummed label placed on the sample container bottle. Information regarding the sampling activity is recorded on the label, and the label is attached to the appropriate bottle.

3.2.5 Sample Identification (ID) Number - A unique number assigned to a sample that is used to trace the sample from its origin to final reporting of data. Features of the ID may be used to identify the sampling location, installation type, sequential sample number, the media (air, water, or soil) sampled, or other pertinent descriptive information.

4.0 RESPONSIBILITIES

4.1 See Common Responsibilities at the front of the FTP Manual. R

4.2 FIELD MANAGER

The Field Manager is responsible for:

4.2.1 ensuring that all personnel perform their assigned duties in accordance with this procedure when it is applicable;

4.2.2 ensuring compliance with the Sampling and Analysis Plan (SAP);

4.2.3 overall management of field activities;

4.2.4 assuming custody of the collected samples in the field (if appropriate) until he or she properly transfers them to a Sample Manager, to a courier, or directly to the laboratory; and

4.2.5 ensuring that sample custody is maintained from the time of sample collection until release to a courier or a laboratory.

4.2.6 ensuring that field chain-of-custody forms are provided to data management personnel. R

5.0 GENERAL

5.1 Any deviations from specified requirements will be justified to and authorized by the Project Manager and/or the relevant Program Manager and will be documented on the appropriate field change forms.

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5.2 Deviations from requirements will be sufficiently documented to allow re-creation of the modified process.

5.3 Refer to the site- or project-specific Health and Safety (H&S) Plan for relevant H&S requirements. R

5.4 Refer to the site or project/task-specific SAP for relevant sampling and analysis requirements.

5.5 SAIC and subcontractor personnel who use this procedure must provide documented evidence of having been trained on the procedure to the Program or Project manager for records purposes.

5.6 All field team members entering data will use indelible black ink. All entries must be legible. If an error is made, the field team member draws one line through the incorrect entry so that data is not obliterated, and initials and dates each correction. Dates and times are recorded using the format “mm/dd/yy” for the date and the military or 24-hour clock to record the time. Zeros in the sample identification number will be recorded with a slash (/) to distinguish them from the letter "O".

6.0 PROCEDURE

6.1 SAMPLES UNDER CUSTODY

6.1.1 A sample is considered to be under a specific person’s custody if any of the following conditions are met:

a) the sample is in the person’s physical possession;
b) the sample is in line of sight of the person after he/she has taken possession;
c) the sample is secured by that person so any tampering can be detected; and
d) a sample is secured by the person in possession, in an area which only authorized personnel can enter.

6.1.2 Chain-of-custody requirements are necessary whenever a sample leaves the sampling team’s custody or when samples are collected and archived.

6.2 SAMPLE LABELS

6.2.1 Sample container labels are completed by entering the required information.

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6.2.2 Sample containers shall be labeled (e.g.,) marked) using printed labels or by marking directly on sample containers prior to or at the time of sampling. To the extent practicable, sample bottles are labeled prior to filling. R

6.2.3 Labels are completed with black indelible ink and typically include the following information:

a) unique field study or sampling activity name and/or number;
b) unique sample identification number;
c) sample location (station) or appropriate identification as identified in the sampling program;
d) sample preservation used;
e) media sampled;
f) sample type;
g) analyses requested;
h) destination laboratory name;
i) sampling date and time;
j) collector's name; and
k) comments and special precautions as needed.

6.2.4 Labels may be preprinted with most of the information. It is suggested that after sample labels are filled out and affixed to the sample container, the label will be covered with wide clear tape to preserve the label during shipment, if water proof labels are not used.

6.3 SAMPLE SEALS

6.3.1 Sample seals are used to detect tampering following sample collection and prior to the time of analysis.

6.3.2 The seal is attached in such a way that it is necessary to break the seal in order to open the sample container. ("Sample containers" may refer to either individual sample containers or a shipping container such as an ice chest.)

6.3.3 Seals are affixed to the containers as soon as possible following collection, before they leave the custody of the sampling personnel.

6.3.4 Sample seals will be waterproof paper or plastic with gummed backs.

6.3.5 All samples designated for shipment which leave the sampler's custody will have a sample seal affixed which includes the date the sample was collected and the initials of the person who collected the samples.

6.3.6 Alternately, evidence tape with collector's initials and date may be used.

R

6.4 FIELD LOGBOOKS

6.4.1 A field logbook entry is made at the time the chain-of-custody is generated when the sample is taken to record the chain-of-custody number. R

6.4.2 Any additional chain-of-custody information required by the project-specific SAP or QAPjP is also entered in the field logbook as required.

6.5 CHAIN-OF-CUSTODY FORMS

6.5.1 The chain-of-custody form is completed by the sampling personnel at the time of the sampling event.

6.5.2 The chain-of-custody form includes the following information:

a) unique field study or sampling activity name and/or number;
b) sampling personnel signatures and printed names;
c) unique sample identification number(s);
d) analyses required for each sample;
e) date and time the sample was collected;
f) sample media;
g) comments regarding the sampling event;
h) shipping information including (1) number of shipping containers; (2) method of shipment; and (3) special handling requirements, if any.
i) number of bottles/vials for each sample number/analysis;
j) signatures of person relinquishing custody and person accepting custody each time custody is transferred from one individual to another; and
k) date and time of each transfer.

6.5.3 One sample is entered on each line and a sample is not split on multiple lines.

6.5.4 If QA samples are provided to another laboratory facility or government agency, a separate chain-of-custody form will be filled out in the field by a sampling team member when the sample is taken.

6.5.5 Copies of chain-of-custody forms will be maintained by the Field Manager and/ or Data Management.

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6.6 DELIVERY OF SAMPLES TO THE LABORATORY

6.6.1 The field sampling team member places the sample in an identified container for storage until all samples have been collected for that sampling activity.

6.6.2 A Shipping Coordinator, Field Sampling Leader, or field sampling team member who ships samples from the field to the laboratory completes the chain-of-custody form, including referencing all QC samples, signs the form, and notes the date and time of shipment.

6.6.3 A field sampling team member inspects the form for completeness and accuracy. He or she makes any needed corrections.

6.6.4 A field sampling team member detaches the proper copies of the form or makes copies as appropriate. R

6.6.5 A field sampling team member places the chain-of-custody form in a reclosable plastic bag and tapes it to the inside of the cooler lid. The sample shipping container is then sealed, and custody seals are placed on the container so that it cannot be opened without breaking the seals. The seal must be signed and dated.

6.6.6 The person who is going to deliver the samples to a courier takes custody of the samples.

6.6.7 If the samples must be shipped to a distant laboratory, the Shipping Coordinator or field sampling team member arranges by phone for a courier pickup or transports the sealed containers to a commercial air courier for overnight delivery to the laboratory. He or she records the airbill number and signs his or her name and records the company name, date, and time in the relinquished block on the chain-of-custody form. He or she writes in the name of the courier company, date, and time in the received by block. The airbill is retained as part of the chain-of-custody documentation.

6.6.8 If a local laboratory will perform analysis, the Field Sampling Leader, Shipping Coordinator, or a field team member may transport the samples to the laboratory facility directly from the field either throughout the day or at the end of each day's sampling effort. The Field Sampling Leader, Shipping Coordinator, or field team member delivering the samples to a local laboratory will relinquish custody to the laboratory and sign, and write in the date and time of the transfer in the appropriate box on the chain-of-custody form.

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6.6.9 If samples are not immediately transported to the analytical laboratory, they remain in the custody of the Shipping Coordinator or the Field Sampling Leader. Samples with the need for temperature controls are stored under refrigeration with a custody seal affixed. Samples with no need for temperature controls are kept in a dry location with a custody seal affixed. R

6.7 LABORATORY RECEIPT

6.7.1 Upon receipt of the samples at the laboratory, the laboratory receiving staff member signs his or her name, company name, date, and time in the received by block of the chain-of-custody form.

6.7.2 On the chain-of-custody form, the laboratory sample receiving personnel document the condition of the samples in regard to temperature, integrity of chain-of-custody seals, and proper preservation.

6.7.3 The laboratory personnel verify that information on the chain-of-custody form and labels is complete and accurate.

6.7.4 The laboratory follows chain-of-custody procedures as required by its Quality Assurance Plan. The laboratory may initiate a laboratory internal chain-of-custody form to track the sample throughout the laboratory process.

6.7.5 If problems are identified, the laboratory contacts the designated SAIC contact to inform them of the type of problem and actions to prevent recurrence.

6.7.6 The laboratory provides a receiving report to the Project Manager or designee, which contains the information specified in the laboratory's Statement of Work or in the Sampling and Analysis Plan (SAP).

7.0 RECORDS

As noted in this procedure, there are several items that are part of the system for documenting chain-of-custody. The following is a listing of all items that must be used to document chain-of-custody:

a) chain-of-custody forms tracing possession of samples from their collection to final disposition;
b) field logbooks documenting information pertaining to the actual sample collection event; and
c) laboratory receiving report verifying receipt of samples and their requested analysis.

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Documentation generated as a result of this procedure is submitted to the designated records system in accordance with Section 17 of the Business Unit QAP. R

8.0 ATTACHMENTS

8.1 Attachment I - Chain-of-Custody Form (Example)

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SAIC
An Employee-Owned Company
Science Applications International Corporation
151 Lafayette Drive Oak Ridge, TN 37830 (865) 481-4600

CHAIN OF CUSTODY RECORD

COC NO.:

PROJECT NAME:

PROJECT NUMBER:

PROJECT MANAGER:

Sampler (Signature) (Printed Name)

REQUESTED PARAMETERS

LABORATORY NAME:

LABORATORY ADDRESS:

PHONE NO:

Sample ID	Date Collected	Time Collected	Matrix	Toxicology Test (10 day Hyalella)	No. of Bottles/Vials	OBSERVATIONS, COMMENTS, SPECIAL INSTRUCTIONS

RELINQUISHED BY:	Date/Time	RECEIVED BY:	Date/Time	TOTAL NUMBER OF CONTAINERS: / Cooler Temperature:
COMPANY NAME:		COMPANY NAME:		Cooler ID: / FEDEX NUMBER:
RECEIVED BY:	Date/Time	RELINQUISHED BY:	Date/Time	
COMPANY NAME:		COMPANY NAME:		
RELINQUISHED BY:	Date/Time	RECEIVED BY:	Date/Time	
COMPANY NAME:		COMPANY NAME:		

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Manual Name: **Quality Assurance Technical Procedures Volume II: Field Standard Operating Procedures**

Document Number: FTP-650

Revision Number: 3

Date Printed: _____

Person Checking the Revision Number: _____

SCIENCE APPLICATIONS INTERNATIONAL CORPORATION FIELD TECHNICAL PROCEDURE			
Title: Labeling, Packaging and Shipping of Environmental Field Samples			
Procedure No: FTP-650	**Revision: 3**	**Date: 5/29/2009**	**Page 1 of 10**
Business Unit General Manager: Date: 6/1/09		**QA/QC Officer: Date:** 5/29/2009	

R

1.0 PURPOSE

The purpose of this procedure is to describe the minimum requirements to properly label and package containers of samples for transport.

2.0 SCOPE

This procedure applies to samples collected in the course of environmental field investigations and monitoring activities.

3.0 REFERENCES, RELATED READING, AND DEFINITIONS

3.1 REFERENCES

3.1.1 See Common References at the front of the FTP Manual.

3.1.2 Code of Federal Regulations, Title 40, Protection of Environment.

3.1.3 Code of Federal Regulations, Title 49, Transportation.

3.1.4 Dangerous Goods Regulations, International Air Transport Association (IATA), latest revision.

3.1.5 Science Applications International Corporation, Field Technical Procedure (SAIC FTP) 405, Cleaning and Decontaminating Sample Containers and Sample Equipment.

3.1.6 Science Applications International Corporation, Field Technical Procedures (SAIC FTP) 625, Chain of Custody.

3.1.7 Science Applications International Corporation, Field Technical Procedures (SAIC FTP) 651, Hazardous Materials/ Dangerous Goods Shipping

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3.2 DEFINITIONS

None.

4.0 RESPONSIBILITIES

4.1 See Common Responsibilities at the front of the FTP Manual.

4.2 FIELD MANAGER

The Field Manager is responsible for:

4.2.1 ensuring that all personnel perform their assigned duties in accordance with this procedure when it is applicable;

4.2.2 ensuring compliance with the Sampling and Analysis Plan (SAP);

4.2.3 overall management of field activities; and

4.2.4 ensuring that sample packaging and shipping is performed safely.

5.0 GENERAL

5.1 Any deviations from specified requirements will be justified to and authorized by the Project Manager and/or the relevant Program Manager.

5.2 Deviations from requirements will be sufficiently documented to allow re-creation of the modified process.

5.3 Refer to the site- or project-specific Health and Safety (H&S) Plan for relevant H&S requirements.

5.4 SAIC and subcontractor personnel who use this procedure must provide documented evidence of having been trained on the procedure to the Program or Project Manager.

5.5 Receivers and carriers should be contacted prior to packaging to ascertain any specific restrictions, such as weight limits, delivery and pick up schedules, receiving hours, or sample disposal terms.

5.6 A unique sample identification will be assigned to each sample. The identification scheme will be presented and approved in the Sampling and Analysis Plan. The identification scheme will be designed such that at a minimum the site, sample location within the site, sample matrix, sample interval, and sample type (i.e. environmental, duplicate, split, etc.) can be ascertained from the sample identification. Frequently you cannot include all of this information in a sample number. Some programs may have requirements for sample numbers that must be followed. The requested

analysis, sample date and time, and preservative will also be presented on the sample label.

5.7 Individual sample containers are checked against accompanying chain-of-custody and analytical request forms prior to signing for receipt from sample collection personnel.

5.8 Site samples are placed in strong exterior shipping packages and surrounded with compatible cushioning/absorbent material, if necessary.

5.9 The shipping package is labelled and marked in accordance with U.S. Department of Transportation (DOT) and/ or International Air Transport Association (IATA) regulations and carrier or receiver-specific instructions. DOT applies primarily to ground transport and IATA applies to air cargo transport.

5.10 The chain-of-custody form must accompany the package as specified in the approved Chain-of-Custody procedure. The package is closed and sealed, as appropriate, and any required shipping papers prepared.

5.11 An example (non-mandatory) Cooler Shipping Description Log is provided as Attachment III, which may be useful for projects which require detailed cooler contents information in a logbook.

6.0 PROCEDURE

6.1 SAMPLE CLASSIFICATION

The sample team leader classifies each sample as environmental or one of several categories of hazardous material/ dangerous goods as defined by the DOT (49 CFR) and the IATA Dangerous Goods Regulations.

6.1.1 Environmental Samples

A sample that does not meet the criteria for any of the nine hazard classes identified in this section is an environmental sample.

Note: The vast majority of soil, groundwater, and surface water samples are environmental samples.

6.1.2 Hazardous Materials/ Dangerous Goods

A sample that meets the criteria for one or more of the following classes of hazardous materials/ dangerous goods must be shipped per the requirements of 49 CFR if a surface shipment or by the

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requirements of the IATA Dangerous Goods regulations if an air shipment.
Note: There are additional requirements beyond the mechanics of shipping including hazardous materials awareness, safety, and function specific training every two years.

Class 1. Explosives- any substance or article which is designed to explode or capable of exploding. If the sample team leader has knowledge that a sample contains a sufficient quantity/ concentration of explosive compound(s) to meet this criterion, the sample must be shipped as an explosive.
Note: Notification must be made to the Project Manager and Group H&S Officer prior to shipment or handling. Under no circumstances ship or otherwise handle explosive devices.

Class 2. Gases- cylinders of compressed gasses such as acetylene, nitrogen, air, oxygen, etc.
Note: Field samples do not normally include compressed gases.

Class 3. Flammable liquids- liquids with flash points less than 140°F such as gasoline, toluene, isopropyl alcohol, or a mixture known to contain more than 1% (10,000 ppm) of a flammable liquid [49 CFR 173.120(ii)].
Note: A useful field indicator that a sample may be a flammable liquid is a reading with a combustible gas indicator greater than 20% LEL in the head space of the sample container.

Class 4. Flammable solids- substances liable to spontaneous combustion, substances which, in contact with water, emit flammable gases- wetted explosives, self reactive materials, readily and spontaneously combustible materials. If the sample team leader has knowledge that a sample contains a sufficient quantity/ concentration of such materials to meet any of these criteria, the sample must be shipped as Class 4.
Note: These are highly reactive materials and will generally not be encountered in an unreacted state during environmental sampling unless samples are collected from intact containers. Notification must be made to the Project Manager and Group H&S Officer prior to shipment or handling.

Class 5. Oxidizing substances and organic peroxides- materials such as swimming pool chlorine, that will release oxygen in contact with organic materials and organic compounds containing the -O-O- structure which may be considered as derivatives of hydrogen peroxide (at greater than 1% concentration). If the sample team leader has

knowledge that a sample contains a sufficient quantity/ concentration of such materials to meet either of these criteria, and has not previously reacted with materials in the immediate environment, the sample must be shipped as Class 5.
Note: These are highly reactive materials and will not generally be encountered in an unreacted state in environmental sampling unless samples are collected from intact containers. Notification must be made to the Project Manager and Group H&S Officer prior to shipment or handling.

Class 6. Poisonous and infectious substances- materials with an acute oral LD_{50} of not more than 500 mg/kg (liquid) or 200 mg/kg (solid) or a viable organism that causes or may cause disease in humans or animals.
Note: Potentially poisonous samples are samples known to contain percent (not ppm) concentrations of mercury, tetrachloroethane, or other DOT defined poisonous materials. Potentially infectious substances are hospital (and related) wastes, and biological warfare agents.

Class 7. Radioactive materials- a material with > 0.002 µCi/ gram.
Note: A sample may meet the definition of radioactive material if it produces a radiological survey instrument reading (in counts per minute) in excess of 200% of regional background readings. Note that this is a conservative number and should be considered as a flag indicating the need for further investigation. Notification must be made to the Project Manager and Group H&S Officer prior to shipment.

Class 8. Corrosive material- materials capable of causing destruction or irreversible skin damage from a contact period of four hours or less.
Note: Generally, this applies to materials with a pH of less than 2 or more than 12. Preservation of samples of water with corrosive materials does not make those water sample DOT regulated corrosive materials. DOT letters of interpretation specifically exclude preserved water samples from this class if the samples are preserved per EPA method.

Class 9. Miscellaneous Hazardous Material- a material that has a property that would impair the performance of an aircraft crew member, a hazardous waste requiring a manifest, a hazardous substance that exceeds the reportable quantity in one package, and dry ice, among many other things.
Note: A soil or water sample containing unknown concentrations of contaminants does not meet this definition. Samples of a material that is known (identified) as hazardous waste do meet this definition. A sample preserved with dry ice also fits this class.

6.2 SAMPLE PACKAGING, LABELING, AND MARKING

6.2.1 Environmental Samples

Samples shipped to a laboratory for the purpose of testing are exempt from the requirements of 40 CFR 261 through 268 or Part 270 or Part 124 or the notification requirements of section 3010 of the Resource Conservation and Recovery Act (RCRA). Environmental samples will be packaged as follows:

a) Verify all sample containers contain the correct preservative and are of appropriate type and volume;
b) Clean the exterior of filled sampled container (See FTP-405);
c) Attach a label with unique sample identification(completed with indelible black ink) to the sample bottle;
d) Seal the tops of bottles, except VOA vials, with appropriate tape or other secure fastening;
e) Apply custody seals;
f) Place each sample bottle in a plastic bag, squeeze as much air as possible from the bag, seal the bag;
g) Wrap glass containers in bubble wrap;
h) Prepare the shipping container (cooler) by taping the drain plug shut from the inside and outside, lining the cooler with a large heavy-duty plastic bag, and placing approximately 1 inch of packing material such as vermiculite, perlite, or bubble wrap in the bottom of the bag liner;
i) Place the sample containers upright in the cooler, do not stack sample containers;
j) Add sufficient ice to maintain the samples at the required temperature and include a temperature blank, at a minimum, all containers are covered with ice. Ice should be placed inside two zip-seal bags to prevent breaking, when required;
k) Fill the cooler with appropriate sorbent/ padding, not required if containers are wrapped in bubble wrap;
l) Tape the liner shut;
m) Seal the laboratory paperwork inside a plastic bag and tape it to the inside of the cooler lid;
n) Tape the lid of the cooler with duct tape, apply around the seam. Strapping tape should be wrapped around the cooler in two locations, if samples are shipped via commercial carrier;
o) Place signed custody seals on the front and back of the cooler; and

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p) Assure that the following information accompanies the samples: sample collector's name, mailing address, and telephone number, laboratory's name, mailing address, and telephone number, quantity of sample, date of shipment, and description of the samples.

Note: The steps described in a) through o) above are typical, but may be modified by the Field Operations Manager in accordance with a project-specific Sampling and Analysis Plan.

6.2.2 Hazardous Materials/ Dangerous Goods/ Radioactive Materials

Packaging for samples of hazardous materials/ dangerous goods/ radioactive materials must meet the requirements for environmental samples as well as additional requirements of DOT and IATA (if the sample will be shipped by air).

Note: This procedure cannot address all the requirements of the regulations. Expert advice must be obtained prior to shipping hazardous materials/ dangerous goods. Shipping firms such as Federal Express and UPS have hazardous materials/ dangerous goods departments which can provide specific guidance on packaging and other shipping requirements. Refer to FTP-651 for additional information.

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6.3 ASSOCIATED DOCUMENTATION

6.3.1 Environmental Samples

Chain of Custody Record (See FTP-625)
Custody Seal (See Attachment I)
Sample Label (See Attachment II)

6.3.2 Hazardous Materials/ Dangerous Goods

See FTP-651

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7.0 RECORDS

Documentation generated as a result of this procedure is submitted to the designated records system in accordance with Section 17 of the Business Unit QAP.

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8.0 ATTACHMENTS

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8.1 Attachment I - Custody Seal and Sample Label (Examples)

8.2 Attachment II- Cooler Shipping Description Log (Example)

Attachment I

Sample Label (Example)

Lab: Southwest Laboratory of

Sample ID: B12ss-ØØ1-Ø378-SO

Area: Building 12ØØ
Station: B12ss-ØØ1
Media: Surface Soil
Type: Grab Composite
Analysis: SVOC,Pest/PCB,Explosives
Preserv: Cool,4C

Rad Screen: _____
Collection Date/Time: _____
Comment: _____
Collected by: _____

Custody Seal (Example)

SECURITY SEAL	DATE_____
DO NOT TAMPER	INITIALS_____

Attachment II
(Example)

COOLER SHIPPING DESTRIPTION LOG

PROJECT NAME:_____ PROJECT NO: _____

_____

LER NO: _____ AIR BILL NO: _____ DATE:_____

COOLER CONTENT INFORMATION

AL NUMBER OF SAMPLES IN COOLER:_____

SAMPLES CLASSIFIED AS ENVIRONMENTAL: YES_____ NO_____

D, NUMBER OF SAMPLES IN THE FOLLOWING CATEGORIES:

mable liquid- DOT/IATA Class 3 _____

onous material - DOT/IATA Class 6 _____

oactive material - DOT/IATA Class 7 _____

osive material - DOT/IATA Class 8 _____

rdous waste/ substance - DOT/IATA Class 9 _____

ROVAL TO SHIP: YES ___ NO ___

_____

_____

_____

_____

_____

SIGNATURE _____
(Shipper)

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Manual Name: **Quality Assurance Technical Procedures Volume II: Field Standard Operating Procedures**

Document Number: FTP-750

Revision Number: **6**

Date Printed: _____

Person Checking the Revision Number: _____

SCIENCE APPLICATIONS INTERNATIONAL CORPORATION FIELD TECHNICAL PROCEDURE			
Title: Field Measurement Procedures: Operation of Organic Vapor Detectors			
Procedure No: FTP-750	**Revision: 6**	**Date: 11/18/2008**	**Page 1 of 4**
Business Unit General Manager: A. Lummis **Date:** 12/8/08		**QA/QC Officer:** C. D. Coward **Date:** 11/18/2008	

R

1.0 PURPOSE

The purpose of this procedure is to outline the methods of detecting and/or measuring organic vapors with direct reading instruments such as photoionization detectors and flame ionization detectors.

2.0 SCOPE

This procedure is meant to serve as a guide to instrument operations. It does not indicate that this is the generally preferred method or instrument type. Specific calibration, operation and maintenance requirements are in the manufacturer's operating instructions. Data obtained from these instruments can be qualitative or quantitative.

3.0 REFERENCES, RELATED READING, AND DEFINITIONS

3.1 REFERENCES

3.1.1 See Common References at the front of the FTP Manual.

3.1.2 Environmental Investigations Standard Operating Procedures and Quality Assurance Manual, U.S. Environmental Protection Agency.

R

3.1.3 Science Applications International Corporation Quality Assurance Administrative Procedure (SAIC QAAP) 12.1, Control of Measuring and Test Equipment.

3.1.4 Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, NIOSH/OSHA/USCG/EPA, DHHS (NIOSH) Publication No. 85-115.

3.2 DEFINITIONS

None

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4.0 RESPONSIBILITIES

4.1 See Common Responsibilities at the front of the FTP Manual. R

4.2 FIELD MANAGER

The Field Manager or designee is responsible for:

4.2.1 ensuring compliance with the Sampling and Analysis Plan (SAP);

4.2.2 ensuring that all personnel perform their assigned duties in accordance with this procedure when it is applicable; and

4.2.3 overall management of field activities.

5.0 GENERAL

5.1 Any deviations from specified requirements will be justified and authorized by the Project Manager and/or the relevant Program Manager, and will be sufficiently documented on the appropriate field change forms to allow re-creation of the modified process.

5.2 Refer to the site- or project-specific Health and Safety (H&S) Plan for relevant H&S requirements. R

5.3 Refer to the SAP for project/task-specific sampling and analysis requirements.

5.4 SAIC and subcontractor personnel who use this procedure must provide documented evidence of having been trained on the procedure to the Program or Project Manager for records purposes.

5.5 The manufacturer's operating instructions are present for each instrument on site.

5.6 A number of field instrument methods are available for detecting and/or measuring organic vapors. These include, but are not limited to, instruments equipped with flame ionization detectors (FIDs) or photoionization detectors (PIDs). These instruments can be used to detect organic vapors in depressions or confined spaces, to screen drums or other containers for the presence of trapped vapors, or to assess an area for elevated levels of volatile organics.

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5.7 Guidelines presented in QAAP 12.1, "Control of Measuring and Test Equipment" will be followed for identification, storage, and documentation of the use and calibration of the organic vapor detection instrument.

5.8 Response factors and any general user maintenance performed for the instrument will be recorded.

5.9 An optional field checklist is provided immediately following this procedure for the Project Manager's use during mobilization. R

6.0 PROCEDURE

6.1 Choose an instrument that is consistent with investigative requirements (i.e., verify known contaminants and that the instrument used can detect the contaminant. See requirements in the H&S Plan and the SAP.

6.2 Operate the instrument per the manufacturer's instructions.

6.3 Check and, if necessary, adjust instrument calibration as per manufacturer's instructions at routine intervals. For most organic vapor detectors (PID, FID) this must be done at least once for each day's use. The calibration of an organic vapor detector is performed by exposing the instrument to a known (traceable) gas source and verifying, or correcting, instrument response to ±5% of the concentration of the test gas.

6.4 Perform the required measurements. If the measurements are intended to estimate worker exposure, follow the requirements of the H&S Plan. Collect sufficient readings to adequately assess and document potential exposures. Measurement locations will include breathing zone (≤ 14 inch half circle radius in front of the shoulder), worst-case locations such as at the mouth of augers, well casings and at the bottom of trenches, and at the perimeter of the work area if offsite exposures are of concern. If measurements are zero or below the exposure limit, and there is an identifiable source, such as a borehole, it is acceptable to take most readings at the borehole with only an occasional measurement in breathing zone(s). This approach assumes that if the concentration at the source is below the exposure limit, then the concentration in a worker's breathing zone, which is further from the source, will also be less than the exposure limit. Note that the exposure limits or action levels in the H&S Plans typically refer to the concentrations in the breathing zone.

6.5 Organic vapor detectors are broad range detectors that give an indication that there are organic vapors present. Another method is required to identify the contaminants.

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6.6 Record calibration data in an official project logbook such as a Measuring and Test Equipment logbook, H&S logbook, or geologist's logbook. This data must include; name of person performing calibration, name and number of instrument, type and concentration of calibration gas, lot number of calibration gas, date of calibration, instrument reading when exposed to calibration gas, amount of adjustment (if any), post-adjustment instrument reading (only if adjustment is necessary), and time of calibration if calibration is performed more than once per day.

6.7 Record field measurements in appropriate logbooks. The recorded information must include, as a minimum: name of person performing measurement, instrument project identifier, reading(s), date, time, and the specific location(s). Examples of specific locations include: headspace of sample no. xxx, 5 inches from top of auger at soil boring no. 4, at the mouth of soil boring no. 30, in breathing zone of driller, etc. Note that for repetitive measurements at the same location with essentially the same results, this information can be condensed by recording the detailed information once per uninterrupted work period (day, morning, half hour, etc.) and stating that the measurements were repeated at specific intervals with no change in results. The data and related narrative must be sufficient to demonstrate to a third party that the worker exposures were less than the exposure limits or that overexposures were detected and corrected.

6.8 If extremely high concentrations are encountered, verify that the instrument is still operating properly (i.e., check that the background reading is zero) before continued use of the instrument. Note: any equipment problem or environmental factors that may influence meter readings.

7.0 RECORDS

Documentation generated as a result of implementing this procedure is submitted to the designated records system in accordance with Section 17 of the Business Unit QAP.

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8.0 ATTACHMENTS

None.

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Field Checklist

- ☐ Portable Survey Instrument
- ☐ Calibration Standard
- ☐ Pipe Cleaners
- ☐ Safety Glasses or Monogoggles
- ☐ Gloves
- ☐ Safety Shoes
- ☐ Logbook
- ☐ Black Indelible Pen
- ☐ Decontamination Equipment
- ☐ Sampling and Analysis Plan (SAP)
- ☐ Health and Safety Plan (HASP)
- ☐ Manufacturer's Instrument Calibration and Maintenance Manual
- ☐ Instrument-specific Calibration Assembly

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Manual Name: **Quality Assurance Technical Procedures Volume II: Field Standard Operating Procedures**

Document Number: FTP-752

Revision Number: **4**

Date Printed: _____

Person Checking the Revision Number: _____

SCIENCE APPLICATIONS INTERNATIONAL CORPORATION FIELD TECHNICAL PROCEDURE			
Title: Field Measurement Procedures: Combustible Gas Detection			
Procedure No: FTP-752	**Revision: 4**	**Date: 11/18/2008**	**Page 1 of 4**
Business Unit General Manager: A. L. Gruenler **Date:** 12/8/08		**QA/QC Officer:** C. D. Coward **Date:** 11/18/2008	

R

1.0 PURPOSE

The purpose of this procedure is to describe the methods of detecting and/or measuring combustible gases.

2.0 SCOPE

This procedure serves to provide guidance in calibrating and operating a combustible gas detection meter.

3.0 REFERENCES, RELATED READING, AND DEFINITIONS

3.1 REFERENCES

3.1.1 See Common References at the front of the FTP Manual.

3.1.2 Environmental Investigations Standard Operating Procedures and Quality Assurance Manual, U.S. Environmental Protection Agency. R

3.1.3 Science Applications International Corporation Quality Assurance Administrative Procedure (SAIC QAAP) 12.1, Control of Measuring and Test Equipment.

3.2 DEFINITIONS

3.2.1 Lower Explosive Limit (LEL) - The minimum concentration of a particular combustible gas in air that will burn and continue to burn when ignited.

3.2.2 Upper Explosive Limit (UEL) - The maximum concentration of a particular combustible gas in air that will burn and continue to burn when ignited.

4.0 RESPONSIBILITIES

4.1 See Common Responsibilities at the front of the FTP Manual. R

R

4.2 FIELD MANAGER

The Field Manager is responsible for:

4.2.1 ensuring compliance with the Sampling and Analysis Plan (SAP);

4.2.2 ensuring that all personnel perform their assigned duties in accordance with this procedure when it is applicable; and

4.2.3 overall management of field activities.

5.0 GENERAL

5.1 Any deviations from specified requirements will be justified to and authorized by the Project Manager and/or the relevant Program Manager and should be documented on the appropriate field change forms.

5.2 Deviations from requirements will be sufficiently documented to allow re-creation of the modified process.

5.3 Refer to the site- or project-specific Health and Safety (H&S) Plan for relevant H&S requirements regarding personnel safety and exposure limits. R

5.4 Refer to the SAP for project/task-specific sampling and analysis requirements.

5.5 SAIC and subcontractor personnel who use this procedure must provide documented evidence of having been trained on the procedure to the Program or Project Manager. R

5.6 The manufacturer's operating instructions shall be available for each instrument on site.

5.7 This instrument should be intrinsically safe.

5.8 Some combustible gas sensors are designed to measure combustible gas or vapor content in air. These will not indicate the combustible gas content in an inert gas background, furnace stack, or in other atmospheres with less than 16% oxygen.

5.9 These instruments should not be used where the oxygen concentration exceeds that of fresh air (i.e., oxygen enriched atmosphere) because the extra oxygen makes any combustible mix easier to ignite and, thus, more dangerous.

R

5.10 Certain materials such as silicone, silicates, and organic lead compounds may tend to poison a combustible gas sensor, thereby causing erroneously low readings. Calibration checks should be made frequently if such materials are suspected to be present in the tested atmosphere.

5.11 A combustible gas sensor will not indicate the presence of combustible airborne mists or dusts such as lubricating oils, coal dust, or grain dust.

5.12 Before each day's usage (every 8 hours), sensitivity must be tested on a known concentration of each of the gases for which the instrument is calibrated. If the instrument is not adequately calibrated according to manufacturer's specification, it must be recalibrated.

5.13 The sample inlet filter should be examined each time the instrument is recharged, if appropriate. If the filter element appears to be coated with dust or dirt, it should be properly cleaned, dried, and reinserted or a new element substituted.

5.14 An optional field equipment checklist is provided as a full size form immediately following this procedure.

6.0 PROCEDURE

6.1 Choose an instrument that is consistent with investigative requirements.

6.2 See the manufacturer's operating instructions prior to use. Operate the instrument as per manufacturer's instructions including the daily calibration and note in the field logbook which instrument is being used, date of calibration, calibration standard descriptions, and post-calibration results. Also note in the field logbook the method of calibration if more than one choice exists.

6.3 Follow the guidelines in procedure QAAP 12.1, "Control of Measuring and Test Equipment" for the identification, handling, storage, and documentation of controlled use and calibration of the instrument.

R

6.4 Check the last calibration date to determine if it is current. Return the instrument to the calibration lab if the calibration is out of date.

6.5 Record measurements in the appropriate field logbook.

R

7.0 RECORDS

Documentation generated as a result of this procedure is submitted to the designated records system in accordance with Section 17 of the Business Unit QAP.

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8.0 ATTACHMENTS

None.

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Field Checklist

- ☐ Portable Survey Instrument
- ☐ Calibration Standard
- ☐ Pipe Cleaners
- ☐ Safety Glasses or Monogoggles
- ☐ Gloves
- ☐ Safety Shoes
- ☐ Logbook
- ☐ Black Indelible Pen
- ☐ Manufacturer’s Instrument Calibration and Maintenance Manual
- ☐ Calibration Equipment (e.g., tubing, regulators, screwdrivers, etc.)
- ☐ Sampling Logbook
- ☐ Decontamination Equipment
- ☐ Health and Safety Plan
- ☐ Sampling and Analysis Plan

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Manual Name: **Quality Assurance Technical Procedures Volume II: Field Standard Operating Procedures**

Document Number: FTP-880

Revision Number: 5

Date Printed: _____

Person Checking the Revision Number: _____

SCIENCE APPLICATIONS INTERNATIONAL CORPORATION FIELD TECHNICAL PROCEDURE			
Title: Field Measurement Procedures: pH, Temperature, Salinity, and Conductivity			
Procedure No: FTP-880	**Revision: 5**	**Date:11/18/2008**	**Page 1 of 3**
Business Unit General Manager: 12/8/08 **Date:**		**QA/QC Officer:** 11/18/2008 **Date:**	

R

1.0 PURPOSE

The purpose of this procedure is to establish guidelines for the uniform calibration and use of pH, temperature, salinity, and conductivity meters.

2.0 SCOPE

This procedure applies to all pH, temperature, salinity and conductivity meters. It is not necessary that one instrument be capable of measuring all four parameters (i.e., pH, temperature, salinity, and conductivity).

3.0 REFERENCES, RELATED READING, AND DEFINITIONS

3.1 REFERENCES

3.1.1 See Common References at the front of the FTP Manual.

3.1.2 Environmental Investigations Standard Operating Procedures and Quality Assurance Manual, U.S. Environmental Protection Agency. R

3.2 DEFINITIONS

3.2.1 Buffer Solution - Commercially prepared standard solutions with known pH concentrations. Solutions are traceable to the manufacturer by lot number or similar documentation.

4.0 RESPONSIBILITIES

4.1 See Common Responsibilities at the front of the FTP Manual. R

4.2 FIELD MANAGER

The Field Manager is responsible for:

4.2.1 ensuring that all personnel perform their assigned duties in accordance with this procedure when it is applicable;

4.2.2 ensuring compliance with the Sampling and Analysis Plan (SAP); and

R

4.2.3 overall management of field activities.

5.0 GENERAL

5.1 Any deviation from specified requirements will be justified to and authorized by the Project Manager and/or the relevant Program Manager and should be documented on the appropriate field change forms.

5.2 Deviations from requirements will be sufficiently documented to allow re-creation of the modified process.

5.3 Refer to the site- or project-specific Health and Safety (H&S) Plan for relevant H&S requirements. R

5.4 Refer to the SAP for project/task-specific sampling and analysis requirements.

5.5 SAIC and subcontractor personnel who use this procedure must provide documented evidence of having been trained on the procedure to the Program or Project Manager. R

5.6 The manufacturer's operating instructions should be available in the field for the instrument used.

5.7 pH measurements (Hydronium Ion Concentration) are determined electrometrically using either a glass electrode in combination with a reference potential, or a combination electrode and pH meter.

5.8 Conductivity measurements are determined electrometrically using either a glass electrode or conductivity cell.

5.9 An optional field equipment checklist is provided as a full size form immediately following this procedure.

6.0 PROCEDURE

6.1 Choose an instrument that is consistent with investigation requirements.

6.2 See the manufacturer's operating instructions of Hach Model DR/700 Portable Colorimeter prior to use. Operate the instrument as per manufacturer's instructions and note in the field logbook which instrument is being used. Also note in the field logbook the method of calibration if more than one choice exists.

6.3 Check the last calibration date to determine if it is current. Return the instrument to the instrument provider if the calibration is out of date.

R

6.4 Record measurements in the appropriate field logbook.

7.0 RECORDS

Documentation generated as a result of this procedure is submitted to the designated records system in accordance with Section 17 of the Business Unit QAP. R

8.0 ATTACHMENTS

None

Field Checklist

- ☐ Appropriate pH, Temperature, Salinity, and Conductivity Instruments
- ☐ Calibration Standard/check source
- ☐ Safety Glasses or Monogoggles*
- ☐ Gloves*
- ☐ Safety Shoes*
- ☐ Logbook
- ☐ Black Indelible Pen
- ☐ Sampling and Analysis Plan
- ☐ Health and Safety Plan
- ☐ Manufacturer's Instrument Calibration and Maintenance
- ☐ Decontamination Equipment

*When specified by the site-specific H&S plan.

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Manual Name: **Quality Assurance Technical Procedures Volume II: Field Standard Operating Procedures**

Document Number: FTP-910

Revision Number: 1

Date Printed: _____

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SCIENCE APPLICATIONS INTERNATIONAL CORPORATION FIELD TECHNICAL PROCEDURE			
Title: Field Measurement Procedures: Turbidity			
Procedure No: FTP-910	**Revision: 1**	**Date: 11/18/2008**	**Page 1 of 3**
Business Unit General Manager: Date: 12/8/08.		**QA/QC Officer: Date:** C. J. Conant 11/18/2008	

R

1.0 PURPOSE

The purpose of this procedure is to establish guidelines for the uniform calibration and use of the turbidity meter.

2.0 SCOPE

This procedure applies to all turbidity meters.

3.0 REFERENCES, RELATED READING, AND DEFINITIONS

3.1 REFERENCES

3.1.1 See Common References at the front of the FTP Manual.

3.1.2 Environmental Investigations Standard Operating Procedures and Quality Assurance Manual, U.S. Environmental Protection Agency. R

3.2 DEFINITIONS

3.2.1 Formazine- Standard solution used in calibrating turbidity meters.

3.2.2 NTUs- Nephelometric Turbidity Units are the units used to express turbuidity.

4.0 RESPONSIBILITIES

4.1 See Common Responsibilities at the front of the FTP Manual. R

4.2 FIELD MANAGER

The Field Manager is responsible for:

4.2.1 ensuring that all personnel perform their assigned duties in accordance with this procedure when it is applicable;

4.2.2 ensuring compliance with the Sampling and Analysis Plan (SAP); and

R

4.2.3 overall management of field activities.

5.0 GENERAL

5.1 Any deviation from specified requirements will be justified to and authorized by the Project Manager and/or the relevant Program Manager and documented on the appropriate field change forms.

5.2 Deviations from requirements will be sufficiently documented to allow re-creation of the modified process.

5.3 Refer to the site- or project-specific Health and Safety (H&S) Plan for relevant H&S requirements. R

5.4 Refer to the SAP for project/task-specific sampling and analysis requirements.

5.5 An optional field checklist is provided as a full size form immediately following this procedure.

5.6 SAIC and subcontractor personnel who use this procedure must provide documented evidence of having been trained on the procedure to the Program or Project Manager. R

5.7 The manufacturer's operating instructions, for the specific instrument used will be maintained at the site.

5.8 Turbidity measurements are determined through the light-absorption-scattering method by using a glass electrode.

6.0 PROCEDURE

6.1 Choose an instrument that is consistent with investigation requirements.

6.2 See the manufacturer's operating instructions prior to use. Operate the instrument as per manufacturer's instructions. Note in the field logbook the model and serial number of the instrument being used. Also note in the field logbook the method of calibration if more than one choice exists.

6.3 Check the last calibration date to determine if it is current. Return the instrument to the equipment supplier if the calibration is out of date.

6.4 Record measurements in the appropriate field logbook.

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7.0 RECORDS

Documentation generated as a result of this procedure is submitted to the designated records system in accordance with Section 17 of the Business Unit QAP.

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8.0 ATTACHMENTS

None.

Field Checklist

- ☐ AppropriateTurbidity Instruments
- ☐ Calibration Standard/check source
- ☐ Safety Glasses or Monogoggles*
- ☐ Gloves*
- ☐ Safety Shoes*
- ☐ Logbook
- ☐ Black Indelible Pen
- ☐ Sampling and Analysis Plan
- ☐ Health and Safety Plan
- ☐ Manufacturer's Instrument Calibration and Maintenance
- ☐ Decontamination Equipment

*When specified by the site-specific H&S plan.

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Manual Name: **Quality Assurance Technical Procedures Volume II: Field Standard Operating Procedures**

Document Number: FTP-955

Revision Number: **2**

Date Printed: _____

Person Checking the Revision Number: _____

SCIENCE APPLICATIONS INTERNATIONAL CORPORATION FIELD TECHNICAL PROCEDURE			
Title: Field Measurement Procedures: Dissolved Oxygen			
Procedure No: FTP-955	**Revision: 2**	**Date: 11/18/2008**	**Page 1 of 4**
Business Unit General Manager: **Date:** 12/8/08		**QA/QC Officer:** **Date:** C. G. Coward 11/18/2008	

R

1.0 PURPOSE

The purpose of this procedure is to provide general instructions both for calibrating dissolved oxygen meters and for taking field measurements of dissolved oxygen in natural and waste waters.

2.0 SCOPE

This procedure describes the use of the membrane electrodes (ME) probe method for field measurement of dissolved oxygen in a variety of ground, surface, and saline waters, as well as in domestic and industrial wastes.

3.0 REFERENCES, RELATED READING, AND DEFINITIONS

3.1 REFERENCES

3.1.1 See Common References at the front of the FTP Manual.

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3.1.2 Environmental Investigations Standard Operating Procedures and Quality Assurance Manual, U.S. Environmental Protection Agency.

3.1.3 Science Applications International Corporation Field Technical Procedure (SAIC FTP) 400, Equipment Decontamination.

3.1.4 Science Applications International Corporation (SAIC) Field Technical Procedure (FTP) 625, Chain-of-Custody.

3.2 DEFINITIONS

None.

4.0 RESPONSIBILITIES

4.1 See Common Responsibilities at the front of the FTP Manual.

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4.2 FIELD MANAGER

The Field Manager is responsible for:

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4.2.1 ensuring that all personnel perform their assigned duties in accordance with this procedure when it is applicable;

4.2.2 ensuring compliance with the Sampling and Analysis Plan (SAP); and

4.2.3 overall management of field activities.

5.0 GENERAL

5.1 Any deviations from specified requirements will be justified to and authorized by the Project Manager and/or the relevant Program Manager.

5.2 Deviations from requirements will be sufficiently documented to allow re-creation of the modified process.

5.3 Refer to the site- or project-specific Health and Safety (H&S) Plan for relevant H&S requirements. R

5.4 Refer to the SAP for project/task-specific sampling and analysis requirements.

5.5 SAIC and subcontractor personnel who use this procedure must provide documented evidence of having been trained on the procedure to the Program or Project manager. R

5.6 The most common ME instruments for determination of dissolved oxygen (DO) in water are dependent upon the rate of diffusion of molecular oxygen across a membrane and upon electrochemical reactions. Under steady-state conditions, the current or potential can be correlated with DO concentration.

5.7 Interfacial dynamics at the ME-sample interface are a factor in probe response and a significant degree of interfacial turbulence is necessary. For precision performance, turbulance must be constant.

5.8 Dissolved organic materials are not known to interfere in the output from DO probes. However, dissolved inorganic salts are a factor in the performance of DO probes. Reactive gases that pass through the ME probes may interfere. For example, chlorine will depolarize the cathode, cause a high probe output, and eventually desensitize the probe. Hydrogen sulfide will interfere with ME probes under certain conditions.

5.9 Dissolved oxygen ME probes are temperature sensitive, and temperature compensation is normally provided by the manufacturer.

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5.10 Refer to the manufacturer's instructions, which are attached to the equipment, for calibrating and operating each specific DO meter.

5.11 An optional field equipment checklist is provided as a full size form immediately following this procedure.

6.0 PROCEDURE

6.1 CALIBRATION PROCEDURES

6.1.1 The exact calibration method used is dependent upon the specific make and model of the DO meter being used. Refer to the specific manufacturer's instruction manual for the calibration method applicable to the instrument.

6.1.2 Four common types of calibration methods used include, but are not limited to the following: Winkler method, air calibration method, 100% air saturated water method, and the salt water method.

6.2 FIELD MEASUREMENT PROCEDURE

6.2.1 Inspect membrane before each field trip for air bubbles, oily film, and/or holes. If the membrane is defective, it must be replaced and the new membrane soaked in distilled water before calibration.

6.2.2 Follow manufacturer's instructions for sample measurement.

6.2.3 When making measurements be sure that the ME stirring apparatus is working (if using a submersible stirrer). If operator is stirring the ME probe manually, then the probe must be stirred as described in manufacturer's instructions in order for the DO instrument to work effectively.

6.2.4 Keep the probe in water when not in use to prevent the membrane from drying out.

6.2.5 If the sample temperature is significantly greater (greater than 10%) than the calibration temperature, the meter is recalibrated to the manufacturer's specifications.

6.2.6 Recalibrate when the DO readings show a distinct change in DO levels or under other specific conditions described in the owners manual.

6.2.7 Complete logbook and chain-of-custody forms in accordance with procedures FTP-1215, Field Logbooks and Field Forms, and FTP-625, Chain-of-Custody.

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6.3 The ME probe is calibrated daily as described in the manufacturer's instructions. If a measurement seems anomalous for any reason, the probe is checked against a solution of known DO value and the field measurement taken again. The original results are either verified or changed, with an explanation recorded in the field logbooks.

7.0 RECORDS

Documentation generated as a result of this procedure is submitted to the designated records system in accordance with Section 17 of the Business Unit QAP.

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8.0 ATTACHMENTS

None

Field Checklist

- ☐ DO Meter with Stirrer
- ☐ Reagents
- ☐ Biochemical Oxygen Demand Bottles (300 ml)
- ☐ WM Flasks (500 ml minimum size)
- ☐ Burets with Holders
- ☐ Siphon Tube
- ☐ Safety Glasses or Monogoggles
- ☐ Gloves
- ☐ Safety Shoes
- ☐ Container
- ☐ Custody Seals, as required
- ☐ Chain-of-Custody Forms, as required
- ☐ Logbook
- ☐ Black Indelible Pen
- ☐ Sampling and Analysis Plan
- ☐ Manufacturer’s Instrument Calibration and Maintenance Manual
- ☐ Health and Safety Plan
- ☐ Decontamination Equipment
- ☐ Lab Wipes
- ☐ Appropriate Containers for Waste

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Manual Name: **Quality Assurance Technical Procedures Volume II: Field Standard Operating Procedures**

Document Number: FTP-1215

Revision Number: **2**

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SCIENCE APPLICATIONS INTERNATIONAL CORPORATION FIELD TECHNICAL PROCEDURE			
Title: Field Logbooks and Field Forms			
Procedure No: FTP-1215	**Revision: 2**	**Date: 11/18/2008**	**Page 1 of 9**
Business Unit General Manager: Date: 12/8/08		**QA/QC Officer: Date:** 11/18/2008	

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1.0 PURPOSE

The purpose of this procedure is to establish minimum requirements for the development, content, use, review, protection, and disposition of field logbooks and field forms.

2.0 SCOPE

This procedure applies to all types of logbooks and field forms used for environmental field studies and for other types of field activities that capture project technical data or administrative data that support the project objectives.

3.0 REFERENCES AND DEFINITIONS

3.1 REFERENCES

3.1.1 See Common References at the front of the FTP Manual. R

3.1.2 SAIC Quality Assurance Administrative Procedure, QAAP 2.2, Readiness Review.

3.1.3 SAIC Quality Assurance Technical Procedures, Volume II, Field Standard Operating Procedures.

3.2 DEFINITIONS

3.2.1 Field Forms – a project-specific collection of forms that are not bound into a logbook, but which serve a similar purpose to a bound field logbook, in that field data is captured in real time in a specific format relevant to the objectives of the investigation or other site activity.

3.2.2 Field Logbook – A bound book with sequentially numbered pages that is used to create a permanent, real time record of activities and conditions, significant events, observations, and measurements which occur during each day of field activities. The minimum requirements for a bound logbook are described in Section 5.0 of this procedure.

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3.2.3 Force Majeure – an extraordinary event or circumstance beyond the control of the responsible person, such as war, strike, riot, crime, flood, earthquake, volcano, which prevents fulfillment of an obligation. However, Force Majeure is not intended to excuse negligence or other malfeasance, as where non-performance is caused by the usual and natural consequences of external forces (e.g., predicted rain stops an event).

3.2.4 Logbook Type – Identification of bound logbooks by purpose or area of coverage. Examples include but are not limited to Project, Field Manager, Soil Sampling, Groundwater Sampling, Well Installation, Well Development, Soil Boring, Calibration, Decontamination and Health & Safety.

3.2.5 Quality Control (QC) Review – The act of verifying the accuracy, completeness, legibility, consistency, and clarity of a field logbook and/or field forms.

4.0 RESPONSIBILITIES

4.1 See Common Responsibilities at the front of the FTP Manual.

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4.2 PROJECT MANAGER

In addition to the Common Responsibilities the Project Manager is responsible for:

4.2.1 Ensuring that field personnel are trained to the requirements of this procedure, and are familiarized with the specific logbook and/or field form requirements for the project.

4.2.2 Determining the project-specific requirements for the field logbook(s) and/or field forms, including the extent of use of pre-printed forms in the logbook(s).

4.2.3 Identifying the field forms that will be used for the project.

4.2.4 Ensuring that logbooks are copied for records as specified in paragraph 5.6 of this procedure.

4.2.5 Ensuring that logbook QC is performed as specified in paragraph 5.11 of this procedure.

4.3 FIELD MANAGER

The Field Manager is responsible for:

4.3.1 Ensuring that field personnel implement the field logbook and field form requirements detailed in this procedure and those requirements determined to be applicable to the specific project.

4.3.2 Ensuring that logbooks and forms are assembled to meet project requirements, including the use of pre-printed forms, when applicable.

4.3.3 Ensuring that project-specific requirements for field logbooks and field forms are implemented in the field.

4.3.4 Ensuring that field forms are completed in accordance with project objectives.

4.3.5 Ensuring that field personnel who will use logbooks or field forms are trained in their use as described in this procedure and in the specific logbook/field form requirements for the project. Ensuring that training is documented and forwarded to the identified records system.

4.3.6 Ensuring that field logbooks and field forms are protected from loss, damage or deterioration and are copied for record as specified in paragraph 5.6 of this procedure.

4.3.7 Ensuring that field logbooks and field forms are given a QC review by a qualified person other than the person(s) making logbook entries and at a frequency specified in paragraph 5.11 of this procedure.

4.4 FIELD TEAM MEMBERS

Field team members are responsible for:

4.4.1 Using and making entries in field logbooks and field forms in accordance with this procedure and project-specific training.

4.4.2 Ensuring that field logbooks and forms are protected from loss, damage or deterioration.

4.4.3 Making corrections to logbooks as necessary including those noted during QC review.

4.5 QC REVIEWER

The QC Reviewer is responsible for:

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4.5.1 Conducting a thorough review of the field logbook(s) and field forms on the schedule established by the Project Manager. This includes the general requirements in section 5.0 below as well as the technical and general information.

4.5.2 Documenting the review by initialing or signing each page reviewed along with the date reviewed.

5.0 GENERAL

5.1 This procedure is written to include Project Manager and Field Manager functional positions; however, where the same person fills both positions, the coordination steps noted in the procedure are considered to be consolidated.

5.2 This procedure is followed by a variety of form(s) which could be used in a field logbook depending on the needs of the project. These forms are provided as information only and do not represent a comprehensive set of forms. These forms may be used 'as is' or modified as necessary to meet specific project needs. Other forms or formats may also be used to meet project-specific needs.

5.3 Field logbooks will be structured and used according to the following criteria:

- Controlled by the Field Manager who will ensure that the logbooks are identified by project name or number, by logbook type (see definition 3.2.4), and if there is more than one logbook for a project, by sequential number.
- Bound with sequentially numbered pages (It is recommended that field logbooks include a table of contents, when appropriate).
- It is recommended that logbooks and field forms should be produced on waterproof (Rite in the Rain®) paper when possible.
- Entries are to be made in indelible ink, and must be clear, objective and legible. No entries are to be made in pencil or other erasable form.
- Each page used is signed (or initialed) and dated by the person making the entries.
- Dates recorded in the month/day/year format; time recorded in the 24-hour military clock format (e.g., 1500 hours rather than 3:00 p.m.)
- Changes made by striking through the original entry in a manner which does not obliterate the original entry. The initials of the person making the change and the date will be written next to the change.

- Unused portions of completed logbook pages and completed logbooks will be indicated in a positive, clearly recognizable manner. Typical methods include:
  - › drawing a line through the unused area(s) and providing the initials of the person making the entry and date the entry was made.
  - › writing a notation such as " INTENTIONALLY LEFT BLANK" and providing the initials of the person making the entry and date the entry was made.

5.4 Field forms will be structured and used according to the following criteria:

- Controlled by the Field Manager who will ensure that they are identified by project name or number.
- Entries made in indelible ink that are clear, objective and legible. No entries are to be made in pencil or other erasable form.
- Dates recorded in the month/day/year format; time recorded in the 24-hour military clock format (e.g., 1500 hours rather than 3:00 p.m.). Time is always location specific.
- Changes made by striking through the original entry in a manner which does not obliterate the original entry. The initials of the person making the change and the date will be written next to the change.

5.5 It is recommended that logbooks and field forms containing entries never be shipped to and from the field; however, if this is necessary, copies must be made to protect the data from loss during shipment.

5.6 Logbooks and field forms will be copied for record purposes on the frequency established by the Project Manager at the beginning of field activities but at no longer than 30 calendar day intervals when in use in the field.

- The frequency will be appropriate to the risk of loss of the data contained in the logbooks.
- Customer requirements regarding logbook copying and protection will be followed, when applicable.
- Exceptions to the frequency requirements for record copies may be made on a project-specific basis; however, an alternate frequency must be specified in writing, approved by the responsible manager (Project or Division) or higher line management authority, and captured in the designated records system.
- Allowance will also be made for Force Majeure events that are uncontrollable and prevent meeting the specified requirements.

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5.7 The use of pre-printed field logbooks is a best practice; however, in all cases the Project Manager and/or Field Manager will determine and document the types of information to be recorded in each field logbook. The types of entries and level of detail must comply with applicable laws, regulations and any customer-specified requirements, as well as being consistent with the information requirements necessary for writing the report(s) for the project.

5.8 When field forms and a log book are both used, the log book entry should note what field forms were used, and include a daily inventory of the forms.

5.9 The names of the individuals authorized to write in the field logbook will be printed in the front of the logbook, including the QC Reviewer. It is also recommended that each individual's signature or initials be included by their printed name.

5.10 The QC Reviewer will be a person with an appropriate level of experience and knowledge to perform a review, as determined by the Project Manager.

5.11 QC review will be completed on a schedule determined by the Project Manager but at no greater than seven (7) calendar day intervals when in use in the field.

5.12 Exceptions to the frequency requirement for QC review may be made on a project-specific basis; however, an alternate frequency must be specified in writing, approved by the responsible manager (Project or Division) or higher line management authority, and captured in the designated records system. Allowance will also be made for Force Majeure events that are uncontrollable and prevent meeting the specified requirements.

6.0 PROCEDURE

6.1 BOUND LOGBOOK AND FIELD FORM DEVELOPMENT

6.1.1 The Project Manager determines the logbook and field form requirements for the project including the types of entries required, number of logbooks and forms needed, and the extent of use of pre-printed forms in the logbook(s). Where pre-printed forms are to be included in the logbooks, they may be either selected from existing examples or developed specifically for the project.

6.1.2 The Project Manager coordinates project logbook and field form needs with the Field Manager and arranges for assembly of the correct number and types of logbooks and forms for the project.

6.1.3 The logbook(s) and forms are forwarded to the Field Manager for control and use.

6.2 LOGBOOK AND FIELD FORM ENTRIES GUIDANCE

6.2.1 Logbook and field form entries should be a compilation of relevant, factual events as they occur. Keep in mind that logbooks and field forms are work products that belong to the client; therefore, they should only include entries that are appropriate to share with the client or third parties. Logbooks and field forms are subject to subpoena, made legal exhibits, read in court and become permanent legal records.

6.2.2 The following should not be included in a logbook or field form:

- unsubstantiated opinions (best professional judgment may be necessary in some cases)
- editorializing
- language that is derogatory or that would not be acceptable in front of the client or in a public forum
- events that are not relevant to the work

6.2.3 Words to avoid unless absolutely necessary and appropriate:

Not recommended	Alternative words
approve	work is in general conformance
inspection *	periodic observation of work in progress
supervision *	periodic observation of work in progress
or equal	or equivalent

* *Inspect and supervise are potentially dangerous words. Court decisions have interpreted these words to mean: superintend, oversee, control, manage, direct, restrict, regulate, govern, administer, and conduct.*

Also, definitive words such as: Final, Any, All, None, Full, Every, Will and Shall should be avoided.

6.2.4 Words of promise such as: Guarantee, Warrant, Certify, Ensure or Insure should be avoided unless absolutely necessary and appropriate for the scope of work.

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6.3 LOGBOOK AND FIELD FORM CONTROL

6.3.1 The Field Manager takes control of the logbook(s) and field forms, and ensures that the type and content meet project requirements.

6.3.2 The Field Manager prepares the logbook(s) for use by inscribing each logbook with the identifying information required in paragraph 5.3 above. An example logbook cover page is included in the forms following this procedure.

6.3.3 The Field Manager prepares and assembles the appropriate types and quantities of field forms.

6.3.4 The Field Manager prepares and maintains a logbook inventory to ensure that the number and type of logbooks in use is known at any time.

Note: Alternatively, a centralized logbook inventory may be utilized providing continuity is maintained by having an individual designated in charge of the inventory at all times. R

6.3.5 The Field Manager ensures that logbooks and field forms are protected during use and are put under appropriate control when not in use.

6.4 LOGBOOK USE AND PROTECTION

6.4.1 The Field Manager ensures that each field team member who will use a logbook and/or field forms is provided instruction on the use and control of, as well as the entries required in, each type of logbook and form the person will use.

6.4.2 The Field Manager and field team members make entries in logbooks and forms in accordance with the general requirements in Sections 5.0 and 6.2 of this procedure and any project-specific requirements.

6.4.3 When not in use, logbooks and forms are secured, controlled, stored and protected in accordance with the methods established for the project. As a minimum, logbooks and field forms should be kept in the personal custody of the field manager (or designee) or locked up.

6.4.4 The Field Manager ensures that copies of logbook pages and field forms are made at the intervals specified in paragraph 5.6 above, and submitted to the identified records system. This includes

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extended intervals between field activities and upon conclusion of field activities.

6.5 QUALITY CONTROL OF LOGBOOKS AND FIELD FORMS

6.5.1 On the schedule established by the Project Manager, the Field Manager ensures that each logbook and field form used are reviewed to verify the accuracy, completeness, legibility, consistency, and clarity of these documents.

6.5.2 The QC Reviewer indicates acceptance of the logbook and field form entries by writing his/her initials at the bottom of each page as well as the date reviewed.

6.5.3 If errors, omissions, or uncertainties are found, the QC Reviewer resolves them with the person responsible for making entries on that day in the logbook or field form. Corrections to any logbook and field form entries are made by striking through the original entry and providing the initials of the person making the change and date the change was made.

7.0 RECORDS

Logbooks and/or field forms, or copies will be submitted to the designated records system in accordance with Section 17 of the Business Unit QAP.

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8.0 ATTACHMENT

None

WELL DEVELOPMENT FORM

PROJECT NAME: **PROJECT NUMBER:**

Date: _____ Time: _____

Task Team Members: _____

Well Number and Location: _____

Development Crew: _____

Driller (if applicable): _____

Water Levels / Time: Initial: _____ / _____ Pumping: _____ / _____
Final _____ / _____

Total Well Depth: Initial: _____ feet BTOC Final: _____ feet BTOC

Date and Time: Begin: _____ / _____ Completed: _____ / _____

Development Method(s): _____

_____

Total Quantity of Water Removed: _____ gallons

FIELD MEASUREMENT	SERIAL NUMBER	DATE OF LAST CALIBRATION
Temperature		
Specific Conductivity		
pH		
Turbidity		

QA performed by: _____

WELL DEVELOPMENT FORM (continued)

PROJECT NAME: **PROJECT NUMBER:**

WELL NUMBER: **LOCATION:**

DATE AND TIME	PUMP SETTING (DEPTH BTOC)	DISCHARGE RATES* AND MEASUREMENT METHOD	FIELD MEASUREMENTS				REMARKS INCLUDING SAND PRODUCTION
			TEMP (^{O}C)	SPECIFIC CONDUCTIVITY (uMHOS/CM)	pH STANDARD UNITS	TURBIDITY (NTUs)	

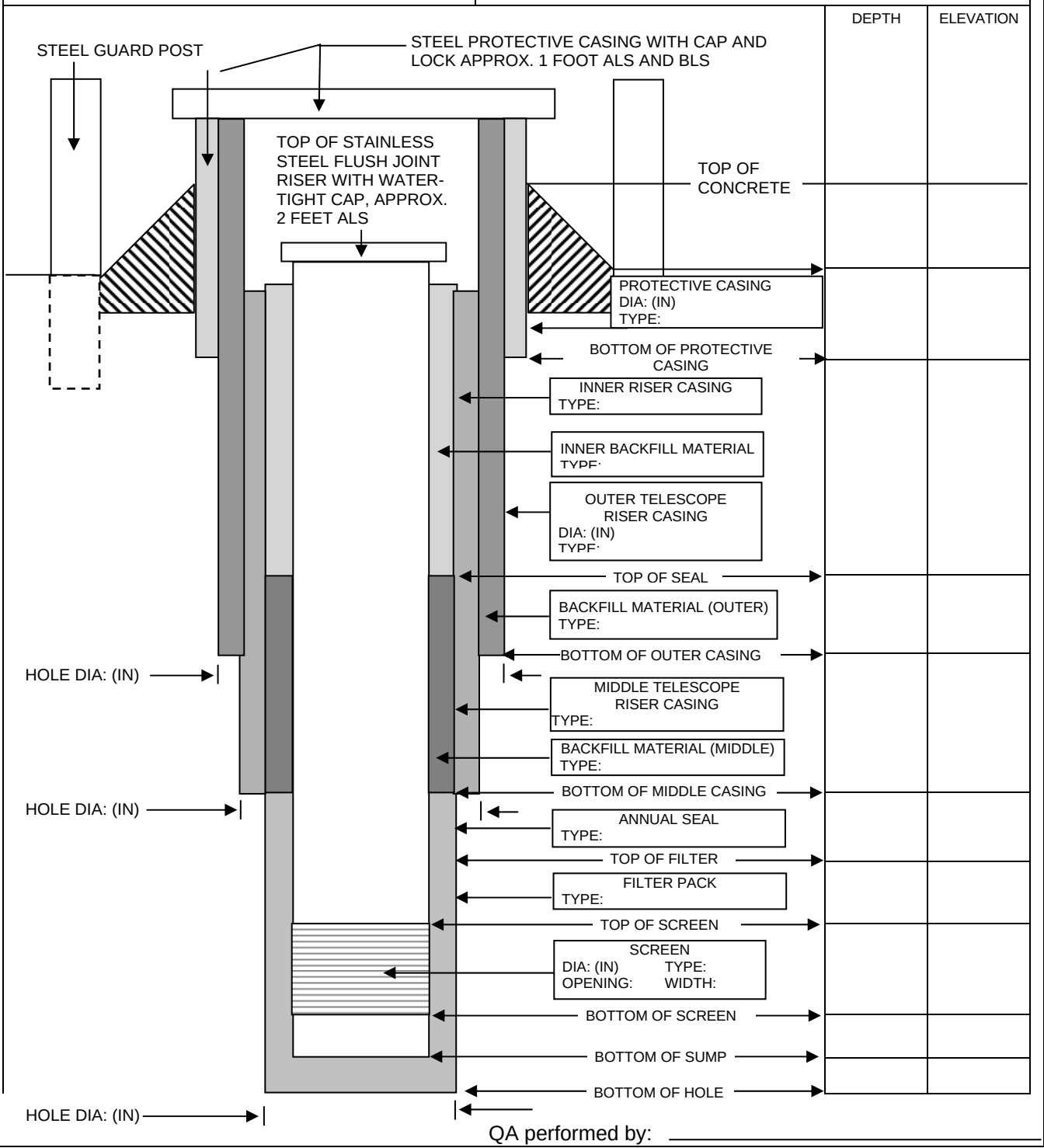
* Gallons per minute or bailer capacity _____

RECORDED BY: _____ (Signature) QC CHECKED BY: _____ (Signature)

TELESCOPED WELL

PROJECT NAME: **PROJECT NO:**

WELL NUMBER:	**BEGIN:**	**END:**
COORDINATES: **N:** **E:**	**REFERENCE POINT:**	**ELEVATION:** **MSL**



QA performed by: _____

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TASK TEAM ACTIVITY LOG SHEET

PROJECT NAME: **PROJECT NO:**

Date: (mm/dd/yy): _____ Page _____ of _____

Task Team Members:

_____ _____

_____ _____

_____ _____

Narrative (include time and location):

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Daily Weather Condition: A.M. _____

P.M. _____

Recorded By: _____ QC Checked by: _____

(Signature) (Signature)

SAMPLE LOG SHEET

PROJECT NAME: **PROJECT NO:**

SAMPLE ID NUMBER: _____ DATE COLLECTED (MM/DD/YY): _____
TIME: _____

SAMPLING LOCATION CODE: _____
DESCRIPTION: _____

SAMPLING POINT CODE: _____
DESCRIPTION: _____

NORTHING: _____ EASTING: _____ ELEVATION: _____

SAMPLE DEPTH CODE: _____:_____ TO _____ BLS
SAMPLE MEDIA CODE: _____ DESCRIPTION: _____

WEATHER: _____ ACTIVITIES IN AREA: _____
FIELD OBSERVATIONS: _____

FIELD MEASUREMENTS	READING	UNITS	SERIAL NO.	LAST CALIB.
RADIOACTIVITY:				
TEMPERATURE:				
pH:				
CONDUCTIVITY:				
REDOX:				
DO:				
ORGANIC VAPORS:				
TURBIDITY:				
OTHER _____:				

SAMPLE TYPE:
☐ GRAB ☐ SPATIAL COMPOSITE ☐ TIME COMPOSITE
☐ QC TRIP BLANK ☐ QC RINSATE ☐ QC FIELD BLANK
☐ OTHER (SPECIFY)_____

SAMPLE COLLECTED: ☐ YES ☐ NO SAP SAMPLING PROCEDURE WAS FOLLOWED: ☐ YES ☐ NO
IF SAP WAS NOT FOLLOWED, SPECIFY WHAT DEVIATIONS WERE NECESSARY AND WHY:

Recorded By: _____ QC Checked by: _____
(Signature) (Signature)

SAMPLE LOG SHEET

SAMPLE ID NUMBER:

CONTAINER VOLUME (mL)	CONTAINER TYPE	METHOD NAME AND NUMBER ANALYSIS	PRESERVATIVES (TYPE/VOL)	COC #	AIR BILL #	CONTAINER LOT #	LABORATORY

SAMPLE ID's RINSATE: _____ TRIP BLANK: _____ FIELD BLANK: _____ FIELD DUPLICATE: _____

RECORDED BY: _____ QC CHECKED BY: _____

(Signature) (Signature)

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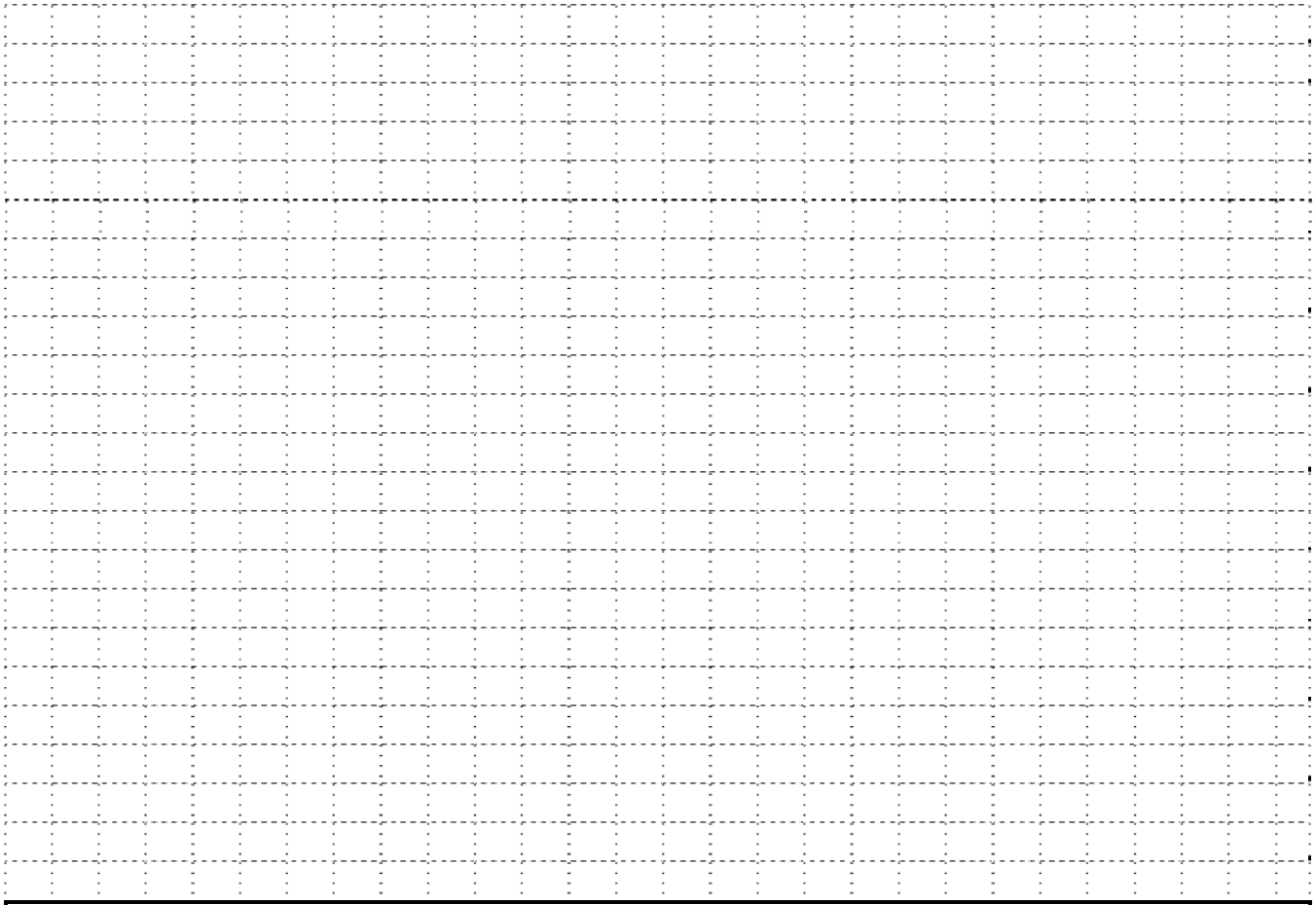
SAMPLE LOCATION SKETCH	HOLE NUMBER
PROJECT	ELEVATION TOP OF HOLE
LOCATION STATION	DATUM FOR ELEVATION SHOWN

LOCATION SKETCH **SCALE:**



COMMENTS		
SIGNATURE OF INSPECTOR/DATE	PROJECT	HOLE NO.

QA performed by: _____

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SAMPLE ID/COC TRACKING FORM

PROJECT NAME: **PROJECT NO:**

SAMPLE ID	FIELD COC	LAB COC		SAMPLE ID	FIELD COC	LAB COC

QA performed by: _____

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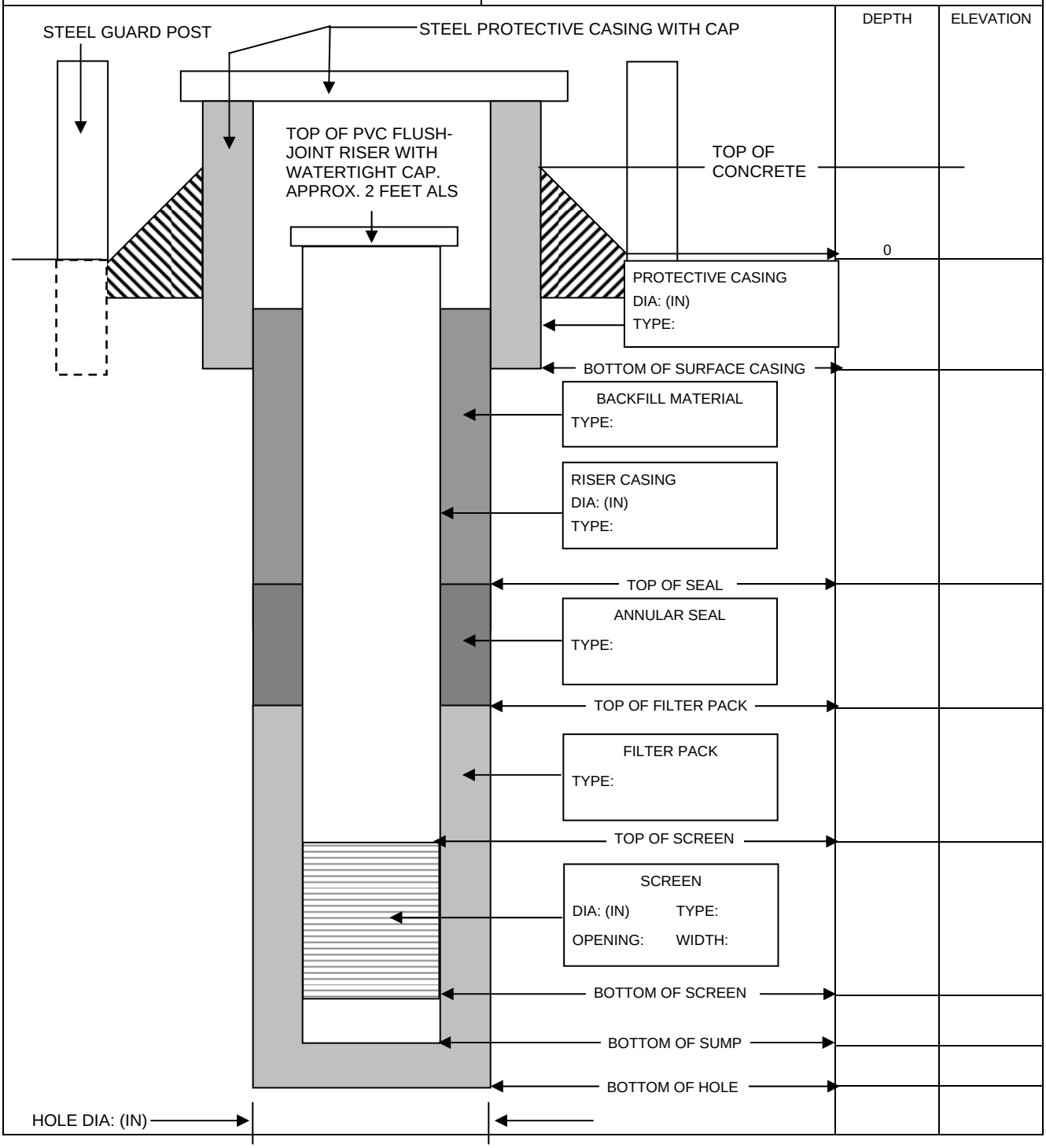
MONITORING WELL

PROJECT NAME: **PROJECT NO:**

WELL NUMBER:	**BEGIN:**	**END:**
COORDINATES: **N:** **E:**	**REFERENCE POINT:**	**ELEVATION:** **MSL**



QA performed by: _____

HYDROLOGIC AND GEOLOGIC CHARACTERIZATION FIELD WATER-LEVEL MEASUREMENTS

PROJECT NAME: **PROJECT NO:**

WELL NUMBER: _____ **LOCATION:** _____ **WELL ELEVATION:** _____ **MSL**

DATE	TIME	DEPTH TO WATER (BTOC)	WATER ELEVATION (MSL)	INSTRUMENT	SERIAL NO.	REMARKS

RECORDED BY: _____ QC CHECKED BY: _____

DATE: _____

EXAMPLE SAMPLE MEDIA CODES

SOLID MATRICES

SOIL
- [01] Surface (0–6 inches)
- [02] Subsurface (>6 inches)
- [03] Other

SEDIMENT/SLUDGES
- [11] Lake/Pond
- [12] River/Stream
- [13] Impoundment/Pond
- [14] Drum/Tank
- [19] Other

AIR SAMPLE
- [21] Filter
- [22] Sorbent
- [23] Sweepings/Fugitive Dust
- [24] Gases
- [29] Other

BIOLOGICAL/TERRESTRIAL
- [31] Biota
- [39] Other

GEOTECHNICAL
- [41] Retained on #40
- [42] Retained on #200
- [43] Passed through #200
- [49] Other

LIQUID MATRICES

SURFACE WATER
- [51] Lake/Pond
- [52] River/Stream
- [53] Impoundment/Pond
- [54] Discharge
- [55] Spring/Seep
- [59] Other

GROUNDWATER
- [61] Lake/Pond
- [62] River/Stream
- [63] Impoundment/Pond
- [64] Drum/Tank AIR SAMPLE
- [65] Lysimeter
- [66] Monitoring Well
- [67] Observation Well
- [68] Piezometer
- [69] Other
- [6A] Public Water Supply
- [6B] Purge Well
- [6C] Test Well
- [6D} Vapor Well
- [6E] Leachate Well

CONTAINERIZED

SEALED	UNSEALED
[71] Drum/Tank	[81] Drum/Tank
[72] Other	[82] Other

EQUIPMENT CALIBRATION

PROJECT NAME: **PROJECT NO:**

CATEGORY 1 **M & TE CALIBRATION LOG**

IDENTIFIER	ITEM DESCRIPTION	CALIBRATION MEASUREMENTS			BACKGROUND CHECK	RESPONSE CHECK	NAME	DATE
		PRE	ADJUSTMENT	POST				

QA performed by: _____

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DRILLING/CORE LOG

PROJECT NAME: **PROJECT NO:**

Page _____ of _____

Site Location: _____ Drilling Date/Time: _____

Boring/Well ID: _____ Started (mm/dd/yy)

Completed (mm/dd/yy) _____

Depth Drilled _____ feet Hole Diameter _____ inches

Depth to Water _____ feet Hammer Weight _____ inches

Drilling Method _____ Hammer Drop _____ inches

Drilling Fluid Used _____

Drilling Contractor _____

Logged by _____ Driller _____

Company _____ Helper _____

Drill Make & Model _____

Type of Sample/Coring Device** _____

No.	Sample/Core Depth (feet below land surface) FROM	TO	Core Recovery %	Blow Counts per 6 inches	OVA/HNU (ppm)	RAD (CPM)	Sample/Core Descr./Notes
				/ / /			
				/ / /			
				/ / /			
				/ / /			
				/ / /			
				/ / /			
				/ / /			
				/ / /			

*Define color, minor constituents, soil type, trace constituents, plasticity, moisture content

MOISTURE CONTENT:
DRY—Very low moisture content
MOIST—Intermediate moisture content, grains darkened by surface water
WET—Visible free water, soil sample from water-bearing zone

** S= Split spoon
T = Shelby tube
D = Dennison
P = Pitcher
O = Other

Prepared By: _____ Date: _____

QC By: _____ Date: _____

DRILLING/CORE LOG

PROJECT NAME: **PROJECT NO:**

Page _________ of ________

Boring/Well ID: _________________________

Logged By: _____________________________ Company ___________________________

No.	Sample/Core Depth (feet below land surface) FROM	TO	Core Recovery %	Blow Counts per 6 inches	OVA/HNU (ppm)	RAD (CPM)	Sample/Core Descr./Notes
				/ / /			
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				/ / /			
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*Define color, minor constituents, soil type, trace constituents, plasticity, moisture content

MOISTURE CONTENT:
DRY—Very low moisture content
MOIST—Intermediate moisture content, grains darkened by surface water
WET—Visible free water, soil sample from water-bearing zone

** S= Split spoon
T = Shelby tube
D = Dennison
P = Pitcher
O = Other

Prepared By: ____________________ Date: ____________

QC By: _________________________ Date: ____________

DECONTAMINATION

PROJECT NAME: **PROJECT NO:**

DATE	EQUIPMENT RINSATE NO.	ITEMS	DECONTAMINATED BY

QA Performed by: _____

R

FOR DATA COORDINATOR USE ONLY

DATA ENTRY PERFORMED BY: _____

DATE ENTERED: _____

NOTES: _____

_____

_____

_____

_____

DATA ENTRY PERFORMED BY: _____

DATE ENTERED: _____

NOTES: _____

_____

_____

_____

_____

DATA ENTRY PERFORMED BY: _____

DATE ENTERED: _____

NOTES: _____

_____

_____

_____

_____

QA performed by: _____

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BOREHOLE OR WELL PLUGGING/ ABANDONMENT

PROJECT NAME: **PROJECT NUMBER:**

SITE ID NUMBER: _____ DATE PLUGGED: _____/_____/_____

SITE COORDINATES: N: _____ DEPTH BLS (feet) _____

E: _____

TYPE OF CASING: _____

CASING DIAMETER (ID) (inches) _____ GROUND ELEVATION (feet MSL) _____

SCREENED ELEVATION (feet MSL) _____

GEOLOGIC MATERIAL AT SCREEN _____

_____

AMOUNT OF CASING REMOVED (feet) _____

_____

PLUGGING MATERIAL _____

APPROX. VOLUME OF PLUGGING MATERIAL (cubic feet) _____

PLUGGING METHOD _____

_____

REMARKS _____

RECORDED BY: _____ QC CHECKED BY: _____

(Signature) (Signature)

WELL INSTALLATION ACTIVITY/PROGRESS REPORT

PROJECT NAME: **PROJECT NO:**

WELL ID: _____	Date Started: _____ Time: _____	
	Finished: _____ Time: _____	
Drilling Method:	Borehole Diameter:	
Supervisor/Geologist:	Driller:	
Drilling Company:	Helper:	
Footage Drilled/Augered/Cored: _____ feet to _____ feet		
MATERIAL USED:	Bentonite: bags	Bentonite: buckets
	Cement (grout): bags	
	Sand: bags	
Water Used: Source:	Quantity: gallons	
Lubricants Used:		
Well Construction Materials Used:		
_____ Inch Well Casing _____ feet	_____ Inch Well Casing _____ feet	
_____ Inch Outer Casing _____ feet		
Well Caps & Plugs _____ pair	Number of Guard Posts	
Drain Hole (yes/no) _____	Stamped ID (yes/no)	
Activities/Comments:		
Driller's Signature:	Date:	
Supervisory Geologist's Signature:	Date:	
Field Supervisor's Signature:	Date:	
QC Checked By:	Date:	

SCIENCE APPLICATIONS INTERNATIONAL CORPORATION

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Manual Name: **Quality Assurance Technical Procedures Volume I: Data Management**

Document Number: TP-DM-300-2

Revision Number: **3**

Date Printed: _____

Person Checking the Revision Number: _____

SCIENCE APPLICATIONS INTERNATIONAL CORPORATION **DATA MANAGEMENT TECHNICAL PROCEDURE**			
Title: Data Entry			
Procedure No: TP-DM-300-2	**Revision: 3**	**Date: 5/26/2006**	**Page 1 of 4**
Business Unit General Manager: Date: Robt Fuller 6/8/2006		**QA/QC Officer: Date:** C.D. Conrad 5/26/2006	

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1.0 PURPOSE

The purpose of this procedure is to define the activities required to enter and verify information entered into electronic databases designed for the collection/storage of environmental data.

2.0 SCOPE

This procedure applies to entry and verification of information for all data collected or generated from environmental characterization, monitoring, and compliance activities performed by Science Applications International Corporation (SAIC).

3.0 REFERENCES AND DEFINITIONS

3.1 REFERENCES

3.1.1 See common references at the front of the Data Management Manual.

3.1.2 Data Management Procedures. Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA, Interim Final. Section 3.5 EPA /540/G-89/004. U.S. Environmental Protection Agency, October 1988.

3.2 DEFINITIONS

3.2.1 Data Form - The compilation of new or existing data by project personnel or environmental restoration staff in support of environmental activities.

3.2.2 Data Entry - The manual input of data into a data file.

3.2.3 Master Table - Table used to translate coded data elements.

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3.2.4 Data Entry Operator - The person who manages the input of data for a particular data base and is responsible for initially entering data into the data base. R

3.2.5 Verification - To formally ensure that data entered are accurate and complete.

4.0 RESPONSIBILITIES

4.1 See common responsibilities at the front of the Data Management Manual.

4.2 TASK LEADER

The Task Leader is responsible for ensuring that personnel in his/her area of responsibility receive appropriate training in data entry.

4.3 DATA COORDINATOR

The Data Coordinator is responsible for supervising the Data Entry Operator.

4.4 DATA ENTRY OPERATOR

The Data Entry Operator is responsible for the entry of new or existing data generated by field activities or as a result of laboratory analyses, and for performing data entry verification following data entry.

5.0 GENERAL

5.1 Data Entry Operators require a personal computer (PC) with a connection to the local area network or the Internet depending on:

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5.1.1 the physical location of the data management system (i.e., PC or server) and

5.1.2 requirements for communication connections to other computer systems.

5.2 Should the data management system reside on a multi-user computer system, data entry operators require user identification codes and passwords in order to gain access to the data management system.

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5.3 Whenever possible, Data Entry Operators use a data entry screen designed to appear like the forms from which the data originate. These entry systems should provide the following data entry verification functions:

5.3.1 verifying data at entry (e.g., range checking, type checking, uniqueness checking);

5.3.2 displaying related data (e.g., translation of coded values, default values, use of master tables);

5.3.3 automatic entry and retention of repetitive data;

5.3.4 calculating new field values;

5.3.5 restricting operator access;

5.3.6 invoking a logical series of actions with as few keystrokes as possible; and

5.3.7 on-line error messages and help screens.

6.0 PROCEDURE

6.1 The Data Entry Operator receives the environmental data form.

6.2 The Data Entry Operator enters the data from the data forms into a "master environmental data management system" data base(s).

6.3 After completion of data entry, the Data Entry Operator prints the information entered.

6.4 After the Data Entry Operator completes the data entry, the verifier proofreads a printout of the entered data against the original data collection form. Verification printouts are signed and dated following verification. R

6.5 The verifier notifies the Data Entry Operator of errors identified resulting from the data entry. The Data Entry Operator makes corrections to the file. Any questions regarding corrections to either entry are referred to the Data Coordinator.

6.6 After the Data Entry Operator has made all necessary corrections to the data base(s), the verifier proofreads the corrections as required.

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6.7 Steps 6.5 and 6.6 are repeated until no errors or discrepancies are detected. The Data Entry Operator is then responsible for completing the Environmental Data Entry and Verification Form (see form immediately following this procedure) and submitting that form, attached to the environmental data collection forms, to the appropriate records personnel. R

6.8 The data base management system data base(s) serves as the permanent verified data base(s).

7.0 RECORDS

Documentation generated as a result of this procedure is submitted to the identified records system, in accordance with section 17 of the E&IBU QAP. R

8.0 ATTACHMENTS

None - Forms supporting this procedure are controlled separately (see QAAP 5.1) and are found immediately following the procedure.

SCIENCE APPLICATIONS INTERNATIONAL CORPORATION

ENVIRONMENTAL DATA ENTRY AND VERIFICATION FORM

Database Name: _____

Database Format: _____

Project Name: _____

Project Manager Name: _____

Source or Reference for Data Entered: _____

Description of Data Entered: _____

Date Data Entered: _____

Data Verification Personnel: _____

Date Verified: _____

Attach Data Forms and Verification Output

LOGBOOK COPIES TRANSMITTAL

PROJECT NAME: _____ **PROJECT NO:** _____

LOGBOOK NO: _____

LOGBOOK TITLE:

_____

BEGINNING DATE: _____ ENDING DATE: _____

COPIES DELIVERED TO: _____ _____

_____ _____

COMMENTS:

_____

_____

_____

_____

COPIED BY: _____ DATE: _____

DATA COORDINATION USE ONLY

DATE RECEIVED: _____ ENTRY REQUIRED (Y/N): _____

ENTERED BY: _____ DATE ENTERED: _____

VERIFIED BY: _____ DATE VERIFIED: _____

COMMENTS: _____

_____

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SCIENCE APPLICATIONS INTERNATIONAL CORPORATION

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Manual Name: **Quality Assurance Technical Procedures Volume I: Data Management**

Document Number: TP-DM-300-6

Revision Number: **4**

Date Printed: _____

Person Checking the Revision Number: _____

SCIENCE APPLICATIONS INTERNATIONAL CORPORATION DATA MANAGEMENT TECHNICAL PROCEDURE			
Title: Data Package Receipt and Verification			
Procedure No: TP-DM-300-6	**Revision: 4**	**Date: 5/26/2006**	**Page 1 of 6**
Business Unit General Manager: Date: Robert Allen 6/8/2006		**QA/QC Officer: Date:** C. A. Cowart 5/26/2006	

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1.0 PURPOSE

The purpose of this procedure is to describe the process for receiving and verifying project analytical data packages delivered by laboratories.

2.0 SCOPE

This procedure applies to all Science Applications International Corporation (SAIC) personnel involved in receiving and/or reviewing data packages delivered by laboratories.

3.0 REFERENCES AND DEFINITIONS

3.1 REFERENCES

3.1.1 See common references at the front of the Data Management Manual.

3.1.2 Science Applications International Corporation Data Management Technical Procedure (SAIC DMTP) TP-DM-300-7, Data Validation.

3.1.3 Science Applications International Corporation Data Management Technical Procedure (SAIC DMTP) TP-DM-300-9, Database Changes.

3.1.4 Science Applications International Corporation Quality Assurance Administrative Procedure (SAIC QAAP) QAAP 15.1, Control of Nonconforming Items and Services.

3.1.5 Data Management Procedures. Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA, Interim Final. Section 3.5 EPA 540/G-89/004. U.S. Environmental Protection Agency, October 1988.

3.1.6 Science Applications International Corporation Quality Assurance Administrative Procedure (SAIC QAAP) QAAP 17.1, Records Management.

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3.2 DEFINITIONS

3.2.1 Project - A finite, usually predetermined number of samples collected over a given time period from a particular site. A project consists of one or more Sample Delivery Groups (SDGs).

3.2.2 Data Verification - The process of checking discrete sets of data to ensure that data have been accurately recorded, transcribed, and reported. This review will check receipt of all documentation for the analyses requested by the project and specified in the project's Quality Assurance Project Plan (QAPP) and analytical Statement of Work (SOW).

3.2.3 Sample Delivery Group (SDG) - A group of 20 or fewer samples, received over a period of up to 14 calendar days. Data from all samples in an SDG are due concurrently. An SDG is defined by one of the following, whichever occurs first:

a) each 20 field samples;
b) each 14 day calendar period during which field samples are received, beginning with receipt of the first sample in the SDG; or
c) as determined and defined by a specific project need.

3.2.4 Electronic Data Deliverable (EDD) – Electronic presentation of sample and analytical Quality Control (QC) data as specified in the Project QAPP and analytical SOW.

3.2.5 SAIC Environmental Information Management System (SEIMS) A computerized repository of field and laboratory data arranged by project. If a given project has an identified alternate database, this should be used.

4.0 RESPONSIBILITIES

See common responsibilities at the front of the Data Management Manual.

4.1 PROJECT CHEMIST

The Project Chemist is responsible for:

4.1.1 preparing and disseminating appropriate guidance and project specific criteria for each verification and validation task;

4.1.2 ensuring that personnel are trained in and follow this procedure and all project specific requirements;

4.1.3 ensuring that data verification activities are conducted in accordance with this procedure and the defined project specific criteria;

4.1.4 monitoring project budget and schedule;

4.1.5 ensuring availability of necessary personnel, equipment, subcontractors, and services;

4.1.6 reviewing project analytical deliverables and verification checklists for technical content, quality, and completeness; and

4.1.7 issuing “Requests for Missing or Incomplete Laboratory SDG Information” or “Nonconformance Reports” as necessary.

4.2 DATA BASE ADMINISTRATOR (DBA)

The DBA is responsible for:

4.2.1 writing, testing, and maintaining all computer programs in support of the Program or Project database;

4.2.2 writing, testing, and maintaining computer programs for downloading laboratory EDDs into the appropriate Program or Project database; and

4.2.3 ensuring electronic files are properly maintained and back-up files are completed.

4.3 DATA COORDINATOR

The Data Coordinator, or designee, is responsible for:

4.3.1 date stamping and logging in all SDG data packages when received;

4.3.2 loading all project specific Sampling and Analysis Plan (SAP) information into the project database and downloading all laboratory EDDs into the established project database, if required by the project;

4.3.3 ensuring that all data packages, electronic data, and data verification checklists and data validation checklists are maintained and complete;

4.3.4 establishing SAIC data review files by SDG for subsequent review by verification and validation staff;

4.3.5 ensuring that the laboratory EDD values are consistent with laboratory data deliverables;

4.3.6 ensuring original EDD files are stored properly;

4.3.7 ensuring data validation qualifiers and reason codes (if validation is performed) are applied to each analytical result stored in the project data base;

4.3.8 ensuring effective and efficient flow of project information; and

4.3.9 issuing “Requests for Missing or Incomplete Laboratory SDG Information” or “Nonconformance Reports” as necessary.

4.4 DATA PACKAGE VERIFIER

The Data Package Verifier is responsible for:

4.4.1 using the appropriate checklists and forms;

4.4.2 following the checklists to carefully review each data package;

4.4.3 completing a Laboratory Data Package Detail Form for each data package;

4.4.4 marking all items on the verification checklist as acceptable (check), not applicable (NA), or not included (*) with a written comment; and

4.4.5 issuing “Requests for Missing or Incomplete Laboratory SDG Information” or “Nonconformance Reports” as necessary.

5.0 GENERAL

Laboratory data packages and EDDs are received and logged in by the Data Coordinator. The data package information is checked by the Data Package Verifier using appropriate forms and checklists. EDD information and its comparison to hardcopy data package or electronic (PDF) format information is performed by the Data Coordinator. The packages, in hard copy form, are processed manually following this procedure and guidance documents cited under references. A defined project specific process as directed in project documents can take precedence over the review procedure stated in this procedure.

6.0 PROCEDURE

6.1 DATA PACKAGE RECEIVING

6.1.1 Data packages are sent to SAIC from the laboratory.

6.1.2 The data packages are date stamped by the Data Coordinator and copies are made, if appropriate.

6.1.3 The EDD is copied and downloaded into project database.

6.1.4 The data package is logged and review files are established by its SDG # and the type of data.

6.2 VERIFYING DATA PACKAGES

6.2.1 The Data Coordinator establishes the data package review files with the following:

a) Laboratory Data Package Detail Form;
b) appropriate Laboratory Data Verification Checklist; and
c) printout of the EDD.

Note: The forms for a) and b) are found as a full size form which is provided immediately following this procedure. Each project may utilize these forms, adapt them to project specific criteria, or create a project specific form as necessary.

6.2.2 The verifiers complete the Laboratory Data Package Detail Form.

6.2.3 The verifiers follow the designated verification review checklist and mark each item on the checklist as having been reviewed.

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Items will be identified as acceptable (check), not applicable (NA), or not included (*) with a written comment.

6.2.4 The verifiers make a copy of all notes taken during the review process, and these must be attached to the relevant checklist.

6.2.5 If the data package is complete and has no problems, the original verifier's notes, checklists, and the Laboratory Data Package Detail Forms are included in the review file with the data package and returned to the Data Coordinator.

6.2.6 The Data Coordinator compares the EDD reported values to those reported in the data package.

6.2.7 All completed verification checklists, notes, EDD printout review, and forms are placed in the Data Package file folder by SDG number.

6.2.8 Missing items and information are requested from the responsible laboratory using a Request for Missing or Incomplete Laboratory SDG Information form. A full size form is provided immediately following this procedure.

6.2.9 Nonconforming items identified during the review will require issue of a Nonconformance Report (NCR), prepared in accordance with QAAP 15.1 (Reference 3.1.4) R

7.0 RECORDS

Documentation generated as a result of this procedure is submitted to the identified records system, in accordance with section 17 of the E&IBU QAP. R

8.0 ATTACHMENTS

None.

SCIENCE APPLICATIONS INTERNATIONAL CORPORATION
Laboratory Data Verification Checklist

Project: _____

SDG No: _____ **Analyte Group:** _____
Sample Matrix: _____
EDD (Y/N): _____

Disposition of Data Package: _____
NCR No. (if applicable): _____

1. Case Narrative

Read SDG Case Narrative _____

Check Laboratory sample ID vs. Project sample ID lists _____

Check that discussion covers each analytical type included in the SDG _____

Check for identified nonconforming items (e.g., missed holding times, etc.) _____

2. Chain-of-Custody (COC)

Check COC sample collection, shipping, and receiving dates _____

Check that COC signature blocks are complete _____

Check COC project sample IDs vs. Lab IDs and Result Form IDs _____

Match COC requested analyses with Case Narrative and with data package content (Result Forms) _____

3. Analytical Results Form

Verify that a Result Form is present for each sample and analysis _____

On each Result Form check:

SDG No. _____
Sample ID _____
Lab ID _____
Date Collected _____
Date Extracted _____
Date Analyzed _____
Result Matrix _____
Result Units _____

4. Project Verification

Check project analyte list vs. analytes reported _____

Check project requested methods vs. analytical methods performed _____

Check analyte reporting levels vs. project reporting level goals _____

5. Analytical Quality Control Information

Check for surrogate recovery results (e.g., org. form II) _____

Check for LCS results (e.g., org. form III, inorg. form XII) _____

Check for method blank results (e.g., org. form IV, inorg. form III) _____

Check for MS/MSD results (e.g., inorg. form V) _____

Check for laboratory duplicate results (e.g., inorg. form VI) _____

Check for Method Calibration and Run Documentation

organic:	instrument performance check	_____
	initial calibration data	_____
	continuing calibration data	_____
	internal standard areas	_____
	internal standard retention times	_____
	sample clean-up documentation	_____
	(org. forms V through X)	
metal:	initial calibration data	_____
	continuing calibration data	_____
	method detection limits	_____
	method linear range	_____
	sample run sequence	_____
	(inorg. forms II, IV, and VIII through XIV)	
other:	initial calibration data	_____
	continuing calibration data	_____
	method detection limits	_____
	sample run sequence	_____

6. Incorrect Information

Identify missing items or incorrect information (i.e., missing forms, unsigned forms, incorrect sample IDs, etc.)

Contact the laboratory or project personnel to obtain missing information or correct information

Document corrections below:

7. Nonconforming Items

Document all nonconforming items that can not be resolved above in a Non-Conformance Report (NCR), complete form, file, and follow-up

NCR # Item

Reviewed By: _____ Date: _____

QA Review By: _____ Date: _____

Data Verification Checklist

Date: _____

Reviewer: _____

Lab SOW#: _____

Lab Batch #: _____

SAIC DRG#: _____

Sample Numbers: (attach copy of lab case narrative)

Analyses: _____ _____

_____ _____

_____ _____

1. Review laboratory Case Narrative _____

- verify direct statement made in the Case Narrative with data forms and other data package information
- identify any major analytical discrepancies in the deviation section below

2. Verify project sample IDs, laboratory sample Ids, and SDG identification in the data submittal _____

3. Examine Chain-of-Custody (COC) forms with the data package

- check COC dates shipped and received _____
- check condition upon receipt (temperature, breakage) _____
- check sample IDs between COC and data submitted _____
- check signature blocks (signed and dated) _____
- check analyses requested vs. analyses submitted _____

Data Verification Checklist

4. Examine Data Forms

- verify submittal of all samples and analyses requested on the COC _____
- verify sample ID and lab ID on all Form 1's _____
- confirm all analytical units are consistent and correct _____

5. Electronic Data Review

- confirm hardcopy and electronic data are in agreement _____
- confirm analytical holding times were met _____
- confirm all analytical units are consistent and correct _____
- review analytical reporting levels _____

6. Identify any deviations or inconsistencies:
(initiate a Database Change Form or Nonconformance Report to clarify any questionable or non-conforming information)

_____

_____

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SCIENCE APPLICATIONS INTERNATIONAL CORPORATION
Laboratory Data Package Detail Form

Project: _____ Page ____ of ____

SDG No: _____ **Analyte Group:** _____

Field Sample ID	Lab ID #	Matrix	Analysis	Notes:

Comments: _____

SCIENCE APPLICATIONS INTERNATIONAL CORPORATION
Data Verification/Validation Review

Request for
Missing or Incomplete Laboratory SDG Information

Project: _____

SDG No: _____

Analyte Group: _____

Sample Matrix: _____

Date Requested: _____

Requested Missing or Incomplete Information:

Response Date: _____

Response:

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Manual Name: **Quality Assurance Technical Procedures Volume I: Data Management**

Document Number: TP-DM-300-7

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SCIENCE APPLICATIONS INTERNATIONAL CORPORATION DATA MANAGEMENT TECHNICAL PROCEDURE			
Title: Data Validation			
Procedure No: TP-DM-300-7	**Revision:** 7	**Date:** 3/03/2009	**Page 1 of 20**
Business Unit General Manager: 3/3/2009	**Date:**	**QA/QC Officer:** C.S. Coward	**Date:** 3/3/2009

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1.0 PURPOSE

The purpose of this procedure is to define the process for validation of analytical sample results obtained from analyses of environmental samples collected for site characterization, assessment, determination of remedial actions, and risk assessment.

The primary goal of data validation is to provide an independent examination of the reported values and associated quality control. This will document that they are complete and accurately define the analytical context of the data set with respect to the project Data Quality Objectives (DQOs).

2.0 SCOPE

This procedure applies to all data generated as a result of analytical laboratory analyses of environmental samples for purposes of site characterization and environmental assessment activities conducted by Science Applications International Corporation (SAIC). This procedure is not applicable to in-situ field measurements, but may be applied to in-field analysis provided applicable documentation is available.

3.0 REFERENCES AND DEFINITIONS

3.1 REFERENCES

3.1.1 See the Common References at the front of the Data Management manual.

3.1.2 Science Applications International Corporation, Quality Assurance Administrative Procedure (SAIC QAAP) QAAP 15.1, Control of Nonconforming Items and Services.

3.1.3 Science Applications International Corporation, Quality Assurance Technical Procedure (SAIC QATP) TP-DM-300-2, Data Entry.

3.1.4 Science Applications International Corporation, Data Management Technical Procedure (SAIC DMTP) TP-DM-300-6, Data Package Receipt and Verification.

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3.1.5 Science Applications International Corporation, Quality Assurance Technical Procedure (SAIC QATP) TP-DM-300-9, Database Changes.

3.1.6 SAIC, Laboratory Data Validation Guidelines for Evaluating Radionuclide Analyses, Thomas L. Rucker and C. Martin Johnson Jr., SAIC document number 143.20020404.001, Revision 7, April 2002.

3.1.7 U.S. Environmental Protection Agency, Statement of Work for Organics Analysis Multi-Media, Multi-Concentration, Contract Laboratory Program, Document Number OLM01.0, and subsequent versions.

3.1.8 U.S. Environmental Protection Agency, Statement of Work for Inorganics Analysis Multi-Media, Multi-Concentration, Contract Laboratory Program, Document Number ILM01.0, and subsequent versions.

3.1.9 U. S. Environmental Protection Agency Contract Laboratory Program National Functional Guidelines for Organic Data Review, EPA-540/R-99/008, October 1999.

3.1.10 U. S. Environmental Protection Agency Contract Laboratory Program National Functional Guidelines for Low Concentrations Organic Data Review, EPA-540/R-00/006, June 2001.

3.1.11 U.S. Environmental Protection Agency Contract Laboratory Program National Functional Guidelines for Inorganic Data Review, EPA-540-R-004, October 2004. R

3.1.12 Region I, EPA New England, Data Validation Functional Guidelines for Evaluating Environmental Analyses, December 1996.

3.1.13 U.S. Environmental Protection Agency, Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-020, Revised March 1983, PB84-128677.

3.1.14 U. S. Environmental Protection Agency, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, Third Edition, and all subsequent “Updates”.

3.1.15 Science Applications International Corporation Quality Assurance Administrative Procedure (SAIC QAAP) QAAP 17.1, Records Management.

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3.2 DEFINITIONS

3.2.1 Data Validation - A systematic process for reviewing a body of data against a defined set of criteria to ensure that the data are adequate for their intended use. This review focuses on the technical aspects of the analytical process and quality control information. It should document that the analyses meet project specified QAPP and analytical SOW criteria.

3.2.2 Electronic Data Deliverable (EDD) - Electronic representation of sample and analytical QC data as specified in the laboratory statement of work.

3.2.3 Project – A finite, usually predetermined number of samples collected over a given time period for a particular site. A project consists of one or more Sample Delivery Groups.

3.2.4 Sample Delivery Group (SDG) - A group of 20 or fewer samples received over a period of up to 14 calendar days. Data from all samples in an SDG are due concurrently. An SDG is defined by one of the following, whichever occurs first:

a) each 20 field samples;
b) each 14-day calendar period during which field samples are received, beginning with receipt of the first sample in the SDG; or
c) as determined and defined by a specific project need.

3.2.5 SAIC Environmental Information Management System (SEIMS) - A computerized repository of field and laboratory data arranged by project. If a given project has an identified alternate database, this should be substituted in this procedure where SEIMS is referenced.

4.0 RESPONSIBILITIES

4.1 See the Common Responsibilities at the front of the Data Management Manual.

4.2 PROJECT CHEMIST

The Project Chemist is responsible for:

4.2.1 preparing and disseminating appropriate guidance and project specific criteria for each verification and validation task;

4.2.2 ensuring that personnel are trained in and follow this procedure and all project specific requirements;

4.2.3 ensuring that data verification activities are conducted in accordance with this procedure and the defined project specific criteria;

4.2.4 monitoring project budget and schedule;

4.2.5 ensuring availability of necessary personnel, equipment, subcontractors, and services;

4.2.6 reviewing project analytical deliverables, verification checklists, and validation checklists for technical content, quality, and completeness; and

4.2.7 issuing “Requests for Missing or Incomplete Laboratory SDG Information” a full size form is provided immediately following this procedure or “Nonconformance Reports” as necessary.

4.3 DATA BASE ADMINISTRATOR (DBA)

The DBA is responsible for:

4.3.1 writing, testing, and maintaining all computer programs in support of the SEIMS database;

4.3.2 writing, testing, and maintaining computer programs for downloading laboratory EDDs into the appropriate SEIMS project database; and

4.3.3 ensuring electronic files are properly maintained and back-up files are completed.

4.4 DATA COORDINATOR

The Data Coordinator is responsible for:

4.4.1 date stamping and logging in all SDG data packages when received;

4.4.2 loading all project specific Sampling and Analysis Plan (SAP) information into SEIMS and downloading all laboratory EDDs into the established SEIMS project database, if required by the project;

4.4.3 ensuring that all data packages, electronic data, data verification checklists, and data validation checklists are maintained and complete;

4.4.4 establishing SAIC data review files by SDG for subsequent review by verification and validation staff;

4.4.5 ensuring that the laboratory EDD values are consistent with laboratory data deliverables;

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4.4.6 ensuring original EDD files are stored properly;

4.4.7 ensuring data validation qualifiers and reason codes, (if validation is performed) are applied to each analytical result stored in the project database;

4.4.8 ensuring effective and efficient flow of project information; and

4.4.9 issuing "Requests for Missing or Incomplete Laboratory SDG Information" a full size form is provided immediately following this procedure or "Nonconformance Reports" as necessary.

4.5 DATA VALIDATORS

The Data Validators are responsible for:

4.5.1 ensuring that the appropriate guidance documents listed under references and outlined in the body of this procedure direct the data validation process;

4.5.2 ensuring that they are knowledgeable and informed of all project specific criteria and information necessary to complete the assigned validation task;

4.5.3 ensuring that appropriate checklists are used;

4.5.4 carefully reviewing the data packages;

4.5.5 completing the verification and validation checklists as identified in this procedure; and

4.5.6 issuing "Requests for Missing or Incomplete Laboratory SDG Information" a full size form is provided immediately following this procedure or "Nonconformance Reports" as necessary.

5.0 GENERAL

5.1 General direction is provided by the Environmental Protection Agency (EPA) under the Contract Laboratory Program (CLP) in the form of the National Functional Guidelines for Organic Data Review (EPA-540/R-99/008, October, 1999), the National Functional Guidelines for Low Concentration Organic Data Review (EPA-540/R-00/006, June 2001), and the National Functional Guidelines for Inorganic Data Review (EPA-540/R-004, October 2004). These guidelines provide specific criteria for determining data usability, however, they also allow for professional judgment. The requirements for LCS recoveries in this procedure have been modified for organic constituents based on professional judgment (See LCS section of organic data checklists).EPA Region I has provided the environmental

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community with a useful "Tiered Approach" to validation that allows a program or project to establish the level of intensity and depth of review applicable to their needs. Guidance to this approach appears in "Region I, EPA-New England Data Validation Functional Guidelines for Evaluating Environmental Analyses", July 1996, revised December 1996. This document and its appendices may prove useful during project data validation development. Interpretation of this guidance and its application to individual programs and projects needs to be made at the operational level and incorporated into the Sampling and Analysis Plan for a given investigation. Direction for radionuclide validation is provided by the Rucker and Johnson publication cited in Reference 3.1.6.

5.2 Specific requirements for analytical data validation are defined in the Quality Assurance Project Plan (QAPP) and/or the site Sampling and Analysis Plan (SAP) and/or the project specific data validation plan and are used to direct the systematic process to validate project data. Verification and validation must be consistent with the project data quality objectives, laboratory scope of work, and designated analytical methods. Data are validated against this set of accepted criteria to provide assurance that data are adequate for their intended use.

5.3 The validation of environmental data is the process by which data are evaluated in context to field and analytical QA/QC samples associated with the environmental samples. This process consists of data checking, auditing, verification, flagging, review, and certification. Validation is independent of the analytical laboratory data review. The project-specific Data Validators certify in writing that data have been validated and flagged in accordance with the defined process.
Examples of the items evaluated during the validation process are:

- technical holding times;
- blanks (laboratory and field/trip/equipment);
- duplicate samples (laboratory and field);
- laboratory control samples;
- matrix spike samples;
- matrix spike duplicate samples;
- surrogate / tracer recoveries;
- calibration;
- internal standards; and
- external standards.

5.4 Data base entry of all data validation flags (Attachment I) and reason codes (Attachment II) that have been entered on the sample results forms is completed according to TP-DM-300-2 (Reference 3.1.3).

6.0 PROCEDURE

6.1 DATA VALIDATION

6.1.1 STANDARD DATA VALIDATION GUIDELINES

a) Data packages are validated in accordance with the QAPP, the site SAP, and Data Validation Plan.

b) Standard data validation includes all aspects of data verification and implements an evaluation of laboratory quality control data and analytical procedures. This ensures the analytical process and instrumentation used to perform the analyses met all of the data quality requirements specified in the Data Quality Objectives (DQOs) and Sampling and Analysis Plan. Focus is given to laboratory /instrument performance criteria, sample preparation and matrix effects evaluation, and field quality control measures. Standard data validation involves evaluating the laboratory analytical data packages to confirm that:

Deliverable verification

- the data packages are complete and contain all of the information specified in the Sampling and Analysis Plan [e.g., all samples and analyses requested, case narrative, summary data report, completed chain-of-custody form, analytical quality control data (blanks, matrix spikes, matrix spike duplicates, etc.), date and time when each analysis was performed],
- the laboratory ran the correct analytical methods specified in the Sampling and Analysis Plan,
- samples did not exceed the maximum analytical holding times specified in the Sampling and Analysis Plan,
- sample chain-of-custody was not broken from the time the sample was collected, analyzed, and the data reported, and
- the laboratory reported analytical results for each analytical method and each analyte required by the laboratory statement of work and the project Sampling and Analysis Plan.

Laboratory/instrument performance criteria

- laboratory case narrative documentation is clear and accurate,
- analytical preparation procedures are acceptable and documented,

- instrument operational and method calibration criteria have been achieved,
- laboratory calibration blank contamination is under control, and
- laboratory control standard criteria are being met.

Sample preparation and matrix effects criteria

- laboratory method blank contamination is under control,
- sample surrogate compound recovery, tracer recovery, and internal standard criteria have been achieved,
- sample matrix spike recoveries meet minimum accuracy requirements specified in the DQOs and Sampling and Analysis Plan,
- sample matrix spike duplicate or duplicate comparisons meet minimum precision requirements specified in the DQOs and Sampling and Analysis Plan, and
- sample dilution review and re-analyses performance.

Field quality control measures

- field source water blank, equipment rinsate blank, and sample trip blank contents have not impacted the project data results, and
- field duplicate comparisons meet minimum precision requirements specified in the DQOs and Sampling and Analysis Plan.

c) Following application of TP-DM-300-6 (Reference 3.1.4) the Data Validator reviews the data package and data verification checklists. The appropriate work sheets (see checklist forms “Standard Validation Checklist”, Attachment III, full size forms are provided immediately following this procedure), or QAPP, SAP, or Data Validation Plan specified checklists, available from the Data Coordinator, are used when validating data.

d) All data presented on standardized reporting forms are validated against guideline criteria in all data packages.

e) After completion of the work sheets, nonconforming items identified by the validation process are summarized and reported following TP-DM-300-9 (Reference 3.1.5) or QAAP 15.1 (Reference 3.1.2).

f) Copies of the sample result forms are made and marked “DATA VALIDATION COPY”.

g) Failures to meet specified criteria are documented on the work sheets for each analyte. The data for each sample/analyte are flagged accordingly on the data reporting forms marked “DATA VALIDATION COPY”. This will involve professional judgement on the part of the data validator.

h) For each data package, a two part data validation deliverable is generated consisting of:

- data reporting forms marked “DATA VALIDATION COPY” with validation flags and reason codes; and
- validation work sheet.

6.1.2 COMPREHENSIVE DATA VALIDATION GUIDELINES

Comprehensive data validation encompasses all Standard Data Validation information and adds an examination of the analytical raw data. This level of review requires all information generated by the laboratory to be presented as part of the data deliverable. This would include copies of all chromatograms, spectral printouts, quantification details, preparation logbooks, standard logbooks, calculation programs, etc., produced by the laboratory. In addition to the material reviewed during standard data validation, comprehensive data validation will include:

- a detailed examination of the raw data analyte identification,
- a check of calculations used to quantify analyte results, normally a minimum of 10% of the reported concentrations are checked by recalculation from original raw data information, and
- recalculated results are verified against final reported concentrations.

Following application of TP-DM-300-6 (Reference 3.1.4), the Data Validator reviews the data package and data verification checklists. The appropriate work sheets (see checklist forms “Comprehensive Validation Checklist”, Attachment III, full size forms are provided immediately following this procedure), or QAPP, SAP, or Data Validation Plan specified checklists, available from the Data Coordinator, are used when validating data.

6.2 After completion of the validation, the Data Validator returns the validation package to the Data Coordinator. The Data Coordinator then sends the data validation package to the Project Chemist or another Data Validator for QA and technical review.

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6.3 After the QA and technical review is completed, the data validation flags and reason codes (when applicable) are entered into the database according to TP-DM-300-2 (Reference 3.1.3).

7.0 RECORDS

Documentation generated as a result of this procedure is submitted to the identified records system, in accordance with Section 17 of the Business Unit QAP.

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8.0 ATTACHMENTS

8.1 Attachment I – Data Qualifiers (validation qualifiers and laboratory qualifiers)
8.2 Attachment II – Data Validation Reason Codes
8.3 Attachment III- Forms List

ATTACHMENT I
DATA QUALIFIERS

Validation Data Qualifiers (Flags)

During the data validation process, all laboratory data are assigned appropriate data validation flags and reason codes. Validation flags are defined as follows:

"U" Indicates the analyte was analyzed for, but not detected above the level of the associated value.

"J" Indicates the analyte was positively identified, however, the associated numerical value is an estimated concentration of the analyte in the sample.

"UJ" Indicates the analyte was analyzed for, but not detected, above the associated value, however, the reported value is an estimate and demonstrates a decreased knowledge of its accuracy or precision.

"R" Indicates the analyte value reported is unusable. The integrity of the analyte's identification, accuracy, precision, or sensitivity have raised significant question as to the reality of the information presented.

"=" Indicates the analyte has been validated, the analyte has been positively identified, and the associated concentration value is accurate.

Normal Laboratory Data Qualifiers

During the laboratory production and internal review laboratory data may be assigned data qualifiers. These are reported as part of the laboratory data deliverable and will eventually be replaced by the more concise set of Validation Data Qualifiers. Normal laboratory data qualifiers are defined as follows:

Laboratory Qualifiers for Organic Analytical Data

U — Indicates that the compound was analyzed for but not detected. The sample quantitation limit (SQL) must be corrected for dilution. For a soil/sediment sample, the value must also be corrected for percent moisture.

J — Indicates an estimated value. This qualifier is used either when estimating a concentration for tentatively identified compounds (TICs) where a 1:1 response is assumed, or when the mass spectral data indicates the presence of a compound that meets the identification criteria but the result is less than the SQL but greater than zero.

N — Indicates presumptive evidence of a compound. This qualifier is used only for TICs, where the identification is based on a mass spectral library search.

ATTACHMENT I (continued)

P — Used for pesticide/PCB target analytes when there is greater than 25% difference for detected concentrations between the two GC columns.

C — Applies to pesticide results where the identification has been confirmed by gas chromatography/mass spectrometry (GC/MS). If GC/MS confirmation was attempted but was unsuccessful, this qualifier is not applied; instead a laboratory-defined qualifier is used.

B — Used when the compound is found in the associated blank as well as in the sample. It indicates possible/probable blank contamination and alerts the data user to take appropriate action. This qualifier is used for TICs as well as for positively identified target compounds.

E — Identifies compounds whose concentrations exceed the calibration range of the GC/MS instrument for that specific analysis.

D — Identifies all compounds identified in an analysis at a secondary dilution factor. This qualifier alerts data users that any discrepancies between the concentrations reported may be due to dilution of the sample or extract.

A — Indicates that a TIC was a suspected aldol-condensation product.

X — Indicates that other specific qualifiers were required to properly define the results. If used, the qualifier must be fully described and such description must be included in the Sample Data Summary Package and SDG narrative.

Laboratory Qualifiers for Inorganic Analytical Data

B — Indicates that the reported value was obtained from a reading that was less than the Contract Required Detection Limit (CRDL), but greater than or equal to the Instrument Detection Limit (IDL).

U — Indicates that the analyte was analyzed for but not detected.

E — Used when the reported value was estimated because of the presence of interference.

M — Indicates that the duplicate injection precision was not met.

N — Indicates that the spiked sample recovery was not within control limits.

S — Indicates that the reported value was determined by the method of standard additions (MSA).

ATTACHMENT I (continued)

W — Used when the post-digestion spike for furnace atomic absorption analysis was not within control limits (85 - 115%), while sample absorbance was less than 50% of spike absorbance.

***** — Indicates that the duplicate analysis was not within control limits.

+ — Indicates that the correlation coefficient for the MSA was less than 0.995.

Laboratory Qualifiers for Radiochemical Analytical Data

< — The numerical value reported was less than the MDA.

N — The sample results were qualified to denote poor spike recovery.

***** — The sample results were qualified to denote poor duplicate results.

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ATTACHMENT II
DATA VALIDATION REASON CODES

Organic, Inorganic, and Radiological Analytical Data

Holding Times

A01 Extraction holding times were exceeded.
A02 Extraction holding times were grossly exceeded.
A03 Analysis holding times were exceeded.
A04 Analysis holding times were grossly exceeded.
A05 Samples were not preserved properly.
A06 Professional judgement was used to qualify the data.

GC/MS Tuning

B01 Mass calibration was in error, even after applying expanded criteria.
B02 Mass calibration was not performed every 12 hours.
B03 Mass calibration did not meet ion abundance criteria.
B04 Professional judgement was used to qualify the data.

Initial/Continuing Calibration - Organics

C01 Initial calibration RRF was <0.05.
C02 Initial calibration RSD was >30%.
C03 Initial calibration sequence was not followed as required.
C04 Continuing calibration RRF was <0.05.
C05 Continuing calibration %D was not acceptable.
C06 Continuing calibration was not performed at the required frequency.
C07 Resolution criteria were not met.
C08 RPD criteria were not met.
C09 RSD criteria were not met.
C10 Retention time of compounds was outside windows.
C11 Compounds were not adequately resolved.
C12 Breakdown of endrin or DDT was >20%.
C13 Combined breakdown of endrin/DDT was >30%.
C14 Professional judgement was used to qualify the data.

ATTACHMENT II (continued)

Initial/Continuing Calibration - Inorganics

D01 ICV or CCV were not performed for every analyte.
D02 ICV recovery was above the upper control limit.
D03 ICV recovery was below the lower control limit.
D04 CCV recovery was above the upper control limit.
D05 CCV recovery was below the lower control limit.
D06 Standard curve was not established with the minimum number of standards.
D07 Instrument was not calibrated daily or each time the instrument was set up.
D08 Correlation coefficient was <0.995.
D09 Mid range cyanide standard was not distilled.
D10 Professional judgement was used to qualify the data.

ICP and Furnace Requirements

E01 Interference check sample recovery was outside the control limit.
E02 Duplicate injections were outside the control limit.
E03 Post digestion spike recovery was outside the control limit.
E04 MSA was required but not performed.
E05 MSA correlation coefficient was <0.995.
E06 MSA spikes were not at the correct concentration.
E07 Serial dilution criteria were not met.
E08 Professional judgement was used to qualify the data.

Blanks

F01 Sample data were qualified as a result of the method blank.
F02 Sample data were qualified as a result of the field blank.
F03 Sample data were qualified as a result of the equipment rinsate.
F04 Sample data were qualified as a result of the trip blank.
F05 Gross contamination exists.
F06 Concentration of the contaminant was detected at a level below the CRQL.
F07 Concentration of the contaminant was detected at a level less than the action limit, but greater than the CRQL.
F08 Concentration of the contaminant was detected at a level that exceeds the action level.
F09 No laboratory blanks were analyzed.
F10 Blank had a negative value >2x's the IDL.
F11 Blanks were not analyzed at required frequency.
F12 Professional judgement was used to qualify the data.
F13 Reported blank net result is > than 1.65 sigma, radiochemistry.
F14 Subtracted method blank exceeds 3 sigma of established blank value, radiochemistry.

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ATTACHMENT II (continued)

Surrogate/Radiological Chemical Recovery

G01 Surrogate/radiological chemical recovery was above the upper control limit.
G02 Surrogate/radiological chemical recovery was below the lower control limit.
G03 Surrogate recovery was <10%.
G04 Surrogate recovery was zero.
G05 Surrogate/radiological chemical recovery data was not present.
G06 Professional judgement was used to qualify the data.
G07 Radiological chemical recovery was <20%.
G08 Radiological chemical recovery was >150%.
G09 The 2 sigma uncertainty in the radiological sample specific chemical recovery was > 10%

Matrix Spike/Matrix Spike Duplicate (MS/MSD)

H01 MS/MSD recovery was above the upper control limit.
H02 MS/MSD recovery was below the lower control limit.
H03 MS/MSD recovery was <10%.
H04 MS/MSD pairs exceed the RPD limit.
H05 No action was taken on MS/MSD results.
H06 Professional judgement was used to qualify the data.
H07 Radiological MS/MSD recovery was < 20% .
H08 Radiological MS/MSD recovery was >160% .
H09 Radiological MS/MSD samples were not analyzed at the required frequency.

Matrix Spike

I01 MS recovery was above the upper control limit.
I02 MS recovery was below the lower control limit.
I03 MS recovery was <30%.
I04 No action was taken on MS data.
I05 Professional judgement was used to qualify the data.
I06 MS samples were not analyzed at the required frequency.

Laboratory Duplicate

J01 Duplicate RPD/radiological duplicate error ratio (DER) was outside the control limit.
J02 Duplicate sample results were >5 x the CRDL.
J03 Duplicate sample results were <5 x the CRDL.
J04 Professional judgement was used to qualify the data.
J05 Duplicate was not analyzed at the required frequency.
J06 Radiological duplicate RPD and duplicate error ratio (DER) were outside acceptable limits.

ATTACHMENT II (continued)

Internal Area Summary

K01 Area counts were outside the control limits.
K02 Extremely low area counts or performance was exhibited by a major drop off.
K03 IS retention time varied by more than 30 seconds.
K04 Professional judgement was used to qualify the data.

Pesticide Cleanup Checks

L01 10% recovery was obtained during either check.
L02 Recoveries during either check were >120%.
L03 GPC Cleanup recoveries were outside the control limits.
L04 Florisil cartridge cleanup recoveries were outside the control limits.
L05 Professional judgement was used to qualify the data.

Target Compound Identification

M01 Incorrect identifications were made.
M02 Qualitative criteria were not met.
M03 Cross contamination occurred.
M04 Confirmatory analysis was not performed.
M05 No results were provided.
M06 Analysis occurred outside 12 hr GC/MS window.
M07 Professional judgement was used to qualify the data.
M08 The %D between the two pesticide/PCB column checks was >25%.

Compound Quantitation and Reported CRQLs

N01 Quantitation limits were affected by large off-scale peaks.
N02 MDLs reported by the laboratory exceeded corresponding CRQLs.
N03 Professional judgement used to qualify the data.

Tentatively Identified Compounds (TICs)

O01 Compound was suspected laboratory contaminant and was not detected in the blank.
O02 TIC result was not above 10 x the level found in the blank.
O03 Professional judgement was used to qualify analytical data.

Laboratory Control Samples (LCSs)

P01 LCS recovery was above upper control limit.
P02 LCS recovery was below lower control limit.
P03 LCS recovery was <50%.
P04 No action was taken on the LCS data.
P05 LCS was not analyzed at required frequency.

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ATTACHMENT II (continued)

P06 Radiological LCS recovery was <50% for aqueous samples; <40% for solid samples.
P07 Radiological LCS recovery was >150% for aqueous samples; >160% for solid samples.
P08 Professional judgement was used to qualify the data.

Field Duplicate

Q01 Field duplicate RPDs were >30% for waters and/or > 50% for soils.
Q02 Radiological field duplicate error ratio (DER) was outside the control limit.
Q03 Duplicate sample results were >5 x the CRDL.
Q04 Duplicate sample results were <5 x the CRDL.

Radiological Calibration

R01 Efficiency calibration criteria were not met.
R02 Energy calibration criteria were not met.
R03 Resolution calibration criteria were not met.
R04 Background determination criteria were not met.
R05 Quench curve criteria were not met.
R06 Absorption curve criteria were not met.
R07 Plateau curve criteria were not met.
R08 Professional judgement was used to qualify the data.
R09 Background quench curve criteria were not met.
R10 Errors found in calculations.
R11 Calibration required frequency not met.
R12 Dark current criteria were not met.

Radiological Calibration Verification

S01 Efficiency verification criteria were not met.
S02 Energy verification criteria were not met.
S03 Resolution verification criteria were not met.
S04 Background verification criteria were not met.
S05 Cross-talk verification criteria were not met.
S06 Professional judgement was used to qualify the data.
S07 Calibration verification required frequency not met.

Radionuclide Quantitation

T01 Detection limits were not met.
T02 Analytical uncertainties were not met and/or not reported.
T03 Inappropriate aliquot sizes were used.
T04 Professional judgement was used to qualify the data.
T05 Errors in calculation of reported result.
T06 Errors in calculation of reported uncertainty.
T07 Net negative result with absolute value greater than the reported uncertainty.

ATTACHMENT II (continued)

T08 Exceeded maximum mass/area on planchet for alpha/beta.
T09 Quantification not possible due to interference.
T10 Results do not compare with others related measurements on the same sample.
T11 Reported result is less than 1.65 theta.
T12 Analytical result is less than the associated MDA, but greater than the counting uncertainty.
T13 Analytical result is less than both the associated counting uncertainty and the MDA.
T14 Negative analytical result where absolute value exceeds 2x the associated MDA.

System Performance

V01 High background levels or a shift in the energy calibration were observed.
V02 Extraneous peaks were observed.
V03 Loss of resolution was observed.
V04 Peak-tailing or peak splitting that may result in inaccurate quantitation were observed.
V05 Professional judgement was used to qualify the data.
V06 General degradation of system performance.

Radionuclide Identification

W01 Peak energy difference greater than 40 keV (alpha) or 2 keV (gamma).
W02 Interference peak in region of interest.
W03 Less than 50% total gamma abundance for tentatively identified radionuclides (TIRs).
W04 Professional judgement was used to qualify the data.

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ATTACHMENT III
Forms List

Immediately following this procedure are the full size forms for the following:

- Organic Data Review Checklist – Standard Validation
- GC and LC Organic Data Review Checklist- Standard Validation
- Metals Data Review Checklist- Standard Validation
- Inorganic Data Review Checklist- Standard Validation
- Radiochemical Data Review Checklist- Standard Validation
- Organic Data Review Checklist – Comprehensive Validation
- GC and LC Organic Data Review Checklist- Comprehensive Validation
- Metals Data Review Checklist- Comprehensive Validation
- Inorganic Data Review Checklist- Comprehensive Validation
- Radiochemical Data Review Checklist- Comprehensive Validation
- Requests for Missing or Incomplete Laboratory SDG Information

SCIENCE APPLICATIONS INTERNATIONAL CORPORATION
Organic Data Review Checklist - Standard Validation

Project: _____

SDG No: _____ **Analysis:** _____

Method: _____

Laboratory: _____ **Matrix:** _____

The above data package has been reviewed and the analytical quality control/quality assurance performance data have been summarized. The general criteria used to assess the analytical integrityof the data were based on an examination of the following:

Case Narrative	Analytical Surrogate Recoveries
Analytical Holding Times	Internal Standard Performance
Sample Preservation	MS/MSD Recoveries and Differences
Method Calibration	LCS Recoveries
Method and Project Blanks	Re-analysis and Secondary Dilution

Project Specific QA/QC or contract requirements may take priority over validation criteria in this procedure.

Overall Remarks: _____

Definition of Qualifiers:

"U", not detected at the associated level
"UJ", not detected and associated value estimated
"J", associated value estimated
"R", associated value unusable or analyte identity unfounded
"=", compound properly identified and value positive

Reviewed by: _____ Date: _____

QA Reviewed by: _____ Date: _____

I. Case Narrative

Verify direct statements made within the Laboratory Case Narrative (note discrepancies).

Remarks:

II. Re-analysis and Secondary Dilutions

Verify that re-analysis and secondary dilutions were performed and reported as necessary. Determine appropriate results to report.

Remarks:

III. Holding Times

VOC - Waters - unpreserved: aromatic within 7 days, non-aromatic within 14 days of sample collection
VOC - Waters - preserved: aromatic and non-aromatic within 14 days of sample collection
VOC - Soils - preserve or analyze within 48 hours of sample collection; analyze within 14 days of preservation

SVOC, Pest., PCB - Waters - extract within 7 days of sample collection, analyze within 40 days of extraction
SVOC, Pest., PCB - Soils - extract within 14 days of sample collection, analyze within 40 days of extraction

Deviations:

Sample #	VOC		SVOC			Pest/PCB		
	Date Collected	Date Analyzed	Date Collected	Date Extracted	Date Analyzed	Date Collected	Date Extracted	Date Analyzed

Actions:
1. If holding times are exceeded, all results are qualified as estimated (J/UJ)
2. If holding times are exceeded by more than 2X, reviewer may qualify non-detected results as unusable (R)

Remarks: _____

IV. System Monitoring Compounds (SMC) Recoveries (VOC, SVOC, Pesticides, PCBs)

List SMC compounds with unacceptable recoveries:

Deviations:

Sample #	VOC			SVOC B/N Compounds			SVOC Acid Compounds			Pest	PCB
	TOL	BFB	DCE	NBZ	FBP	TPH	PHL	2FP	TBP	TCX	DCB
QC Limits											

Actions:

1. If any SMC recovery is <10%, qualify all positive results in associated fractions as estimated (J)
2. If any SMC recovery is <10%, qualify all nondetects in associated fractions as unusable (R)
3. If SMC recoveries fall between 10% and the lower recovery limit, qualify results as estimated (J/UJ)
4. If SMC recoveries fall above the upper recovery limit, qualify positive results as estimated (J)
5. Use professional judgement to qualify Pest/PCB results when SMC recoveries are >10%
6. Use professional judgement to qualify results when SMC recoveries have been diluted out of spec.
7. For SVOC, qualification of the data is required only when 2 or more SMC per fraction are not within control limits
8. Note: SMC formerly known as surrogates.

Remarks: _____

V. Internal Standards Performance (VOC, SVOC)

VOC internal standard area counts within -50% to +100% of standard (Y/N)
VOC internal standard retention times within ± 30 seconds of standard (Y/N)

SVOC internal standard area counts within -50% to +100% of standard (Y/N)
SVOC internal standard retention times within + 30 seconds of standard (Y/N)

Deviations:

Sample #	IS Affected	Area Counts	Acceptable Range	RT	Std. RT Value

Actions:

1. If area counts are outside limits, qualify positive results associated with that IS as estimated (J)
2. Non-detected compounds quantitated using an IS area count >100% should not be qualified
3. Non-detected compounds quantitated using an IS area count <50%, qualify as estimated (UJ)
4. If extremely low area counts are reported (<50% of the lower limit), qualify non-detects as unusable (R)
5. If an IS retention time varies more than 30 seconds, review the chromatographic profile for shifts and irregularities. Use professional judgement to qualify the data estimated (J/UJ) or unusable (R)

Remarks: _____

VI. Blanks

All blanks were reported per matrix per concentration level for each 12 hour period on each GC/ MS system used to analyze VOCs and SVOCs Yes ☐ No ☐

Review associated laboratory and project blank samples. List documented contamination below:

Laboratory Method Blanks:

Date:	Lab ID #	Fraction	Compound	Conc. (ppb)

Associated Project Blanks (e.g., equipment rinsates, trip blanks, etc.)

Date	Lab ID #	Fraction	Compound	Conc. (ppb)

Remarks:

VI. Blanks (continued)

Calculate action levels based on 10X the highest blank concentration of "common laboratory solvents", VOCs (methylene chloride, acetone, toluene, 2-butanone, cyclohexane) or SVOCs (phthalates), and 5X the highest blank concentration for all other VOC, SVOC, Pesticides, and PCB compounds. Sample weights, volumes, and dilution factors must be taken into account when applying the 5X and 10X criteria. This allows the total amount of contaminant present to be considered.

Deviations:

Compound	Maximum Conc. Detected, (ppb)	Action Level (ppb)	Samples Affected

Actions:

1. If compound results exceed the action levels, the data are not qualified
2. If compound results are below the required reporting level, report results as non-detect (U) at the reporting level
3. If the compound is detected above the reporting level, but below the action level, qualify as not-detected (U)
4. If gross contamination exists in blanks (i.e.,, saturated peaks by GC/ MS), all affected compounds in the associated samles should be qualifed as unusable (R) due to interference.
5. If blanks were not analyzed per matrix per concentration level for each 12 hour period on each GC/MS system used to analyze VOCs and SVOCs use professional judgement to qualifty data. Data may be rejected (R).

Remarks: _____

VII. Initial & Contining Calibration (VOC, SVOC)

GC/MS instrument performance checks (BFB / DFTPP) Acceptable Y or N
All compounds must have and RRF > 0.01, %RSD < 30, and %D < 25

VOC - Date of initial calibration: _____
VOC - Date(s) of continuing calibration:
Was the 12 hour critieria met? Y or N

SVOC- Date of initial calibration: _____
SVOC - Date(s) of continuing calibration: _____
Was the 12 hour critieria met? Y or N

Deviations:

Compound	Date	RRF	%RSD	%D	Samples Affected

* % Difference = $((RF_{CCV} - RF_{ICAL\ AVG})/RF_{ICAL\ AVG}) \times 100$. In instances where the bias of the CCV impacts validation qualifiers, review the RF values or amount reported to confirm that the % Difference or % Drift are reported with the correct negative or positive value.

Actions:

1. If any compound has an intial or continuing RRF of < 0.01, qualify positive results as estimated (J)
2. If any compound has an intial or continuing RRF of < 0.01, qualify non-detects as unusable (R)
3. If any compound has a %RSD >30 or a %D >25, qualify positive results as estimated (J)
4. If any compound has a %RSD >40 or a %D >40, qualify non-detects as estimated (UJ)
5. If BFB or DFTPP mass assignment / ION abundance criteria are all associated data as unusable (R).
6. If samples were analyzed outside the 12 hour BFB or DFTPP performance check time period, qualify the affected sample data as estimated (J/UJ).
7. If separate calibration for water and soil were not performed, use professional judgement to evaluate the data. Data may be rejected (R).
8. If calibrations were not completed within the 12 hour criterion, qualifty all associated data as estimated (J/UJ). If the 12 hour criterion was grossly exceeded, reject all associated data (R).

Remarks: _____

VIII. Initial & Continuing Calibration (Pesticides, PCBs)

Linearity evaluation, are %RSD <20? (Y/N) _____

Is the RPD between calibration factors ≤25? (Y/N) _____

Are multicomponent calibration data provided for each analysis date? (Y/N) _____

Is the difference between columns check ≤ 25%D? (Y/N) _____

Are 4, 4'- DDT and endrin breakdown (PEM) ≤ 20% and combined breakdown ≤ 30% (Y/N)

Deviations:

Compound	%RSD	RPD	Samples Affected

* % Difference = $((RF_{CCV} - RF_{ICAL\ AVG})/RF_{ICAL\ AVG}) \times 100$. In instances where the bias of the CCV impacts validation qualifiers, review the RF values or amount reported to confirm that the % Difference or % Drift are reported with the correct negative or positive value.

Actions:

1. If %RSD criteria are not met, qualify positive results as estimated (J) and non-detects as estimated (UJ)
2. If RPD criteria are not met, qualify positive results as estimated (J) and non-detects as estimated (UJ)
3. If %D criteria is not met, qualify positive results as estimated (J) and non-detects as estimated (UJ)
4. If breadkwon criteria are not met, positive 4, 4'-DDT and endrin should be qualified as estimated (J). And non-detects should be rejected (R).

Remarks: _____

IX. Matrix Spike/Matrix Spike Duplicate Information

General MS/MSD Criteria:

	VOC	SVOC	Pest	PCB
percent recovery (%R)	70-130	45-135	40-140	40-140
relative percent difference (RPD)	<30	<50	<50	<50

Project Sample(s) Spiked: _____

Deviations:

Compound	%R	%R Limits	RPD	RPD Limits	Samples Affected

Actions:

1. If the spike recovery is above the upper control limit (UCL), qualify all positive values in the unspiked sample as estimated (J) and non-detects as estimated (UJ).
2. If the spike recovery is below the lower control limit (LCL), qualifty positive values as estimated (J). And non-detects as estimated (UJ).
3. If the spike recovery is <10%, qualify non-detect values as unusable (R)
4. If the RPD does not meet criteria, qualify positive values in the unspiked sample as estimated (J)
5. Use professional judgement to qualify additional samples in the analytical group based on MS/MSD results
6. Use professional judgement for qualification of data for unspiked compounds

Remarks: _____

X. Laboratory Control Sample Information

General LCS Criteria:	VOC	SVOC	Pest	PCB
percent recovery (%R)	80-120	60-120	50-130	50-130

Laboratory LCS Identifications: _____

Deviations:

Compound	Date	%R	Samples Affected/Qualifiers Applied

Actions:

Action should be based on both the number of compounds outside the criterion and the magnitude of the exceedance.

1. If the LCS recovery is below limits but > one- half the lower limit, qualify valves as estimated (J/UJ).
2. If the LCS recovery is < one-half the lower limit, qualify all data for that analyte as unusable (R).
3. If the LCS recovery is greater than the upper limit, qualify positive valves for that analyte as estimated (J).
4. If more than half the compounds in this LCS are not within recovery criteria, then qualify associated detected compounds as estimated (J).
5. Use professional judgement for qualification of data for compounds with no LCS information

Remarks: _____

SCIENCE APPLICATIONS INTERNATIONAL CORPORATION
GC and LC Organic Data Review Checklist - Standard Validation
(Explosives, PAHs, Herbicides, GRO/DRO, Methanol, etc.)

Project: _____

SDG No: _____ **Analysis:** _____

Method: _____

Laboratory: _____ **Matrix:** _____

The above data package has been reviewed and the analytical quality control/quality assurance performance data have been summarized. The general criteria used to assess the analytical integrityof the data were based on an examination of the following:

Case Narrative	Analytical Surrogate Recoveries
Analytical Holding Times	MS/MSD Recoveries and Differences
Sample Preservation	LCS Recoveries
Method Calibration	Re-analysis and Secondary Dilution
Method and Project Blanks	

Overall Remarks: _____

Definition of Qualifiers:

"U", not detected at the associated level
"UJ", not detected and associated value estimated
"J", associated value estimated
"R", associated value unusable or analyte identity unfounded
"=", compound properly identified and value positive

Reviewed by: _____ Date: _____

QA Reviewed by: _____ Date: _____

I. Case Narrative

Verify direct statements made within the Laboratory Case Narrative (note discrepancies).

Remarks:

II. Re-analysis and Secondary Dilutions

Verify that re-analysis and secondary dilutions were performed and reported as necessary. Determine appropriate results to report.

Remarks:

III. Holding Times

VOC types - Waters - unpreserved: aromatic within 7 days, non-aromatic within 14 days of sample collection
VOC types - Waters - preserved: aromatic and non-aromatic within 14 days of sample collection
VOC types - Soils - preserve/analyze within 48 hours of sample collection; analyze within 14 days of preservation

SVOC types - Waters - extract within 7 days of sample collection, analyze within 40 days of extraction
SVOC types - Soils - extract within 14 days of sample collection, analyze within 40 days of extraction

Deviations:

Sample #	VOC types		SVOC types			Notes:
	Date Collected	Date Analyzed	Date Collected	Date Extracted	Date Analyzed	

Actions:
1. If holding times are exceeded, all results are qualified as estimated (J/UJ)
2. If holding times are exceeded by more than 2X, reviewer may qualify non-detected results as unusable (R)

Remarks: _____

IV. Initial & Continuing Calibration

A blank and five standards should be analyzed, with one of the standards being within 2X the MDL
Correlation coefficients must be $\geq$ 0.995
The RSD of the calibration factor or the relative response factor (RRF) must be $\leq$ 20%
Continuing calibration %D must be within $\pm$ 15%

Deviations:

Compound	Correlation Coefficient	% RSD	%D	Samples Affected

* % Difference = $((RF_{CCV} - RF_{ICAL\ AVG})/RF_{ICAL\ AVG}) \times 100$. In instances where the bias of the CCV impacts validation qualifiers, review the RF values or amount reported to confirm that the % Difference or % Drift are reported with the correct negative or positive value.

Actions:

1. If any compounds initial calibration linearity is <0.995, qualifiy the data as estimated (J/UJ)
2. If any compounds initial calibration linearity is <0.95, qualify the data as unusable (R)
3. If %RSD criteria are not met, qualify positive results as estimated (J) and non-detects as estimated (UJ)
3. If %D criteria is not met, qualify positive results as estimated (J) and non-detects as estimated (UJ)

Remarks:

V. Surrogate Recoveries

List surrogate compounds with unacceptable recoveries:

Deviations:

Sample #	Surrogate ID	% R	QC Limits	Samples Affected

Actions:

1. If any surrogate recovery is <10%, qualify all positive results in associated fractions as estimated (J)
2. If any surrogate recovery is <10%, qualify all nondetects in associated fractions as unusable (R)
3. If surrogate recoveries fall between 10% and the lower recovery limit, qualify results as estimated (J/UJ)
4. If surrogate recoveries fall above the upper recovery limit, qualify positive results as estimated (J)
6. Use professional judgement to qualify results when surrogate recoveries have been diluted out of spec.

Remarks: _____

VI. Blanks

Review associated laboratory and project blank samples. List documented contamination below:

Laboratory Method Blanks:

Date	Lab ID #	Fraction	Compound	Conc. (ppb)

Associated Project Blanks (e.g., equipment rinsates, trip blanks, etc.)

Date	Lab ID #	Fraction	Compound	Conc. (ppb)

Remarks:

VI. Blanks (continued)

Calculate action levels based on 5X the highest blank concentration of any given compound
Sample weights, volumes, and dilution factors must be taken into account when applying the 5X criteria

Deviations:

Compound	Maximum Conc. Detected, (ppb)	Action Level (ppb)	Samples Affected

Actions:

1. If compound results exceed the action levels, the data are not qualified
2. If compound results are below the required reporting level, report results as non-detect (U) at the reporting level
3. If the compound is detected above the reporting level, but below the action level, qualify as not-detected (U)

Remarks: _____

VII. Matrix Spike/Matrix Spike Duplicate Information

General MS/MSD Criteria:

	VOC types	SVOC types
percent recovery (%R)	70-130	45-135
relative percent difference (RPD)	<30	<50

Project Sample(s) Spiked: _____

Deviations:

Compound	%R	%R Limits	RPD	RPD Limits	Samples Affected

Actions:

1. If the spike recovery is outside limits, qualify all positive values in the unspiked sample as estimated (J)
2. If the spike recovery is <10%, qualify non-detect values as unusable (R)
3. If the RPD does not meet criteria, qualify positive values in the unspiked sample as estimated (J)
4. Use professional judgement to qualify additional samples in the analytical group based on MS/MSD results
5. Use professional judgement for qualification of data for unspiked compounds

Remarks: _____

VIII. Laboratory Control Sample Information

General LCS Criteria:

	VOC types	SVOC types
percent recovery (%R)	80-120	60-120

Laboratory LCS Identifications: _____

Deviations:

Compound	Date	%R	Samples Affected/Qualifiers Applied

Actions:

1. If the LCS recovery is outside limits but >10%, qualify all positive values as esimated (J)
2. If the LCS recovery is outside limits but >10%, qualify non-detect values as estimated (UJ)
3. If the LCS recovery is <10%, qualify all data for that analyte as unusable (R)
4. Use professional judgement for qualification of data for compounds with no LCS information

Remarks: _____

SCIENCE APPLICATIONS INTERNATIONAL CORPORATION
Metals Data Review Checklist - Standard Validation

Project: _____

SDG No: _____ **Analysis:** _____

Method: _____

Laboratory: _____ **Matrix:** _____

The above data package has been reviewed and the analytical quality control/quality assurance performance data have been summarized. The general criteria used to assess the analytical integrity of the data were based on an examination of the following:

Case Narrative	MS/MSD Recoveries and Differences
Analytical Holding Times	Duplicate Relative Percent Differences
Sample Preservation	ICP Serial Dilution
Method Calibration	Furnace Atomic Absorption QC
Method and Project Blanks	Re-analysis and Secondary Dilution
LCS Recoveries	Internal Standard Performance (if applicable)

Project specific QA/QC or contract requirements may take priority over validation criteria in this procedure.

Overall Remarks: _____

Definition of Qualifiers:

"U", not detected at the associated level
"UJ", not detected and associated value estimated
"J", associated value estimated
"R", associated value unusable or analyte identity unfounded
"=", compound properly identified and value positive

Reviewed by: _____ Date: _____

QA Reviewed by: _____ Date: _____

I. Case Narrative

Verify direct statements made within the Laboratory Case Narrative (note discrepancies).

Remarks:

II. Re-analysis and Secondary Dilutions

Verify that re-analysis and secondary dilutions were performed and reported as necessary. Determine appropriate results to report.

Remarks:

III. Holding Times

Metals - Waters - preserved to pH<2, 180 days from sample collection
Metals - Soils - 180 days from sample collection
Mercury - Waters - preserved to pH<2, 28 days from sample collection
Mercury - Soils - 28 days from sample collection

Deviations:

Sample #	Metals				Mercury			
	Date Collected	Date Analyzed	Days >HT	pH Check	Date Collected	Date Analyzed	Days >HT	pH Check

Actions:

1. If preserved samples exceed holding time, qualifty all associated results as estimated (J/UJ).
2. If unpreserved samples exceed holding time, qualify all associated results as unusable (R).
3. If holding times are exceeded by more than 2X, reviewer may qualify non-detected results as unusable (R)
4. If water samples are not acidified, use professional judgement. Minimally, qualify data as estimated (J) and non-detects unusable (R).
5. If soil samples exceed holding time, use professional judgement to qualify data.

Remarks:

IV. Initial & Contining Calibration (ICP, GFAA, CVAA, etc.)

Initial calibration linearity criteria is r $\geq$ 0.995
ICV and CCV criteria are $\pm$ 10% recovery, low level check standard allowed $\pm$ 30%
ICP inter-element check standard criteria $\pm$ 20%

Deviations:

Element	Date	Intial Calib.	ICV/ CCV	%R	Samples Affected

Actions:

1. If any elements initial claibration linearity is <0.995, qualify the data as estimated (J/UJ)

2. If any elements initial claibration linearity is <0.95, qualify the data as unusable (R)

3a. If any elements ICV or CCV recovery is <90%, qualify the data as estimated (J/UJ)

3b. If any elements ICV or CCV recovery is > 110%, qualify results $\geq$ MDL as estimated (J), do not qualify non-detects

4a. If any elements ICV or CCV recovery is <75%, qualify the data as unusable (R)

4b. If any elements ICV or CCV recovery is > 125%, qualify positive results as estimated (J) or non-detects unusable (R)

4c. If any elements ICV or CCV recovery is > 160%, qualify positive results $\geq$ MDL us unusable (R). Do not qualify non-detects.

5a. If any elements CRI recovery is 50-69% (30-49% for Sb, Pb, Tl), qualify results $\geq$ MDL (but < 2 x CRQL) as estimated (J/UJ) and results > 2 x CRQL are not qualified.

5b. If any elements CRI recovery is < 50% (< 30% for Sb, Pb, Tl), qualify results $\geq$ MDL (but < 2 x CRQL) as unusable (R) and results > 2 x CRQL as estimate (J).

5c. If any elements CRI recovery is > 130% but < 180 % (> 150% but $\leq$ 200% for Sb, Pb, Tl) quality results $\geq$ MDL (but < 2 x CRQL) as esimated (J) and non-detects and results > 2 x CRQL are not qualified.

5d. If CRI or (R) > 180% (> 200% for Sb, Pb, Ti), qualify results that are $\geq$ MDL as unusable (R).

Remarks: _____

IV. Initial & Contining Calibration (ICP, GFAA, CVAA, etc.) (continued)

Analytical Sequence and MS Tune (Y/N)

1. Were the appropriate number of ICP standards used? _____
2. Were the appropriate number of AA standards used? _____
3. Was calibration performed and documented at the beginning of each run? _____
4. Were calibration check standards run at 10% frequency or every two hours? _____
5. Were low level standard checks analyzed at approximately 2X the PQL? _____
6. Was ICP-MS mass calibration within 0.1 AMU? _____
7. Was ICP-MS % RSD of the absolute signals for all analytes < 5%? _____

Deviations:

Element	Deviation	Samples Affected

Actions:

1. If instrument calibration is questionable, use professional judgement, qualify the data as estimated (J/UJ)
2. If instrument calibration documentation can not be obtained or is inadequate, qualify the data as unusable (R)
3. If mass calibration for ICP-MS was not within 0.1 AMU, qualify analyte results as estimated (J/UJ).
4. If % RSD for ICP-MS was > 5% for any analyte in the tuning solution, qualify associated resuts as estimated (J/UJ).

Remarks: _____

V. Blanks (ICB, CCB, Method Blank, Equipment Rinsate Blank)

A. Blank Results

If the blank level is > CRQL for any analyte check that the analyte's concentration in a sample is > 10 x the blank value.The highest blank concentration of observed elements is the action level.
Sample weights, volumes, and dilution factors must be taken into account when applying the action level.
Blank results given in ug/L must be converted to mg/kg to compare them with soil sample results.
use the following equation:

ug/L x V/W x 1L/1000mL x 1000g/1kg x 1mg/1000ug = mg/kg

where: V = volume of samples digest solution (usually 200 mL)
W = weight of sample digested (usually 1 g)

Deviations:

Blank ID	Element	Max. Conc. Detected	Action Level	Samples Affected

If additional space is required, use next page

Actions:

1. For blank results ≥ MDL but ≤ CRQL, qualify sample results ≥ MDL but < CRQL as CRQL U. Use professional judgement to qualify sample results exceeding the CRQL.

2a. If blank results are > CRQL: for sample values ≥ MDL but ≤ CRQL, qualify results as CRQL U; for sample values > CRQL but < 10 x the blank, qualify results as unusable (R) or estimated (J). No action is taken for sample results ≥ 10 x the blank values.

2b. If ICB/ CCB results are > CRQL: for sample values ≥ MDL but ≤ CRQL, qualify results as CRQL U; for sample values > CRQL but < blank results, qualfiy results as not detected (U) at the level of the blank or unusable (R). Use proffessional judgement for sample results > blank results.

Remarks: _____

V. Blanks (continued)

The highest blank concentration of observed elements is the action level.
Sample weights, volumes, and dilution factors must be taken into account.
Blank results given in ug/L must be converted to mg/kg to compare them with soil sample results.
use the following equation:

ug/L x V/W x 1L/1000mL x 1000g/1kg x 1mg/1000ug = mg/kg

where: V = volume of samples digest solution (usually 200 mL)
W = weight of sample digested (usually 1 g)

Deviations:

Blank ID	Element	Max. Conc. Detected	Action Level	Samples Affected

V. Blanks (continued)

B. Frequency Requirements (Y/N)

1. Was a method (preparation) blank analyzed for each matrix? _____
2. Was a method blank processed for every analytical batch (20 samples)? _____
3. Was a calibration blank analyzed at 10% frequency or every two hours? _____

Deviations:

Element	Deviation	Samples Affected

Remarks: _____

C. Baseline Shift Evaluation

List the highest negative blank concentration for each analyte observed in laboratory or project blanks.

Deviations:

Blank ID	Element	Max. Neg. Conc.	Action Level	Samples Affected

Actions:

1. If the absolute value of the maximum negative blank result is > the CRQL, qualify positive results as estimated (J) and non-detects as estimated (UJ).

Remarks: _____

VI. Laboratory Control Sample Evaluation

All LCS recovery criteria are set at 80-120%
An LCS must be analyzed for each matrix and for each digestion batch or set of twenty samples

Deviations:

Element	Date	%R	Matrix	Samples Affected

Actions:

1. If any element's LCS recovery is >120%, qualify positive results as (J) .
2. If any element's LCS recovery is 50-79%, qualify positive results as (J) and non-detect results as (UJ).

3a. If any element's LCS recovery is <50%, qualify positive results as (J) and non-detect results as (R).
3b. If the LCS recovery is > 150%, qualify all results as unusable (R).

4. For soil LCS recovery > upper limit, qualify sample results $\geq$ MDL as estimated (J).
5. For soil LCS recovery < lower limit, qualify results $\geq$ MDL as estimated (J) and non-detects estimated (UJ).
6. Use professional judgement to qualify data if the LCS frequency criteria are not met.

Remarks:

VII. Matrix Spike Evaluation

All MS recovery criteria are set at 75-125%
An MS must be analyzed for each matrix and for each digestion batch or set of twenty samples
Verify that a field blank or PE sample was not used for spiked sample analysis.
Verify that a post-digestion spike was analyzed for those analytes where the pre-digestion spike recovery is outside control limits and the sample result is < 4 x the spike added.

Project Sample(s) Spiked: _____

Deviations:

Element	Spiked Sample Result	Sample Result	Spike Amount	%R	Samples Affected

Actions:

1. If the sample concentration exceeds the spiking level by a factor of 4X or more, do not qualify the data
2. If the spike recovery is >125%, qualify all positive values as (J).
3. If the spike recovery is between 30-74%, qualify positive values as (J) and non-detect values as estimated (UJ)
4. If the spike recovery is <30%, qualify positive values as (J) and non-detects are qualified unusable (R) if the post-digestion spike recovery is < 75% (or none was performed); non-detects are qualified as estimated (UJ) if the post-digestion spike recovery is $\geq$ 75%. There is no post-digestion spike performed for mercury.
5. Qualify all samples of similar matrix to the spiked sample in the same manner
6. Use professional judgement to qualify data if the MS frequency criteria are not met.
7. Use professional judgement for qualification of data for unspiked elements

Remarks: _____

VIII. Laboratory Duplicate Evaluation

Duplicate relative percent difference (RPD) for water is 20% (both results > 5 times CRDL) or < CRDL difference (if either result is < 5 times CRDL) and RPD for soil is 35% (if both results are > 5 times CRDL or < 2 times CRDL if either result is < 5 times CRDL.
When duplicate sample values are both less than the reporting level they are considered acceptable
When dupicate sample values are within 5X the reporting level they are acceptable if their absolute difference is within 3X the reporting level
Verify that a field blank or PE samples was not used for duplicate analysis.

Deviations:

Element	Sample #	Duplicate #	RPD	Samples Affected

Actions:

1. If an element's RPD is >20% (water) / 35% (soil), qualify positive results as (J) and non-detect results as (UJ)
2. For low concentrations, if an element's duplicate absolute difference is > 3X the reporting level, qualify positive results as (J) and non-detect results as (UJ)
3. Use professional judgement to qualify data if the duplicate frequency criteria are not met.

Remarks: _____

IX. Inductively Coupled Plasma (ICP) Serial Dilution Analysis

Verify that a field blank or PE sample was not used for serial dulution.
Serial dilution of positive results are performed when values exceed 50X the IDL
Results from serial dilutions should agree within 10% of the original undiluted analysis

Deviations:

Element	Sample #	Sample Result	Serial Dilution	%D	Action

Actions:

1. If the serial dilution %D is >10 and the analyte results are >50X the IDL, qualify all positive results as estimated (J) and non-detects as estimated (UJ).

Remarks:

X. Furnace Atomic Absorption QC

A. Duplicate Precision (Y/N)

1. Were duplicate injections performed for all samples? _____
2. Were one point analytical spikes performed for all samples? _____
3. Did duplicate injections agree within ± 20%? _____

Deviations:

Element	Deviation	Sample Affected

Actions:

1. If duplicate injection results are outside ± 20%, qualify positive results as (J) and non-detect results as (UJ)

Remarks: _____

B. Post Digestion Spike Recoveries (Y/N)

1. Did post digestion spike recoveries meet an 85-115% recovery criteria? _____
2. If spike recoveries did not meet recovery criteria were samples analyzed by MSA? _____
3. If MSA was used to analyze samples, was its' correlation coefficient ≥ 0.995? _____

Deviations:

Element	Deviation	Sample Affected

Actions:

1. If post digestion spike recoveries are >115%, qualify positive results as (J) and non-detect results as (U)
2. If post digestion spike recoveries are 11-84%, qualify positive results as (J) and non-detect results as (UJ)
3. If post digestion spike recoveries are <10%, qualify positive results as (R) and non-detect results as (R)
4. If MSA was used to quantitate values and the correlation coefficient was <0.995, qualify data as (J or UJ)
5. If MSA was used to quantitate values and the correlation coefficient was <0.95, qualify data as (R)

Remarks: _____

SCIENCE APPLICATIONS INTERNATIONAL CORPORATION
Inorganic Data Review Checklist - Standard Validation
(Chloride, Fluoride, Nitrate/Nitrite, Sulfate, Sulfide, Phosphate, etc.)

Project: _____

SDG No: _____ **Analysis:** _____

Method: _____

Laboratory: _____ **Matrix:** _____

The above data package has been reviewed and the analytical quality control/quality assurance performance data have been summarized. The general criteria used to assess the analytical integrityof the data were based on an examination of the following:

Case Narrative	Method and Project Blanks
Analytical Holding Times	Matrix Spike Recoveries
Sample Preservation	Duplicate Differences
Method Calibration	LCS Recoveries
	Re-analysis and Secondary Dilution

Overall Remarks: _____

Definition of Qualifiers:

"U", not detected at the associated level
"UJ", not detected and associated value estimated
"J", associated value estimated
"R", associated value unusable or analyte identity unfounded
"=", compound properly identified and value positive

Reviewed by: _____ Date: _____

QA Reviewed by: _____ Date: _____

I. Case Narrative

Verify direct statements made within the Laboratory Case Narrative (note discrepancies).

Remarks:

II. Re-analysis and Secondary Dilutions

Verify that re-analysis and secondary dilutions were performed and reported as necessary. Determine appropriate results to report.

Remarks:

III. Holding Times

Sample should be preserved and analyzed according to the appropriate analytical method
In general the following preservations and holding times for waters can be applied:

Sulfate, 4 degress C, 28 days
Sulfide, 4 degrees C, pH ≥9 with zinc acetate/sodium hydroxide, 7 days
Bromide/Chloride/Fluoride, no preservative required, 28 days
Nitrate/Nitrite or Ammonia, 4 degrees C, pH ≤ 2 with sulfuric acid, 28 days
Nitrate or Nitrite, 4 degrees C, 48 hours
Alkalinity, 4 degrees C, 14 days
TDS/TSS, 4degrees C, 7 days
Phosphate (total), 4 degrees C, pH < 2 with sulfuric acid, 28 days
Hexavalent Chromium, Cool 4 degress C, water- 24 hours, soil - 30 days

Deviations:

Sample #	Analyte	Date Collected	Date Extracted	Date Analyzed	Notes:

Actions:

1. If holding times are exceeded, all results are qualified as estimated (J/UJ)
2. If holding times are exceeded by more than 2X, reviewer may qualify non-detected results as unusable (R)
3. If samples were not properly preserved, use professional judgement to qualify the data

Remarks: _____

IV. Initial & Continuing Calibration

A blank and at least three standards should be analyzed, with one of the standards being within 2X the MDL
Correlation coefficients must be $\geq$ 0.995
Initial calibration check recoveries must be within 90-110%
Continuing calibration check recoveries must be within 85-115%

Deviations:

Compound	Correlation Coefficient	ICV/ CCV	%R	Samples Affected

Actions:

1. If any compounds initial calibration linearity is <0.995, qualifiy the data as estimated (J/UJ)
2. If any compounds initial calibration linearity is <0.95, qualify the data as unusable (R)
3. If ICV or CCV criteria are not met, qualify positive results as estimated (J) and non-detects as estimated (UJ)
4. If ICV or CCV recoveries fall below 50%, qualify results as unusable (R)

Remarks: _____

V. Blanks (Method Blanks and Project Blanks)

An analytical method blank must be analyzed with each batch of samples
Calculate action levels based on 5X the highest blank concentration of any given analyte
Sample weights, volumes, and dilution factors must be taken into account when applying the 5X criteria

Deviations:

Analyte	Maximum Conc. Detected, (ppb)	Action Level (ppb)	Samples Affected

Actions:

1. If analyte results exceed the action levels, the data are not qualified
2. If analyte results are below the required reporting level, report results as non-detect (U) at the reporting level
3. If the analyte is detected above the reporting level, but below the action level, qualify as not-detected (U)

Remarks:

VI. Laboratory Control Sample Information

Each analyte's LCS % recovery must be within the control limits established by the laboratory
In general LCS % recoveries should all be within 85-115%

Deviations:

Analyte	Date	%R	Samples Affected/Qualifiers Applied

Actions:

1. If the LCS recovery is outside limits but >10%, qualify all positive values as esimated (J)
2. If the LCS recovery is outside limits but >10%, qualify non-detect values as estimated (UJ)
3. If the LCS recovery is <10%, qualify all data for that analyte as unusable (R)
4. Use professional judgement for qualification of data for compounds with no LCS information

Remarks:

VII. Matrix Spike Information

Each analyte's Matrix Spike % recovery should be within the laboratory established control limits
In general matrix spike % recoveries should all be within 75-125%

Deviations:

Analyte	%R	%R Limits	Samples Affected

Actions:

1. If the spike recovery is outside limits, qualify all values in the unspiked sample as estimated (J/UJ)
2. If the spike recovery is <10%, qualify non-detect values as unusable (R)
3. Use professional judgement to qualify additional samples in the analytical group based on MS results
4. Use professional judgement for qualification of data for unspiked analytes

Remarks:

VIII. Laboratory Duplicate Information

Each analyte's RPD should be within the laboratory established control limits
In general RPDs should all be within 20%

Deviations:

Analyte	RPD	RPD Limits	Samples Affected

Actions:

1. If the RPD is outside limits, qualify all values in the unspiked sample as estimated (J/UJ)
2. Use professional judgement to qualify additional samples in the analytical group based on RPD results
3. Use professional judgement for qualification of data when laboratory duplicates were not analyzed

Remarks:

SCIENCE APPLICATIONS INTERNATIONAL CORPORATION
Radiochemical Data Review Checklist - Standard Validation

Project: _____

SDG No: _____ **Analysis:** _____

Method: _____

Laboratory: _____ **Matrix:** _____

The above data package has been reviewed and the analytical quality control/quality assurance performance data have been summarized. The general criteria used to assess the analytical integrityof the data were based on an examination of the following:

Case Narrative	Chemical and/or Tracer Recoveries
Analytical Holding Times	Matrix Spike Results
Sample Preservation	Duplicate Error Ratios and RPDs
Method Calibration	LCS Recoveries
Method and Project Blanks	Re-analysis and Secondary Dilution

Overall Remarks: _____

Definition of Qualifiers:

"U", not detected at the associated level
"UJ", not detected and associated value estimated
"J", associated value estimated
"R", associated value unusable or analyte identity unfounded
"=", compound properly identified and value positive

Reviewed by: _____ Date: _____

QA Reviewed by: _____ Date: _____

I. Case Narrative

Verify direct statements made within the Laboratory Case Narrative (note discrepancies).

Remarks:

II. Re-analysis and Secondary Dilutions

Verify that re-analysis and secondary dilutions were performed and reported as necessary. Determine appropriate results to report.

Remarks:

III. Holding Times

General analytical holding time for radionuclides is 6 months
Water samples require preservation with nitric acid to pH <2, for dissolved radionuclide determination
Radioactive iodine holding time is 7 days
Consideration must always be given to the individual radionuclide half-life

Deviations:

Sample #	Radionuclide:	Date Collected	Date Analyzed	Action

Actions:
1. If holding times are exceeded, all results are qualified as estimated (J/UJ)
2. If holding times are exceeded by more than 2X, reviewer may qualify non-detected results as unusable (R)

Remarks: _____

IV. Minimum Detectable Activities (MDAs)/ Reporting Levels

Verify MDAs with project requested reporting levels for all radionuclides
Compare reported activities and uncertainties with reported MDAs

Deviations:

Radionuclide	Project Reporting Level Goal	MDA Achieved	Samples Affected

Actions:

1. Document all radionuclide determinations that do not meet project reporting level goals.
2. If the reported value with its uncertainty encompass the project reporting level goal, they are equivalent.
3. If the sample result is negative and its absolute value exceeds the MDA, qualify the result as estimated (UJ).
4. If the sample result is negative and its absolute value exceeds 2X the MDA, qualify the result ®.

Remarks:

V.A1. Calibration Alpha Spectroscopy

Initial efficiency calibration must be demonstrated for each detector.
Initial energy calibration must be demonstrated for each detector.
Resolution (FWHM) must be demonstrated for each detector.
Standards must be traceable and documentation must be provided.
Standard preparation (dilutions, calculations, etc.) documentation must be provided.

V.A2.Continuing Calibration Alpha Spectroscopy

Continuing calibration efficiency verification must be performed at least quarterly.
Continuing calibration efficiency must be demonstrated to be within 10% of the initial efficiency.
Continuing energy calibration must be demonstrated to be within 10% of the initial calibration.
Continuing FWHM must be demonstrated to be within 10% of the initial FWHM.
A long background count for each detector must be performed weekly or bi-weekly.
Pulser counts and demonstration of FWHM for each detector must be demonstrated daily.

Deviations:

Deficiency	IS Affected	Area Detectors Affected	Acceptable Range	RT Samples Affected	Std. RT Value

Actions:

1. If the initial calibration efficiencies, resolution, or standard information is not acceptable, qualify all affected results as estimated (J).
2. If the continuing calibration efficiency, energy, or FWHM are not acceptable, qualify all affected results as estimated (J).
3. If background counts or pulser counts are not acceptable, qualify the affected data as estimated (J).

Remarks: _____

V.B1. Calibration Gamma Spectroscopy

Initial efficiency calibration must be demonstrated on each detector for each geometry.
Initial energy calibration must be demonstrated on each detector for each geometry.
Resolution (FWHM) must be demonstrated for each detector for each geometry.
Standards must be traceable and documentation must be provided.
Standard preparation (dilutions, calculations, etc.) documentation must be provided.

V.B2.Continuing Calibration Gamma Spectroscopy

Continuing calibration efficiency verification must be performed for each detector at least quarterly.
Continuing calibration efficiency must be demonstrated to be within 10% of the initial efficiency.
Continuing energy calibration must be demonstrated to be within 10% of the initial calibration.
Continuing FWHM must be demonstrated to be within 10% of the initial FWHM.
A long background count for each detector must be performed monthly.
Pulser counts and demonstration of FWHM for each detector must be demonstrated daily.

Deviations:

Deficiency	IS Affected	Area Detectors Affect	Acceptable Range	RT Samples Affected	Std. RT Value

Actions:

1. If the initial calibration efficiency, energy, resolution, or standard information is not acceptable, qualify all affected results as estimated (J).
2. If the continuing calibration efficiency, energy, or FWHM are not acceptable, qualify all affected results as estimated (J).
3. If background counts or pulser counts are not acceptable, qualify the affected data as estimated (J).

Remarks: _____

V.C1. Calibration Liquid Scintillation Counters

Initial quench curves must be demonstrated for each radionuclide.
Initial calibration must be demonstrated for each radionuclide.
Standards must be traceable and documentation must be provided.
Standard preparation (dilutions, calculations, etc.) documentation must be provided.

V.C2. Continuing Calibration Liquid Scintillation Counters

Continuing calibration efficiency verification must be performed afor each radionuclide.
Continuing calibration efficiency must be demonstrated to be within 10% of the initial efficiency.
Standards linear regression curve must be performed daily and documentation provided.
Control charts for tritium and carbon-14 chi square and figure of merit values should be documented.
A background count for each radionuclide window must be provided.

Deviations:

Deficiency	IS Affected	Area Detectors Affect	Acceptable Range	RT Samples Affected	Std. RT Value

Actions:

1. If the initial calibration quench curve or standard information is not acceptable, qualify all affected results as estimated (J).
2. If the continuing calibration efficiency or control charts are not acceptable, qualify all affected results as estimated (J).
3. If background counts are not acceptable, qualify the affected data as estimated (J).

Remarks: _____

V.D1. Calibration Gas Proportional Counters

Initial efficiency calibration must be demonstrated for each detector.
Absorption curve must be demonstrated for each detector.
Plateau curve performance check must be demonstrated for each detector.
Data used to determine alpha and beta cross-talk must be demonstrated.
Standards must be traceable and documentation must be provided.
Standard preparation (dilutions, calculations, etc.) documentation must be provided.

V.D2.Continuing Calibration Gas Proportional Counters

Continuing calibration efficiency verification must be performed at least quarterly.
Continuing calibration efficiency must be demonstrated to be within 10% of the initial efficiency.
Cross-talk value for each detector must be documented.
Background count for each detector must be performed daily.

Deviations:

Deficiency	IS Affected	Area Detectors Affect	Acceptable Range	RT Samples Affected	Std. RT Value

Actions:

1. If the initial calibration absorption curve, plateau curve, % cross-talk, or standard information is not acceptable, qualify all affected results as estimated (J).
2. If the continuing calibration efficiency or percent cross-talk are not acceptable, qualify all affected results as estimated (J).
3. If background counts are not acceptable, qualify the affected data as estimated (J).

Remarks:

VI. Blanks

Review associated laboratory and project blank samples. List documented contamination below:

If the blank result is less than the associated uncertainty (error), no qualification will be warranted.
If the blank result is greater than its associated uncertainty, but less than the MDA, then no qualification will be warrented.
If the blank result is greater than the associated uncertainty and greater than the MDA, then qualification of sample results may be appropriate.

Laboratory Method Blanks:

Date	Lab ID #	Radionulcide	Result and Error	MDA Result and Error

Associated Project Blanks (e.g., equipment rinsates, etc.)

Date	Lab ID #	Radionuclide	Result and Error	MDA Result and Error

Remarks:

VI. Blanks (continued)

Calculate action levels based on 10X the highest blank concentration.

Deviations:

Radionuclide	Max. Activity Detected	Action Level	Samples Affected

Actions:

1. If the blank result falls outside criteria, qualify associated sample results that are less than 10X the blank value as estimated (J).

Example:	Blank Result	Uncert.	MDA or	Normalized absolute difference	Qualification
acceptable	0.3	0.45	0.5	>2.58	none
acceptable	0.3	0.25	0.5	1.96 to 2.58	J
outside criteria	0.3	0.25	0.2	<1.96	J

2. If the absolute sample result is less than the MDA and the uncertainty is less than the result, qualify as non-detect (U).
3. If the absolute sample results is less than the MDA and the uncertainty is greater than the result, qualify as non-detect value uncertain (UJ).
4. If the sample result is greater than the MDA and the uncertainty is 50-100% of the result, qualify the data as estimated (J).
5. If the sample result is greater than the MDA and the uncertainty is greater than 100% of the result, qualify the data as rejected (R).
4. If the sample result is negative, and its absolute value exceeds 2X the MDA, qualify the data as rejected (R).

Remarks: _____

VII. Sample-Specific Carrier or Tracer Recovery

Sample-specific recoveries must be within limits as demonstrated by the applicable analytical procedures.
Generally, recoveries of 30-110% are considered acceptable.
Documentation of traceable tracer solutions (NIST) and dilution documentation must be provided.
Spot check sample-specific carrier or tracer recovery calculations.

Deviations:

Radionuclide	Sample ID	%R	Action Taken

Actions:

1. If recovery is between 30-110%, no qualification is necessary.
2. If recovery is between 10-30%, qualify the data as estimated (J).
3. If recovery is between 110-150%, qualify the data as estimated (J).
4. If recovery is less than 10%, qualify the data as rejected (R).
5. If recovery if greater than 150%, qualify the data as rejected (R).

Remarks:

VIII. Laboratory Control Sample Information

General LCS Criteria:	aqueous	solid
percent recovery (%R)	80-120	70-130

Laboratory LCS Identifications: _____

Deviations:

Radionuclide	Date	%R	Samples Affected/Qualifiers Applied

Actions:

Aqueous	<50%	50-79%	121-150%	>150%
	R	J	J	R
Solid	<40%	40-69%	131-160%	>160%
	R	J	J	R

Remarks: _____

IX. Matrix Spike Information

General MS Criteria:	Aqueous	Solid
percent recovery (%R)	50-120	40-130

Project Sample(s) Spiked: _____

Deviations:

Radionuclide	Date	%R	Samples Affected/Qualifiers Applied

Actions:

	<20%	20-49%	121-160%	>160%
Aqueous	R	J	J	use professional judgement

	<10%	10-39%	131-160%	>160%
Solid	R	J	J	use professional judgement

Remarks: _____

X. Duplicate Sample or Matrix Spike Duplicate Analysis

Identify the method utilized to evaluate duplicate analyses; duplicate error ration (DER), relative percent difference (RPD), or relative error ratio (RER).
Duplicate actions should apply to all samples associated with the duplicate pair.

Duplicate Sample Identification: _____

Deviations:

Radionuclide	DER	RPD	RER	Samples Affected

Actions:
1. If both sample and duplicate activities are within 2X the MDA comparison is acceptable.
2. If the DER is greater than 1.00, qualify the data as estimated (J).
3. If the RPD is greater than 50% qualify the data as estimated (J).
4. If one sample is <MDA and the other sample is >2X the MDA, qualify the data as estimated (J).

Remarks: _____

XI. Overall Assessment of Data

It is appropriate for the data reviewer to make professional judgements and express concerns regarding the validity of the data, overall. This is particularly appropriate when there are several citeria outside the desired specifications. The additive nature of these factors may present data that needs to be further qualified beyond each individual qualification. The reviewer should summarize these concerns.

Actions:

1. Qualified data must be accompanied by all individual reason codes related to the qualification assigned.
2. If the sample result has been qualified for multiple reasons, the reviewer will use professional judgement to determine if multiple estimations warrants rejection (R).

Remarks:

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Organic Data Review Checklist - Comprehensive Validation

Project: _____

SDG No: _____ **Analysis:** _____

Method: _____

Laboratory: _____ **Matrix:** _____

The above data package has been reviewed and the analytical quality control/quality assurance performance data have been summarized. The general criteria used to assess the analytical integrityof the data were based on an examination of the following:

Case Narrative	Analytical Surrogate Recoveries
Analytical Holding Times	Internal Standard Performance
Sample Preservation	MS/MSD Recoveries and Differences
Method Calibration	LCS Recoveries
Method and Project Blanks	Re-analysis and Secondary Dilution

Project Sepcific QA/QC or contrqact requirements may take priority over validatin criteria in this procedure.

Overall Remarks: _____

Definition of Qualifiers:

"U", not detected at the associated level
"UJ", not detected and associated value estimated
"J", associated value estimated
"R", associated value unusable or analyte identity unfounded
"=", compound properly identified and value positive

Reviewed by: _____ Date: _____

QA Reviewed by: _____ Date: _____

I. Case Narrative

Verify direct statements made within the Laboratory Case Narrative (note discrepancies).

Remarks:

II. Re-analysis and Secondary Dilutions

Verify that re-analysis and secondary dilutions were performed and reported as necessary. Determine appropriate results to report.

Remarks:

III. Holding Times

VOC - Waters - unpreserved: aromatic within 7 days, non-aromatic within 14 days of sample collection
VOC - Waters - preserved: aromatic and non-aromatic within 14 days of sample collection
VOC - Soils - preserve or analyze within 48 hours of sample collection; analyze within 14 days of preservation

SVOC, Pest., PCB - Waters - extract within 7 days of sample collection, analyze within 40 days of extraction
SVOC, Pest., PCB - Soils - extract within 14 days of sample collection, analyze within 40 days of extraction

Deviations:

Sample #	VOC		SVOC			Pest/PCB		
	Date Collected	Date Analyzed	Date Collected	Date Extracted	Date Analyzed	Date Collected	Date Extracted	Date Analyzed

Actions:

1. If holding times are exceeded, all results are qualified as estimated (J/UJ)
2. If holding times are exceeded by more than 2X, reviewer may qualify non-detected results as unusable (R)

Remarks: _____

IV. System Monitoring Compound (SMC) Recoveries (VOC, SVOC, Pesticides, PCBs)

Note: SMC formerly known as surrogates.

List SMC compounds with unacceptable recoveries:

Deviations:

Sample #	VOC			SVOC B/N Compounds			SVOC Acid Compounds			Pest	PCB
	TOL	BFB	DCE	NBZ	FBP	TPH	PHL	2FP	TBP	TCX	DCB
QC Limits											

Actions:

1. If any SMC recovery is <10%, qualify all positive results in associated fractions as estimated (J)
2. If any SMC recovery is <10%, qualify all nondetects in associated fractions as unusable (R)
3. If SMC recoveries fall between 10% and the lower recovery limit, qualify results as estimated (J/UJ)
4. If SMC recoveries fall above the upper recovery limit, qualify positive results as estimated (J)
5. Use professional judgement to qualify Pest/PCB results when SMC recoveries are >10%
6. Use professional judgement to qualify results when SMC recoveries have been diluted out of spec.
7. For SVOC, qualification of the data is required only when 2 or more SMC per fraction are not within control limits.

Remarks: _____

V. Internal Standards Performance (VOC, SVOC)

VOC internal standard area counts within -50% to +100% of standard (Y/N)
VOC internal standard retention times within ± 30 seconds of standard (Y/N)

SVOC internal standard area counts within -50% to +100% of standard (Y/N)
SVOC internal standard retention times within + 30 seconds of standard (Y/N)

Deviations:

Sample #	IS Affected	Area Counts	Acceptable Range	RT	Std. RT Value

Actions:

1. If area counts are outside limits, qualify positive results associated with that IS as estimated (J)
2. Non-detected compounds quantitated using an IS area count >100% should not be qualified
3. Non-detected compounds quantitated using an IS area count <50%, qualify as estimated (UJ)
4. If extremely low area counts are reported (<50% of the lower limit), qualify non-detects as unusable (R)
5. If an IS retention time varies more than 30 seconds, review the chromatographic profile for shifts and irregularities. Use professional judgement to qualify the data estimated (J/UJ) or unusable (R)

Remarks: _____

VI. Blanks

All blanks were reported per matrix per concentration level for each 12 hour period on each GC/Ms system used to analyte VOC and SVOC. Yes / No

Review associated laboratory and project blank samples. List documented contamination below:

Laboratory Method Blanks:

Date	Lab ID #	Fraction	Compound	Conc. (ppb)

Associated Project Blanks (e.g., equipment rinsates, trip blanks, etc.)

Date	Lab ID #	Fraction	Compound	Conc. (ppb)

Remarks:

VI. Blanks (continued)

Calculate action levels based on 10X the highest blank concentration of "common laboratory solvents", VOCs (methylene chloride, acetone, toluene, 2-butanone cyclohexane) or SVOCs (phthalates), and 5X the highest blank concentration for all other VOC, SVOC, Pesticides, and PCB compounds. Sample weights, volumes, and dilution factors must be taken into account when applying the 5X and 10X criteria. This allows the total amount of contaminant present to be considered.

Deviations:

Compound	Maximum Conc. Detected, (ppb)	Action Level (ppb)	Samples Affected

Actions:

1. If compound results exceed the action levels, the data are not qualified
2. If compound results are below the required reporting level, report results as non-detect (U) at the reporting level
3. If the compound is detected above the reporting level, but below the action level, qualify as not-detected (U)
4. If gross contamination exists in blanks (i.e., saturated peaks by GC/MS), all affected compounds in the associated samples should be qualified as unusable (R) due to interference.
5. If blanks were not analyzed per matrix per concentration level, for each 12 hour period on each GC/MS system used to analyze Vocs and SVOCs, use professional judgement to qualify data. Data may be rejected (R).

Remarks: _____

VII. Initial & Contining Calibration (VOC, SVOC)

GC/MS instrument performance checks (BFB or DFTPP) acceptable Yes ☐ No ☐
All compounds must have and RRF $\geq$ 0.01, %RSD $\leq$ 30, and %D $\leq$ 25

VOC - Date of initial calibration: _____
VOC - Date(s) of continuing calibration:
Was the 12 hour critieria met? Y or N

SVOC- Date of initial calibration: _____
SVOC - Date(s) of continuing calibration: _____
Was the 12 hour critieria met? Y or N

Deviations:

Compound	Date	RRF	%RSD	%D	Samples Affected

* % Difference = $((RF_{CCV} - RF_{ICAL\ AVG})/RF_{ICAL\ AVG}) \times 100$. In instances where the bias of the CCV impacts validation qualifiers, review the RF values or amount reported to confirm that the % Difference or % Drift are reported with the correct negative or positive value.

Actions:

1. If any compound has an intial or continuing RRF of < 0.01, qualify positive results as estimated (J)
2. If any compound has an intial or continuing RRF of < 0.01, qualify non-detects as unusable (R)
3. If any compound has a %RSD >30 or a %D >25, qualify positive results as estimated (J)
4. If any compound has a %RSD >40 or a %D >40, qualify non-detects as estimated (UJ)
5. If BFB or DFTPP mass assignment/ ION abundance critieria are in error, qualify all associated data as unusable (R).
6. If samples were analyzed outside the 12 hour BFB or DFTPP performance check time period quality the affected sample data as estimated (J/UJ).
7. If separte calibration for water and soil were not performed, use professional judgement to evaluate the data. Data may be rejected (R).
8. If calibration were not completed within the 12 hour criterion, quality all associated data as estimated (J/UJ). If the 12 hour criterion was grossly exceeded reject all associated data (R).

Remarks: _____

VIII. Initial & Continuing Calibration (Pesticides, PCBs)

Linearity evaluation, are %RSD <20? Yes or No

Is the RPD between calibration factors ≤25? (Y/N) Yes or No

Are multicomponent calibration data provided for each analysis date? Yes or No

Is the difference between columns check ≤ 25%D? Yes or No

Are 4, 4' - DDT and Endrin Breakdown (PEM) < 20% Yes or No

And Combined breakdown < 30 (Y ? N) Yes or No

Deviations:

Compound	% RSD	RPD	Samples Affected

* % Difference = $((RF_{CCV} - RF_{ICAL\ AVG})/RF_{ICAL\ AVG}) \times 100$. In instances where the bias of the CCV impacts validation qualifiers, review the RF values or amount reported to confirm that the % Difference or % Drift are reported with the correct negative or positive value.

Actions:

1. If %RSD criteria are not met, qualify positive results as estimated (J) and non-detects as estimated (UJ)
2. If RPD criteria are not met, qualify positive results as estimated (J) and non-detects as estimated (UJ)
3. If %D criteria is not met, qualify positive results as estimated (J) and non-detects as estimated (UJ)
4. If breakdown criteria are not met, positive 4, 4'-DDT and Endrin should be qualified as estimated (J) and non- detects should be rejected (R).

Remarks:

IX. Matrix Spike/Matrix Spike Duplicate Information

General MS/MSD Criteria:

	VOC	SVOC	Pest	PCB
percent recovery (%R)	70-130	45-135	40-140	40-140
relative percent difference (RPD)	<30	<50	<50	<50

Project Sample(s) Spiked: _____

Deviations:

Compound	%R	%R Limits	RPD	RPD Limits	Samples Affected

Actions:

1. If the spike recovery is above the upper control limit (UCL), qualify all positive values in the unspiked sample as estimated (J)
2. If the spike recovery is below the lower control limit (LCL), qualify positive valves as estimated (J). and non detects as estimated (UJ) in the unspiked sample.
3. If the spike recovery is <10%, qualify non-detect values as unusable (R)
4. If the RPD does not meet criteria, qualify positive values in the unspiked sample as estimated (J)
5. Use professional judgement to qualify additional samples in the analytical group based on MS/MSD results
6. Use professional judgement for qualification of data for unspiked compounds

Remarks: _____

X. Laboratory Control Sample Information

General LCS Criteria:	VOC	SVOC	Pest	PCB
percent recovery (%R)	80-120	60-120	50-130	50-130

Laboratory LCS Identifications: _____

Deviations:

Compound	Date	%R	Samples Affected/Qualifiers Applied

Actions:

Action should be based on both the number of compounds outside the criterion and the magnitude of the exceedance.

1. If the LCS recovery is below limits but > one-half the lower limit, qualify values as estimated (J/UJ).
2. If the LCS recovery is < one-half the lower limit, qualify all non-detect values for the analyte as unusable (R). and all positive values for that analyte as estimated (J).
3. If the LCS recovery is greater than the upper limit, qualifty positive values for that analyte as estimated (J).
4. If more than half the compounds in the LCS are not within recovery criteria, then qualify associated detected compounds as estimated (J).
5. Use professional judgement for qualification of data for compounds with no LCS information

Remarks: _____

XI. Identification Check

Are compound retention time (RT) windows confirmed and correct? _____

Are individual mass spec. ion spectra confirmed and appropriate? _____

Deviations:

Compound	RT	Ion Spec	Samples Affected

Actions:

1. Use professional judgement to qualify data if RT windows are exceeded.
2. Use professional judgement to qualify data if peak shape (i.e. tailing or splitting) is impacted.
3. Use professional judgement to qualify data if analyte ion spectra are compromised.

Remarks: _____

XII. Analyte Quantitation Check

Original data information should fall within the established calibration range for the analytical run.
Confirm appropriate instrument and manual peak integration.
Confirm calculation of reported results for at least 10% of the data set.

Calculation Check:

Analyte:	Method:

Remarks: _____

Calculation Check:

Analyte:	Method:

Remarks: _____

XII. Analyte Quantitation Check

Original data information should fall within the established calibration range for the analytical run.
Confirm appropriate instrument and manual peak integration.
Confirm calculation of reported results for at least 10% of the data set.

Calculation Check:

Analyte:	Method:

Remarks: _____

Calculation Check:

Analyte:	Method:

Remarks: _____

SCIENCE APPLICATIONS INTERNATIONAL CORPORATION
GC and LC Organic Data Review Checklist - Comprehensive Validation
(Explosives, PAHs, Herbicides, GRO/DRO, Methanol, etc.)

Project: _____

SDG No: _____ **Analysis:** _____

Method: _____

Laboratory: _____ **Matrix:** _____

The above data package has been reviewed and the analytical quality control/quality assurance performance data have been summarized. The general criteria used to assess the analytical integrityof the data were based on an examination of the following:

Case Narrative	Analytical Surrogate Recoveries
Analytical Holding Times	MS/MSD Recoveries and Differences
Sample Preservation	LCS Recoveries
Method Calibration	Re-analysis and Secondary Dilution
Method and Project Blanks	

Overall Remarks: _____

Definition of Qualifiers:

"U", not detected at the associated level
"UJ", not detected and associated value estimated
"J", associated value estimated
"R", associated value unusable or analyte identity unfounded
"=", compound properly identified and value positive

Reviewed by: _____ Date: _____

QA Reviewed by: _____ Date: _____

I. Case Narrative

Verify direct statements made within the Laboratory Case Narrative (note discrepancies).

Remarks:

II. Re-analysis and Secondary Dilutions

Verify that re-analysis and secondary dilutions were performed and reported as necessary. Determine appropriate results to report.

Remarks:

III. Holding Times

VOC types - Waters - unpreserved: aromatic within 7 days, non-aromatic within 14 days of sample collection
VOC types - Waters - preserved: aromatic and non-aromatic within 14 days of sample collection
VOC types - Soils - preserve/analyze within 48 hours of sample collection; analyze within 14 days of preservation

SVOC types - Waters - extract within 7 days of sample collection, analyze within 40 days of extraction
SVOC types - Soils - extract within 14 days of sample collection, analyze within 40 days of extraction

Deviations:

Sample #	VOC types		SVOC types			Notes:
	Date Collected	Date Analyzed	Date Collected	Date Extracted	Date Analyzed	

Actions:
1. If holding times are exceeded, all results are qualified as estimated (J/UJ)
2. If holding times are exceeded by more than 2X, reviewer may qualify non-detected results as unusable (R)

Remarks: _____

IV. Initial & Continuing Calibration

A blank and five standards should be analyzed, with one of the standards being within 2X the MDL
Correlation coefficients must be $\geq$ 0.995
The RSD of the calibration factor or the relative response factor (RRF) must be $\leq$ 20%
Continuing calibration %D must be within $\pm$ 15%

Deviations:

Compound	Correlation Coefficient	% RSD	%D	Samples Affected

* % Difference = ((RFCCV - RFICAL AVG)/RFICAL AVG) x 100. In instances where the bias of the CCV impacts validation qualifiers, review the RF values or amount reported to confirm that the % Difference or % Drift are reported with the correct negative or positive value.

Actions:

1. If any compounds initial calibration linearity is <0.995, qualifiy the data as estimated (J/UJ)
2. If any compounds initial calibration linearity is <0.95, qualify the data as unusable (R)
3. If %RSD criteria are not met, qualify positive results as estimated (J) and non-detects as estimated (UJ)
3. If %D criteria is not met, qualify positive results as estimated (J) and non-detects as estimated (UJ)

Remarks: _____

V. Surrogate Recoveries

List surrogate compounds with unacceptable recoveries:

Deviations:

Sample #	Surrogate ID	% R	QC Limits	Samples Affected

Actions:

1. If any surrogate recovery is <10%, qualify all positive results in associated fractions as estimated (J)
2. If any surrogate recovery is <10%, qualify all nondetects in associated fractions as unusable (R)
3. If surrogate recoveries fall between 10% and the lower recovery limit, qualify results as estimated (J/UJ)
4. If surrogate recoveries fall above the upper recovery limit, qualify positive results as estimated (J)
6. Use professional judgement to qualify results when surrogate recoveries have been diluted out of spec.

Remarks: _____

VI. Blanks

Review associated laboratory and project blank samples. List documented contamination below:

Laboratory Method Blanks:

Date	Lab ID #	Fraction	Compound	Conc. (ppb)

Associated Project Blanks (e.g., equipment rinsates, trip blanks, etc.)

Date	Lab ID #	Fraction	Compound	Conc. (ppb)

Remarks:

VI. Blanks (continued)

Calculate action levels based on 5X the highest blank concentration of any given compound
Sample weights, volumes, and dilution factors must be taken into account when applying the 5X criteria

Deviations:

Compound	Maximum Conc. Detected, (ppb)	Action Level (ppb)	Samples Affected

Actions:

1. If compound results exceed the action levels, the data are not qualified
2. If compound results are below the required reporting level, report results as non-detect (U) at the reporting level
3. If the compound is detected above the reporting level, but below the action level, qualify as not-detected (U)

Remarks: _____

VII. Matrix Spike/Matrix Spike Duplicate Information

General MS/MSD Criteria:

	VOC types	SVOC types
percent recovery (%R)	70-130	45-135
relative percent difference (RPD)	<30	<50

Project Sample(s) Spiked: _____

Deviations:

Compound	%R	%R Limits	RPD	RPD Limits	Samples Affected

Actions:

1. If the spike recovery is outside limits, qualify all positive values in the unspiked sample as estimated (J)
2. If the spike recovery is <10%, qualify non-detect values as unusable (R)
3. If the RPD does not meet criteria, qualify positive values in the unspiked sample as estimated (J)
4. Use professional judgement to qualify additional samples in the analytical group based on MS/MSD results
5. Use professional judgement for qualification of data for unspiked compounds

Remarks: _____

VIII. Laboratory Control Sample Information

General LCS Criteria:

	VOC types	SVOC types
percent recovery (%R)	80-120	60-120

Laboratory LCS Identifications: _____

Deviations:

Compound	Date	%R	Samples Affected/Qualifiers Applied

Actions:

1. If the LCS recovery is outside limits but >10%, qualify all positive values as esimated (J)
2. If the LCS recovery is outside limits but >10%, qualify non-detect values as estimated (UJ)
3. If the LCS recovery is <10%, qualify all data for that analyte as unusable (R)
4. Use professional judgement for qualification of data for compounds with no LCS information

Remarks: _____

IX. Identification Check

Are compound retention time (RT) windows confirmed and correct? _____

Are individual chromatographic sequences confirmed and appropriate? _____

Deviations:

Compound	RT	Ion Spec	Samples Affected

Actions:

1. Use professional judgement to qualify data if RT windows are exceeded.
2. Use professional judgement to qualify data if peak shape (i.e. tailing or splitting) is impacted.
3. Use professional judgement to qualify data if analyte ion spectra are compromised.

Remarks: _____

XII. Analyte Quantitation Check

Original data information should fall within the established calibration range for the analytical run.
Confirm appropriate instrument and manual peak integration.
Confirm calculation of reported results for at least 10% of the data set.

Calculation Check:

Analyte:	Method:

Remarks: _____

Calculation Check:

Analyte:	Method:

Remarks: _____

XII. Analyte Quantitation Check

Original data information should fall within the established calibration range for the analytical run.
Confirm appropriate instrument and manual peak integration.
Confirm calculation of reported results for at least 10% of the data set.

Calculation Check:

Analyte:	Method:

Remarks: _____

Calculation Check:

Analyte:	Method:

Remarks: _____

SCIENCE APPLICATIONS INTERNATIONAL CORPORATION
Metals Data Review Checklist - Comprehensive Validation

Project: _____

SDG No: _____ **Analysis:** _____

Method: _____

Laboratory: _____ **Matrix:** _____

The above data package has been reviewed and the analytical quality control/quality assurance performance data have been summarized. The general criteria used to assess the analytical integrity of the data were based on an examination of the following:

Case Narrative	MS/MSD Recoveries and Differences
Analytical Holding Times	Duplicate Relative Percent Differences
Sample Preservation	ICP Serial Dilution
Method Calibration	Furnace Atomic Absorption QC
Method and Project Blanks	Re-analysis and Secondary Dilution
LCS Recoveries	Internal Standard Performance (if applicable)

Project specific QA/QC or contract requirements may take priority over validation criteria in this proceudre.

Overall remarks: _____

Definition of Qualifiers:

"U", not detected at the associated level
"UJ", not detected and associated value estimated
"J", associated value estimated
"R", associated value unusable or analyte identity unfounded
"=", compound properly identified and value positive

Reviewed by: _____ Date: _____

QA Reviewed by: _____ Date: _____

I. Case Narrative

Verify direct statements made within the Laboratory Case Narrative (note discrepancies).

Remarks:

II. Re-analysis and Secondary Dilutions

Verify that re-analysis and secondary dilutions were performed and reported as necessary. Determine appropriate results to report.

Remarks:

III. Holding Times

Metals - Waters - preserved to pH<2, 180 days from sample collection
Metals - Soils - 180 days from sample collection
Mercury - Waters - preserved to pH<2, 28 days from sample collection
Mercury - Soils - 28 days from sample collection

Deviations:

Sample #	Metals				Mercury			
	Date Collected	Date Analyzed	Days >HT	pH Check	Date Collected	Date Analyzed	Days >HT	pH Check

Actions:

1. If preserved samples exceed holding time, qualify all associated results as estimated (J/UJ).
2. If unpreserved samples exceed holding time, qualify all associated results as unusable (R).
3. If holding times are exceeded by more than 2X, reviewer may qualify non-detected results as unusable (R)
4. If water samples are not acidified, use professional judgement. Minimally, qualify data as estimated (J) and non-detects unusable (R).
5. If soil samples exceed holding time, use professional judgement to qualify data.

Remarks: _____

IV. Initial & Contining Calibration (ICP, GFAA, CVAA, etc.)

Initial calibration linearity criteria is r ≥ 0.995
ICV and CCV criteria are ± 10% recovery, low level check standard allowed ± 30%
ICP inter-element check standard criteria ± 20%

Deviations:

Element	Date	Intial Calib.	ICV/ CCV	%R	Samples Affected

Actions:

1. If any elements initial claibration linearity is <0.995, qualify the data as estimated (J/UJ)
2. If any elements initial claibration linearity is <0.95, qualify the data as unusable (R)

3a. If any elements ICV or CCV recovery is <90%, qualify the data as estimated (J/UJ)

3b. If any elements ICV or CCV recovery is > 110%, qualify results ≥ MDL as estimated (J).
Do not qualify non-detects.

4a. If any elements ICV or CCV recovery is <75%, qualify the data as unusable (R)

4b. If any elements ICV or CCV recovery is > 125% qualify positive results as estimated (J) or non-detects as unusable (R).

4c. If any element ICV or CCV recovery is ≥ 160%, qualify positive results ≥ MDL as unusable (R).
Do not qualify non-detects.

5a. If any elements CRI recovery is 50 - 69% (30 - 49% for Sb, Pb, Tb), qualify results ≥ MDL (but < 2 times CRQL) as estimated (UJ) and results > 2 times CRQL are not qualified.

5b. If any elements CRI recovery is < 50% (<30% for Sb, Pb, Tl), qualify results ≥ MDL (but < 2 times CRQL) and non-detectsas unusable (R). Results > 2 times CRQL are estimated (J).

5c. If any elements CRI recovery is > 130% but < 180% (>150% but < 200% for Sb, Pb, Tl), qualify results ≥ MDL (but < 2 times CRQL) as esimated (J). And non-detects and results ≥ the CRQL are not qualified.

5d. If CRI or(R) > 180% (> 200% for Sb, Pb, Ti), qualify results that are ≥ MDL as unusable (R).

Remarks: _____

IV. Initial & Contining Calibration (ICP, GFAA, CVAA, etc.) (continued)

Analytical Sequence and MS Tune (Y/N)

1. Were the appropriate number of ICP standards used? _____
2. Were the appropriate number of AA standards used? _____
3. Was calibration performed and documented at the beginning of each run? _____
4. Were calibration check standards run at 10% frequency or every two hours? _____
5. Were low level standard checks analyzed at approximately 2X the PQL? _____
6. Was ICP-MS mass calibration within 0.1 AMU? _____
7. Was ICP-MS % RSD of the aboslute signals for all analytes < 5%?

Deviations:

Element	Deviation	Samples Affected

Actions:

1. If instrument calibration is questionable, use professional judgement, qualify the data as estimated (J/UJ)
2. If instrument calibration documentation can not be obtained or is inadequate, qualify the data as unusable (R)
3. If mass calibration for ICP-MS was not within 0.1 AMU qualify analyte results as estimated (J/UJ)
4. If % RSD for ICP-MS was > 5% for any analyte in the tuning solution, qualify associated results as estimated (J/UJ).

Results: _____

V. Blanks (ICB, CCB, Method Blank, Equipment Rinsate Blank)

A. Blank Results

If the blank level is > CRQL for any analyte, check that the analyte's concentration in the samples is > 10 times the blank value. The highest blank concentration of observed elements is the action level.
Sample weights, volumes, and dilution factors must be taken into account when applying the action level.
Blank results given in ug/L must be converted to mg/kg to compare them with soil sample results.
use the following equation:

ug/L x V/W x 1L/1000mL x 1000g/1kg x 1mg/1000ug = mg/kg

where: V = volume of samples digest solution (usually 200 mL)
W = weight of sample digested (usually 1 g)

Deviations:

Blank ID	Element	Max. Conc. Detected	Action Level	Samples Affected

If additional space is required, use next page

Actions:

1. For blank results ≥ MDL but ≤ CRQL, qualify samples ≥ MDL but < CRQL as CRQL U.
   Use profession judgement to qualify sample results exceeding the CRQL.

2a. If blank results are > CRQL: For sample values ≥ MDL but ≤ CRQL, qualify results as CRQL U; for sample values > CRQL but < 10 times the blank qualify results as unusable (R) or estimated (J). No action is taken for sample results ≥ 10 times the blank levels.

2b. If ICB/ CCB results are > CRQL; for sample values ≥ MDL but < CRQL, qualify results as CRQL U; for sample values > CRQL but < blank results, qualify results as not detected (U) at the level of the blank or unusable (R). Use professional judgement for sample results > blank results.

Remarks: _____

V. Blanks (continued)

The highest blank concentration of observed elements is the action level.
Sample weights, volumes, and dilution factors must be taken into account when applying the 5X criteria.
Blank results given in ug/L must be converted to mg/kg to compare them with soil sample results.
use the following equation:

ug/L x V/W x 1L/1000mL x 1000g/1kg x 1mg/1000ug = mg/kg

where: V = volume of samples digest solution (usually 200 mL)
W = weight of sample digested (usually 1 g)

Deviations:

Blank ID	Element	Max. Conc. Detected	Action Level	Samples Affected

V. Blanks (continued)

B. Frequency Requirements (Y/N)

1. Was a method (preparation) blank analyzed for each matrix? _____
2. Was a method blank processed for every analytical batch (20 samples)? _____
3. Was a calibration blank analyzed at 10% frequency or every two hours? _____

Deviations:

Element	Deviation	Samples Affected

Remarks: _____

C. Baseline Shift Evaluation

List the highest negative blank concentration for each analyte observed in laboratory or project blanks.

Deviations:

Blank ID	Element	Max. Neg. Conc.	Action Level	Samples Affected

Actions:

1. If the absolute value of the maximum negative blank result is > the CRQL, qualify positive results as estimated (J) and non-detects as estimated (UJ).

Remarks: _____

VI. Laboratory Control Sample Evaluation

All LCS recovery criteria are set at 80-120%
An LCS must be analyzed for each matrix and for each digestion batch or set of twenty samples

Deviations:

Element	Date	%R	Matrix	Samples Affected

Actions:

1. If any element's LCS recovery is >120%, qualify positive results as (J).
2. If any element's LCS recovery is 50-79%, qualify positive results as (J) and non-detect results as (UJ)

3a. If any element's LCS recovery is <50%, qualify positive results as (J) and non-detect results as (R)
3b. If the LCS recovery is > 150%, qualify all results as unusable (R).

4. For soil LCS recovery > upper limit, qualify samples results > MDL as estimated (J).
5. For soil LCS recovery < lower limit, qualify results > MDL as esimated (J) and non-detected estimated (UJ).
6. Use professional judgement to qualify data if the LCS frequency criteria are not met.

Remarks: _____

VII. Matrix Spike Evaluation

All MS recovery criteria are set at 75-125%
An MS must be analyzed for each matrix and for each digestion batch or set of twenty samples
Verify that a field blank or PE sample was not used for spiked sample analysis
Verify that a post-digestion was analyzed for those anlytes where the pre-digestion spike recovery is outside control limits and the sample result is < 4 times the spike added.
Project Sample(s) Spiked: _____

Deviations:

Element	Spiked Sample Result	Sample Result	Spike Amount	%R	Samples Affected		

Actions:

1. If the sample concentration exceeds the spiking level by a factor of 4X or more, do not qualify the data
2. If the spike recovery is >125%, qualify all positive values as (J).
3. If the spike recovery is between 30-74%, qualify positive values as (J) and non-detect values as estimated (UJ)
4. If the spike recovery is <30%, qualify positive values as (J) and non-detects are qualified unusable (R)
if the post-digestion spike recovery is < 75% (or none were performed); non-detects are qualified as estimated (UJ)
If the post-digestion spike reocvery is $\geq$ 75%. There is no post-digestion spike performed for mercury.
5. Qualify all samples of similar matrix to the spiked sample in the same manner
6. Use professional judgement to qualify data if the MS frequency criteria are not met.
7. Use professional judgement for qualification of data for unspiked elements

Remarks: _____

VIII. Laboratory Duplicate Evaluation

Duplicate relative percent difference (RPD) for water is 20% (both results > 5 times CDRL) or < CRDL difference (if either result is < 5 times CRDL) and RPD for soil is 35% (if both results are > 5 times CRDL or < 2 times CRDL if either result is < 5 times CRDL).
When duplicate sample values are both less than the reporting level they are considered acceptable
When dupicate sample values are within 5X the reporting level they are acceptable if their absolute difference is within 3X the reporting level
Verify that a field blank on PE sample was not used or duplicate analysis.

Deviations:

Element	Sample #	Duplicate #	RPD	Samples Affected

Actions:

1. If an element's RPD is >20% (water) / >35% (soil), qualify positive results as (J) and non-detect results as (UJ)
2. For low concentrations, if an element's duplicate absolute difference is > 3X the reporting level, qualify positive results as (J) and non-detect results as (UJ)
3. Use professional judgement to qualify data if the duplicate frequency criteria are not met.

Remarks: _____

IX. Inductively Coupled Plasma (ICP) Serial Dilution Analysis

Verify that a field blank or PE sample was not used for serial dilution.
Serial dilution of positive results are performed when values exceed 50X the IDL
Results from serial dilutions should agree within 10% of the original undiluted analysis

Deviations:

Element	Sample #	Sample Result	Serial Dilution	%D	Action

Actions:

1. If the serial dilution %D is >10 and the analyte results are >50X the IDL, qualify all positive results as estimated (J) and non-detects as estimated (UJ).

Remarks: _____

X. Furnace Atomic Absorption QC

A. Duplicate Precision (Y/N)

1. Were duplicate injections performed for all samples? _____
2. Were one point analytical spikes performed for all samples? _____
3. Did duplicate injections agree within ± 20%? _____

Deviations:

Element	Deviation	Sample Affected

Actions:

1. If duplicate injection results are outside ± 20%, qualify positive results as (J) and non-detect results as (UJ)

Remarks: _____

B. Post Digestion Spike Recoveries (Y/N)

1. Did post digestion spike recoveries meet an 85-115% recovery criteria? _____
2. If spike recoveries did not meet recovery criteria were samples analyzed by MSA? _____
3. If MSA was used to analyze samples, was its' correlation coefficient ≥ 0.995? _____

Deviations:

Element	Deviation	Sample Affected

Actions:

1. If post digestion spike recoveries are >115%, qualify positive results as (J) and non-detect results as (U)
2. If post digestion spike recoveries are 11-84%, qualify positive results as (J) and non-detect results as (UJ)
3. If post digestion spike recoveries are <10%, qualify positive results as (R) and non-detect results as (R)
4. If MSA was used to quantitate values and the correlation coefficient was <0.995, qualify data as (J or UJ)
5. If MSA was used to quantitate values and the correlation coefficient was <0.95, qualify data as (R)

Remarks: _____

XI. Inductively Coupled Plasma (ICP) Interference Check Sample Evaluation

Interference check samples should be analyzed at the beginning and end of each analysis run, or at a minimum of twice per 8 hour working shift.
Results for the ICS solution AB must fall within control limits of 20% for analytes included in the solution.
Evaluate the ICS A solution raw data for results with an absolute value ≥ MDL for analytes that are not present in the ICS A solution.

Deviations:

Element	Sample #	Sample Result	Interferent Result	Action

Actions:

1. If the ICS AB %R for an analyte is > 120%, qualify sample results ≥ MDL as estimated (J) and non-detects should not be qualified.
2. If the ICS AB %R for an analytes is 50-79%, qualify sample results that are ≥ MDL as estimated (J) and non-detects as estimated (UJ).
3. If the ICS AB %R for an analyte is <50%, qualify all sample results that are ≥ MDL and all non-detects as as unusable (R).
4. If results ≥ MDL are found for analytes not present in the ICS A solution, then in samples with comparable or higher levels of interferents and with analyte concentration that approximate those levels in the ICS A, sample results ≥ MDL should be qualified as estimated (J) and non-detects should not be qualified.
5. If negative results with absolute values > MDL are found for analytes not present in the ICS A solution, then in samples with comparable or higher levels of interferents, affected sample results > MDL should be qualified as estimated (J) and non-detects (UJ).

Remarks: _____

XII. Analyte Quantitation Check

Original data information should fall within the established calibration range for the analytical run.
Analyte identification should be confirmed in the original data output.
Confirm calculation of reported results for at least 10% of the data set.

Calculation Check:

Analyte:	Method:

Remarks:

Calculation Check:

Analyte:	Method:

Remarks:

XII. Analyte Quantitation Check

Original data information should fall within the established calibration range for the analytical run.
Analyte identification should be confirmed in the original data output.
Confirm calculation of reported results for at least 10% of the data set.

Calculation Check:

Analyte:	Method:

Remarks:

Calculation Check:

Analyte:	Method:

Remarks:

SCIENCE APPLICATIONS INTERNATIONAL CORPORATION
Inorganic Data Review Checklist - Comprehensive Validation
(Chloride, Fluoride, Nitrate/Nitrite, Sulfate, Sulfide, Phosphate, etc.)

Project: _____

SDG No: _____ **Analysis:** _____

Method: _____

Laboratory: _____ **Matrix:** _____

The above data package has been reviewed and the analytical quality control/quality assurance performance data have been summarized. The general criteria used to assess the analytical integrityof the data were based on an examination of the following:

Case Narrative	Method and Project Blanks
Analytical Holding Times	Matrix Spike Recoveries
Sample Preservation	Duplicate Differences
Method Calibration	LCS Recoveries
	Re-analysis and Secondary Dilution

Overall Remarks: _____

Definition of Qualifiers:

"U", not detected at the associated level
"UJ", not detected and associated value estimated
"J", associated value estimated
"R", associated value unusable or analyte identity unfounded
"=", compound properly identified and value positive

Reviewed by: _____ Date: _____

QA Reviewed by: _____ Date: _____

I. Case Narrative

Verify direct statements made within the Laboratory Case Narrative (note discrepancies).

Remarks:

II. Re-analysis and Secondary Dilutions

Verify that re-analysis and secondary dilutions were performed and reported as necessary. Determine appropriate results to report.

Remarks:

III. Holding Times

Sample should be preserved and analyzed according to the appropriate analytical method
In general the following preservations and holding times for waters can be applied:

Sulfate, 4 degress C, 28 days
Sulfide, 4 degrees C, pH ≥9 with zinc acetate/sodium hydroxide, 7 days
Bromide/Chloride/Fluoride, no preservative required, 28 days
Nitrate/Nitrite or Ammonia, 4 degrees C, pH ≤ 2 with sulfuric acid, 28 days
Nitrate or Nitrite, 4 degrees C, 48 days
Alkalinity, 4 degrees C, 14 days
TDS/TSS, 4degrees C, 7 days
Phosphate (total), 4 degrees C, pH < 2 with sulfuric acid, 28 days
Hexavalent Chromium, Cool 4 degress C, water- 24 hours, soil- 30 days

Deviations:

Sample #	Analyte	Date Collected	Date Extracted	Date Analyzed	Notes:

Actions:

1. If holding times are exceeded, all results are qualified as estimated (J/UJ)
2. If holding times are exceeded by more than 2X, reviewer may qualify non-detected results as unusable (R)
3. If samples were not properly preserved, use professional judgement to qualify the data

Remarks: _____

IV. Initial & Continuing Calibration

A blank and at least three standards should be analyzed, with one of the standards being within 2X the MDL
Correlation coefficients must be $\geq$ 0.995
Initial calibration check recoveries must be within 90-110%
Continuing calibration check recoveries must be within 85-115%

Deviations:

Compound	Correlation Coefficient	ICV/ CCV	%R	Samples Affected

Actions:

1. If any compounds initial calibration linearity is <0.995, qualifiy the data as estimated (J/UJ)
2. If any compounds initial calibration linearity is <0.95, qualify the data as unusable (R)
3. If ICV or CCV criteria are not met, qualify positive results as estimated (J) and non-detects as estimated (UJ)
4. If ICV or CCV recoveries fall below 50%, qualify results as unusable (R)

Remarks: _____

V. Blanks (Method Blanks and Project Blanks)

An analytical method blank must be analyzed with each batch of samples
Calculate action levels based on 5X the highest blank concentration of any given analyte
Sample weights, volumes, and dilution factors must be taken into account when applying the 5X criteria

Deviations:

Analyte	Maximum Conc. Detected, (ppb)	Action Level (ppb)	Samples Affected

Actions:

1. If analyte results exceed the action levels, the data are not qualified
2. If analyte results are below the required reporting level, report results as non-detect (U) at the reporting level
3. If the analyte is detected above the reporting level, but below the action level, qualify as not-detected (U)

Remarks:

VI. Laboratory Control Sample Information

Each analyte's LCS % recovery must be within the control limits established by the laboratory
In general LCS % recoveries should all be within 85-115%

Deviations:

Analyte	Date	%R	Samples Affected/Qualifiers Applied

Actions:

1. If the LCS recovery is outside limits but >10%, qualify all positive values as esimated (J)
2. If the LCS recovery is outside limits but >10%, qualify non-detect values as estimated (UJ)
3. If the LCS recovery is <10%, qualify all data for that analyte as unusable (R)
4. Use professional judgement for qualification of data for compounds with no LCS information

Remarks:

VII. Matrix Spike Information

Each analyte's Matrix Spike % recovery should be within the laboratory established control limits
In general matrix spike % recoveries should all be within 75-125%

Deviations:

Analyte	%R	%R Limits	Samples Affected

Actions:

1. If the spike recovery is outside limits, qualify all values in the unspiked sample as estimated (J/UJ)
2. If the spike recovery is <10%, qualify non-detect values as unusable (R)
3. Use professional judgement to qualify additional samples in the analytical group based on MS results
4. Use professional judgement for qualification of data for unspiked analytes

Remarks:

VIII. Laboratory Duplicate Information

Each analyte's RPD should be within the laboratory established control limits
In general RPDs should all be within 20%

Deviations:

Analyte	RPD	RPD Limits	Samples Affected

Actions:

1. If the RPD is outside limits, qualify all values in the unspiked sample as estimated (J/UJ)
2. Use professional judgement to qualify additional samples in the analytical group based on RPD results
3. Use professional judgement for qualification of data when laboratory duplicates were not analyzed

Remarks:

IX. Analyte Quantitation Check

Original data information should fall within the established calibration range for the analytical run.
Analyte identification should be confirmed in the original data output.
Confirm calculation of reported results for at least 10% of the data set.

Calculation Check:

Analyte:	Method:

Remarks:

Calculation Check:

Analyte:	Method:

Remarks:

IX. Analyte Quantitation Check

Original data information should fall within the established calibration range for the analytical run.
Analyte identification should be confirmed in the original data output.
Confirm calculation of reported results for at least 10% of the data set.

Calculation Check:

Analyte:	Method:

Remarks:

Calculation Check:

Analyte:	Method:

Remarks:

SCIENCE APPLICATIONS INTERNATIONAL CORPORATION
Radiochemical Data Review Checklist - Comprehensive Validation

Project: _____

SDG No: _____ **Analysis:** _____

Method: _____

Laboratory: _____ **Matrix:** _____

The above data package has been reviewed and the analytical quality control/quality assurance performance data have been summarized. The general criteria used to assess the analytical integrityof the data were based on an examination of the following:

Case Narrative	Chemical and/or Tracer Recoveries
Analytical Holding Times	Matrix Spike Results
Sample Preservation	Duplicate Error Ratios and RPDs
Method Calibration	LCS Recoveries
Method and Project Blanks	Re-analysis and Secondary Dilution

Overall Remarks: _____

Definition of Qualifiers:

"U", not detected at the associated level
"UJ", not detected and associated value estimated
"J", associated value estimated
"R", associated value unusable or analyte identity unfounded
"=", compound properly identified and value positive

Reviewed by: _____ Date: _____

QA Reviewed by: _____ Date: _____

I. Case Narrative

Verify direct statements made within the Laboratory Case Narrative (note discrepancies).

Remarks:

II. Re-analysis and Secondary Dilutions

Verify that re-analysis and secondary dilutions were performed and reported as necessary. Determine appropriate results to report.

Remarks:

III. Holding Times

General analytical holding time for radionuclides is 6 months
Water samples require preservation with nitric acid to pH <2, for dissolved radionuclide determination
Radioactive iodine holding time is 7 days
Consideration must always be given to the individual radionuclide half-life

Deviations:

Sample #	Radionuclide:	Date Collected	Date Analyzed	Action

Actions:
1. If holding times are exceeded, all results are qualified as estimated (J/UJ)
2. If holding times are exceeded by more than 2X, reviewer may qualify non-detected results as unusable (R)

Remarks:

IV. Minimum Detectable Activities (MDAs)/ Reporting Levels

Verify MDAs with project requested reporting levels for all radionuclides
Compare reported activities and uncertainties with reported MDAs

Deviations:

Radionuclide	Project Reporting Level Goal	MDA Achieved	Samples Affected

Actions:

1. Document all radionuclide determinations that do not meet project reporting level goals.
2. If the reported value with its uncertainty encompass the project reporting level goal, they are equivalent.
3. If the sample result is negative and its absolute value exceeds the MDA, qualify the result as estimated (UJ).
4. If the sample result is negative and its absolute value exceeds 2X the MDA, qualify the result ®.

Remarks:

V.A1. Calibration Alpha Spectroscopy

Initial efficiency calibration must be demonstrated for each detector.
Initial energy calibration must be demonstrated for each detector.
Resolution (FWHM) must be demonstrated for each detector.
Standards must be traceable and documentation must be provided.
Standard preparation (dilutions, calculations, etc.) documentation must be provided.

V.A2.Continuing Calibration Alpha Spectroscopy

Continuing calibration efficiency verification must be performed at least quarterly.
Continuing calibration efficiency must be demonstrated to be within 10% of the initial efficiency.
Continuing energy calibration must be demonstrated to be within 10% of the initial calibration.
Continuing FWHM must be demonstrated to be within 10% of the initial FWHM.
A long background count for each detector must be performed weekly or bi-weekly.
Pulser counts and demonstration of FWHM for each detector must be demonstrated daily.

Deviations:

Deficiency	IS Affected	Area Detectors Affect	Acceptable Range	RT Samples Affected	Std. RT Value

Actions:

1. If the initial calibration efficiencies, resolution, or standard information is not acceptable, qualify all affected results as estimated (J).
2. If the continuing calibration efficiency, energy, or FWHM are not acceptable, qualify all affected results as estimated (J).
3. If background counts or pulser counts are not acceptable, qualify the affected data as estimated (J).

Remarks: _____

V.B1. Calibration Gamma Spectroscopy

Initial efficiency calibration must be demonstrated on each detector for each geometry.
Initial energy calibration must be demonstrated on each detector for each geometry.
Resolution (FWHM) must be demonstrated for each detector for each geometry.
Standards must be traceable and documentation must be provided.
Standard preparation (dilutions, calculations, etc.) documentation must be provided.

V.B2.Continuing Calibration Gamma Spectroscopy

Continuing calibration efficiency verification must be performed for each detector at least quarterly.
Continuing calibration efficiency must be demonstrated to be within 10% of the initial efficiency.
Continuing energy calibration must be demonstrated to be within 10% of the initial calibration.
Continuing FWHM must be demonstrated to be within 10% of the initial FWHM.
A long background count for each detector must be performed monthly.
Pulser counts and demonstration of FWHM for each detector must be demonstrated daily.

Deviations:

Deficiency	IS Affected	Area Detectors Affect	Acceptable Range	RT Samples Affected	Std. RT Value

Actions:

1. If the initial calibration efficiency, energy, resolution, or standard information is not acceptable, qualify all affected results as estimated (J).
2. If the continuing calibration efficiency, energy, or FWHM are not acceptable, qualify all affected results as estimated (J).
3. If background counts or pulser counts are not acceptable, qualify the affected data as estimated (J).

Remarks: _____

V.C1. Calibration Liquid Scintillation Counters

Initial quench curves must be demonstrated for each radionuclide.
Initial calibration must be demonstrated for each radionuclide.
Standards must be traceable and documentation must be provided.
Standard preparation (dilutions, calculations, etc.) documentation must be provided.

V.C2. Continuing Calibration Liquid Scintillation Counters

Continuing calibration efficiency verification must be performed afor each radionuclide.
Continuing calibration efficiency must be demonstrated to be within 10% of the initial efficiency.
Standards linear regression curve must be performed daily and documentation provided.
Control charts for tritium and carbon-14 chi square and figure of merit values should be documented.
A background count for each radionuclide window must be provided.

Deviations:

Deficiency	IS Affected	Area Detectors Affect	Acceptable Range	RT Samples Affected	Std. RT Value

Actions:

1. If the initial calibration quench curve or standard information is not acceptable, qualify all affected results as estimated (J).
2. If the continuing calibration efficiency or control charts are not acceptable, qualify all affected results as estimated (J).
3. If background counts are not acceptable, qualify the affected data as estimated (J).

Remarks: _____

V.D1. Calibration Gas Proportional Counters

Initial efficiency calibration must be demonstrated for each detector.
Absorption curve must be demonstrated for each detector.
Plateau curve performance check must be demonstrated for each detector.
Data used to determine alpha and beta cross-talk must be demonstrated.
Standards must be traceable and documentation must be provided.
Standard preparation (dilutions, calculations, etc.) documentation must be provided.

V.D2.Continuing Calibration Gas Proportional Counters

Continuing calibration efficiency verification must be performed at least quarterly.
Continuing calibration efficiency must be demonstrated to be within 10% of the initial efficiency.
Cross-talk value for each detector must be documented.
Background count for each detector must be performed daily.

Deviations:

Deficiency	IS Affected	Area Detectors Affect	Acceptable Range	RT Samples Affected	Std. RT Value

Actions:

1. If the initial calibration absorption curve, plateau curve, % cross-talk, or standard information is not acceptable, qualify all affected results as estimated (J).
2. If the continuing calibration efficiency or percent cross-talk are not acceptable, qualify all affected results as estimated (J).
3. If background counts are not acceptable, qualify the affected data as estimated (J).

Remarks:

VI. Blanks

Review associated laboratory and project blank samples. List documented contamination below:

If the blank result is less than the associated uncertainty (error), no qualification will be warranted.
If the blank result is greater than its associated uncertainty, but less than the MDA, then no qualification will be warrented.
If the blank result is greater than the associated uncertainty and greater than the MDA, then qualification of sample results may be appropriate.

Laboratory Method Blanks:

Date	Lab ID #	Radionulcide	Result and Error	MDA Result and Error

Associated Project Blanks (e.g., equipment rinsates, etc.)

Date	Lab ID #	Radionuclide	Result and Error	MDA Result and Error

Remarks:

VI. Blanks (continued)

Calculate action levels based on 10X the highest blank concentration.

Deviations:

Radionuclide	Max. Activity Detected	Action Level	Samples Affected

Actions:

1. If the blank result falls outside criteria, qualify associated sample results that are less than 10X the blank value as estimated (J).

Example:	Blank Result	Uncert.	MDA or	Normalized absolute difference	Qualification
acceptable	0.3	0.45	0.5	>2.58	none
acceptable	0.3	0.25	0.5	1.96 to 2.58	J
outside criteria	0.3	0.25	0.2	<1.96	J

2. If the absolute sample result is less than the MDA and the uncertainty is less than the result, qualify as non-detect (U).
3. If the absolute sample results is less than the MDA and the uncertainty is greater than the result, qualify as non-detect value uncertain (UJ).
4. If the sample result is greater than the MDA and the uncertainty is 50-100% of the result, qualify the data as estimated (J).
5. If the sample result is greater than the MDA and the uncertainty is greater than 100% of the result, qualify the data as rejected (R).
4. If the sample result is negative, and its absolute value exceeds 2X the MDA, qualify the data as rejected (R).

Remarks: _____

VII. Sample-Specific Carrier or Tracer Recovery

Sample-specific recoveries must be within limits as demonstrated by the applicable analytical procedures.
Generally, recoveries of 30-110% are considered acceptable.
Documentation of traceable tracer solutions (NIST) and dilution documentation must be provided.
Spot check sample-specific carrier or tracer recovery calculations.

Deviations:

Radionuclide	Sample ID	%R	Action Taken

Actions:

1. If recovery is between 30-110%, no qualification is necessary.
2. If recovery is between 10-30%, qualify the data as estimated (J).
3. If recovery is between 110-150%, qualify the data as estimated (J).
4. If recovery is less than 10%, qualify the data as rejected (R).
5. If recovery if greater than 150%, qualify the data as rejected (R).

Remarks:

VIII. Laboratory Control Sample Information

General LCS Criteria:	aqueous	solid
percent recovery (%R)	80-120	70-130

Laboratory LCS Identifications: _____

Deviations:

Radionuclide	Date	%R	Samples Affected/Qualifiers Applied

Actions:

Aqueous	<50%	50-79%	121-150%	>150%
	R	J	J	R
Solid	<40%	40-69%	131-160%	>160%
	R	J	J	R

Remarks: _____

IX. Matrix Spike Information

General MS Criteria:	Aqueous	Solid
percent recovery (%R)	50-120	40-130

Project Sample(s) Spiked: _____

Deviations:

Radionuclide	Date	%R	Samples Affected/Qualifiers Applied

Actions:

	<20%	20-49%	121-160%	>160%
Aqueous	R	J	J	use professional judgement

	<10%	10-39%	131-160%	>160%
Solid	R	J	J	use professional judgement

Remarks: _____

X. Duplicate Sample or Matrix Spike Duplicate Analysis

Identify the method utilized to evaluate duplicate analyses; duplicate error ration (DER), relative percent difference (RPD), or relative error ratio (RER).
Duplicate actions should apply to all samples associated with the duplicate pair.

Duplicate Sample Identification: _____

Deviations:

Radionuclide	DER	RPD	RER	Samples Affected

Actions:
1. If both sample and duplicate activities are within 2X the MDA comparison is acceptable.
2. If the DER is greater than 1.00, qualify the data as estimated (J).
3. If the RPD is greater than 50% qualify the data as estimated (J).
4. If one sample is <MDA and the other sample is >2X the MDA, qualify the data as estimated (J).

Remarks: _____

XI. Chemical/Spectroscopic Separation Specificity (alpha spectroscopy)

Each alpha isotopic peak should be clear and free of interference from other energy peaks.
Each isotopic energy peak should be evaluated for peak shape (i.e., tailing, splitting, etc.)
The observed energy peak(s) for the radionuclide of interest must be confirmed as acceptable to theoretical.

Deviations:

Radionuclide	Deficiency	Samples Affected

Actions:

1. If the energy of the radionuclide peak of interest is more than 100keV from the theoretical energy, qualify the results as rejected (R).
2. If the energy spectra contains any overlapping or interferent peaks that can not be resolved from the target peak, qualify the data as rejected (R).
3. If results have not been properly corrected for distinquishable interfering radionuclide peaks, qualify the data as rejected (R).

Remarks:

XII. Target Radionuclide Spectroscopic Identification (gamma spectroscopy)

Each sample target radionuclide energy must be within 2 keV of the observed standard peak energy.
Multiple peak radionuclides must exhibit the appropriate peak energies and proportional status.
At least 50% of the total gamma abundance must be accounted for by the quantified radionuclides.
All peaks greater than 3X the background standard deviation must be identified and quantified.
The observed energy peak(s) for radionuclides of interest must be confirmed as acceptable to theoretical.
Radionuclide values must be consistent with related radionuclides (e.g., parent daughter relationships).

Deviations:

Radionuclide	Deficiency	Samples Affected

Actions:

1. For target radionuclides that are not detected, qualify the results as described in section VI.
2. For target radionuclides that are detected but fail to meet identification crtieria,
   use professional judgement to qualify the data as estimated (J).
3. If the energy of the radionuclide peak of interest is more than 2 keV from the theoretical energy,
   use professional judgement to qualify the data.
4. If the energy spectra contains any overlapping or interferent peaks that can not be resolved
   from the target peak, qualify the data as rejected (R).
5. If results have not been properly corrected for distinquishable interfering radionuclide peaks,
   qualify the data as rejected (R).

Remarks:

XIII. Tentatively Identified Radionuclides (gamma spectroscopy)

Each sample tentatively identified radionuclide energy must be within 2 keV of the theoretical peak energy.
Multiple peak radionuclides must exhibit the appropriate peak energies and proportional status.
Tentatively identified radionuclide gamma spectra must match the radionuclide's library spectra.
All peaks greater than 3X the background standard deviation must be identified and quantified.
The observed energy peak(s) for radionuclides of interest must be confirmed as acceptable to theoretical.
Judgments of this data should include: half-life consistencies; sample set consistencies; lab contamination.
Radionuclide values must be consistent with related radionuclides (e.g., parent daughter relationships).

Deviations:

Radionuclide	Deficiency	Samples Affected

Actions:

1. Qualify all tentatively identified radionuclides as estimated (J).
2. If the energy of the tentatively identified radionuclide peak is more than 2 keV from the theoretical energy, use professional judgement to qualify the data.
3. If the reviewer judges anything regarding the identifcation of the tentatively identified radilnuclide as suspect, qualify the data as rejected (R).

Remarks:

XIV. Evaluate System Performance (alpha spec, gamma spec, etc.)

Examples of system performance indicators:

Abrupt, discreet shifts in background or detector response.
High background levels.
Energy calibration shifts.
Extraneous peaks.
Loss of resolution.
Peak tailing or splitting.

Deviations:

Radionuclide/Method	Deficiency	Samples Affected

Actions:

1. Based on the instrument performance indicators, the data reviewer must use professional judgement ot qualify the data.

Remarks:

XV. Analyte Quantitation Check

Original data information should fall within the established calibration range for the analytical run.
Confirm appropriate instrument and manual peak integration.
Confirm calculation of reported results for at least 10% of the data set.

Calculation Check:

Radionuclide:	Method:

Remarks: _____

Calculation Check:

Radionuclide:	Method:

Remarks: _____

XV. Analyte Quantitation Check

Original data information should fall within the established calibration range for the analytical run.
Confirm appropriate instrument and manual peak integration.
Confirm calculation of reported results for at least 10% of the data set.

Calculation Check:

Radionuclide:	Method:

Remarks: _____

Calculation Check:

Radionuclide:	Method:

Remarks: _____

XVI. Overall Assessment of Data

It is appropriate for the data reviewer to make professional judgements and express concerns regarding the validity of the data, overall. This is particularly appropriate when there are several citeria outside the desired specifications. The additive nature of these factors may present data that needs to be further qualified beyond each individual qualification. The reviewer should summarize these concerns.

Actions:

1. Qualified data must be accompanied by all individual reason codes related to the qualification assigned.
2. If the sample result has been qualified for multiple reasons, the reviewer will use professional judgement to determine if multiple estimations warrants rejection (R).

Remarks:

SCIENCE APPLICATIONS INTERNATIONAL CORPORATION
Data Verification/Validation Review

Request for
Missing or Incomplete Laboratory SDG Information

Project: _____

SDG No: _____

Analyte Group: _____

Sample Matrix: _____

Date Requested: _____

Requested Missing or Incomplete Information:

_____

_____

_____

_____

_____

_____

_____

_____

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_____

Response Date: _____

Response:

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SCIENCE APPLICATIONS INTERNATIONAL CORPORATION

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Manual Name: **Quality Assurance Technical Procedures Volume I: Data Management**

Document Number: TP-DM-300-10

Revision Number: **2**

Date Printed: _____

Person Checking the Revision Number: _____

SCIENCE APPLICATIONS INTERNATIONAL CORPORATION DATA MANAGEMENT TECHNICAL PROCEDURE			
Title: Analytical Laboratory Interface			
Procedure No: TP-DM-300-10	**Revision: 2**	**Date: 5/26/2006**	**Page 1 of 11**
Business Unit General Manager: Date: Robert Bleier 6/8/2006		**QA/QC Officer: Date:** C. D. Conard 5/26/2006	

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1.0 PURPOSE

The purpose of this procedure is to define the information and tasks required for effective interface with the analytical laboratory subcontracted for an environmental project.

2.0 SCOPE

This procedure applies to an environmental project only as project requirements dictate. Analytical laboratory interface can therefore include none of, portions of, or all of this procedure.

3.0 REFERENCES AND DEFINITIONS

3.1 REFERENCES

3.1.1 See common references at the front of the Data Management Manual.

3.1.2 Science Applications International Corporation Quality Assurance Administrative Procedure (SAIC QAAP) 16.1, Corrective Action.

3.1.3 Science Applications International Corporation Field Standard Operating Procedure (SAIC FSOP) FTP-1220, Documenting and Controlling Field Changes to Approved Work Plans.

3.1.4 Science Applications International Corporation Quality Assurance Administrative Procedure (SAIC QAAP) 17.1, Records Management.

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3.1.5 Science Applications International Corporation Quality Assurance Administrative Procedure (SAIC QAAP) 15.1, Control of Nonconforming Items and Services.

3.2 DEFINITIONS

3.2.1 Data Quality Objectives (DQO) - Qualitative and quantitative statements derived from the DQO Process that clarify study technical and quality objectives, define the appropriate type of data, and specify tolerable levels of potential decision errors that will be used as the basis for establishing the quality and quantity of data needed to support decisions.

3.2.2 Statement of work (SOW)- The technical requirements of a contract.

3.2.3 Mobilization- The phase of the environmental project where materials and equipment are accumulated and preparations made to begin sampling.

3.2.4 Preservative- A physical or chemical measure applied to an environmental sample in order to ensure a representative sample (i.e. refrigeration, addition of acid, etc.).

3.2.5 Field Change Order (FCO)- the documentation of a change to an approved project-governing document. This can apply to in-field sampling or analysis activities, analytical procedures, or project operational activities.

3.2.6 SAIC Environmental Information Management System (SEIMS)- A system of relational databases which SAIC employs to manage environmental information.

3.2.7 Turn-around-time- The length of time from the date of laboratory receipt of the last sample in a delivery group to the time SAIC receives all data associated with that delivery group.

3.2.8 Residual Sample Portion- The portion of sample remaining after analysis.

3.2.9 Analytical Holding Time- The elapsed time between sample collection and sample extraction, digestion, or analysis.

4.0 RESPONSIBILITIES

4.1 See common responsibilities at the front of the Data Management Manual.

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4.2 PROGRAM AND/OR PROJECT MANAGER

In addition to the common responsibilies the Program or Project Manager is responsible for developing project analytical needs / DQOs with the Project Chemist, in association with the client, the client's SOW, the project Work Plan, Sampling and Analysis Plan (SAP), and Quality Assurance Project Plan (QAPjP).

4.3 PROJECT PROCUREMENT OFFICER

The Project Procurement Officer is responsible for obtaining prices from potential analytical subcontract laboratories, as identified by the Project Chemist, and awarding analytical subcontractors and modifications at the chemist's request. The Procurement Officer also supports the Project Chemist in relevant laboratory interface.

4.4 ANALYTICAL LABORATORY COORDINATOR

The Analytical Laboratory Coordinator is responsible for coordinating all analytical laboratories and projects subcontracting with analytical laboratories. R

4.5 PROJECT CHEMIST

The Project Chemist is responsible for the effective application of this procedure as part of the analytical contribution to the project. Additionally, the Project Chemist is responsible for interfacing with the Analytical Laboratory Coordinator and other analytical chemists who are supporting environmental projects, as part of SAIC analytical laboratory oversight. R

5.0 GENERAL

5.1 The final product of the environmental field investigation is analytical data. Therefore, it is crucial to the investigation that an experienced analytical chemist be involved during each step of the investigation.

5.2 A portion of this support involves professional judgement and experience in the resolution of issues and questions. The variety of such issues and judgements cannot be predicted or covered in a procedure and therefore are not included in the scope of this document.

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5.3 General concepts related to analytical chemistry environmental project support are described within the context of this document.

6.0 PROCEDURE

6.1 PLANNING PHASE

During the planning phase of an environmental investigation, DQOs are established for the project; governing documents (FSP, QAPjP, etc.) are written based on such DQOs; analytical SOWs are written; and price quotes are obtained from qualified analytical laboratories.

6.1.1 The Project Chemist assists in the development of project DQOs, and in the selection of sample populations, analytical methods, QC samples, analytical criteria, and data verification/ validation protocols.

6.1.2 The Project Chemist assists in writing/ reviewing project planning documents (or portions of documents) such as the Quality Assurance Project Plan (QAPjP) and/ or Field Sampling Plan (FSP).

6.1.3 The Project Chemist prepares analytical laboratory Statement(s) of Work (SOW).

6.1.4 The Project Chemist then interfaces with the Analytical Laboratory Coordinator and Project Procurement Officer to request quotations from appropriate laboratories. R

6.1.5 The Project Chemist responds to questions/ issues raised by responding laboratories, modifies the SOW(s) where necessary, and works with the Project Procurement Officer to finalize project specific analytical cost quotations.

6.2 MOBILIZATION PHASE

In order to ensure the success of the environmental investigation, a great deal of effort is expanded during the mobilization phase of the project. Individual tasks completed during this period include readiness review, project team training, analytical laboratory procurement, assembly of materials and equipment, and prepopulation of the project database. In addition to such definitive activities, the Project Chemist is involved in the resolution of daily, project-specific issues which arise. These might include the resolution of questions posed by SAICs client, selected subcontract laboratory, or confirmation of laboratory status.

6.2.1 The Project Chemist should attend all project readiness reviews in order to respond to issues relative to the subcontract laboratory(ies) and project analytical requests/ data. The Project Chemist prepares documentation to submit during the review(s) to support responses.

6.2.2 The Project Chemist develops, evaluates, and selects in-field analytical methods and procedures.

6.2.3 The Project Chemist provides training to the project field team as appropriate and as requested by the Project Manager. This might include sample handling and preservation training or other training relevant to project-specific analytical in-field analysis (e.g., field gas chromatography, field test kits, field monitoring devices).

6.2.4 Analytical laboratory responses and quotations are evaluated by the Project Chemist, and a primary and back-up laboratory for project analytical support is identified. The chemist then assists the Project Procurement Officer in awarding the subcontract by providing the following information:

a) Technical Evaluation Memorandum (identifying the primary laboratory and the reason for this selection, outlining changes and additions which may have been made to the laboratory SOW, and requesting the subcontract award);

b) Ensuring that procurement process is initiated and finalized.

6.2.5 Project support items required from the analytical laboratory or related to the analytical process are identified during this phase. Items required of the laboratory might include sample containers, coolers, preservative, etc. A request should be submitted to the laboratory (Attachment 1) which details the requirements for support items (quantity, concentration, shipping address, etc.). Items related to the analytical process which are not required of the analytical subcontract laboratory are procured as "other direct costs" (ODCs). R

6.2.6 During the mobilization phase, the Project Chemist documents the provision of controlled copies of project governing documents to all analytical subcontract laboratories. At a minimum, these documents include the project Work Plan, FSAP, and QAPjP. In addition, SAIC Administrative Procedures

such as Nonconformances (NCR) and Corrective Action Report (CAR) SOPs are included. R

6.2.7 An analytical kick-off meeting is held with each subcontracted analytical laboratory during this phase of the project for the purpose of clarifying expectations of the analytical laboratory and discussing questions, logistics, etc. This meeting may be held via tele-conference if a personal meeting is not feasible due to the location of an analytical laboratory.

An agenda for this meeting, including relevant attachments such as a list of expected hardcopy deliverables, electronic disk deliverable format, monthly progress report format, etc. is included as Attachment 2. SAIC requires that each subcontracted analytical laboratory receive documented training in SAIC NCR and CAR procedures. This training can take place as part of the kick-off meeting. R

Following each laboratory kick-off meeting, the Project Chemist provides a follow-up memorandum to each participant, as well as the project file (if applicable), SAIC Central Records Facility (CRF), and other interested parties. The follow-up memorandum documents the resolution of any questions posed during the meeting, identifies all analytical action items required, and initiates a modification to the analytical subcontract, if necessary.

The Project Chemist interfaces with the project Procurement Officer to determine the necessity of a modification to the analytical subcontract(s) based on the analytical kick-off meeting. Examples of items requiring such a measure include a change to methods, detection limits, or turn-around-times. A modification to the analytical subcontract requires a memorandum detailing the changes and a purchase requisition.

Any such change to a subcontract agreement which does not follow a project governing document requires a field change order if the governing document is a final, approved document.

6.3 SAMPLING PHASE

During the sampling phase, the Project Chemist interfaces with the field sampling team and analytical support laboratory. In addition, the Project Chemist monitors the receipt of data, provides support to data verification/ validation staff, and approves laboratory invoices.

6.3.1 The Project Chemist notifies the analytical subcontract laboratory(ies) when sampling begins, and when to expect the initial sample shipments. If the laboratory is not experienced in meeting SAIC requirements, close attention should be paid to the laboratory's initial interface with the SAIC Data Coordinator. The attainment of a successful overall laboratory interface (including that of the Data Coordinator, NCR Coordinator, etc.) is the responsibility of the Project Chemist and will therefore be monitored appropriately.

6.3.2 Questions and issues raised during the sampling phase of the investigation will be investigated and resolved. The Project Chemist documents the resolution of such issues using memoranda, letters, FCOs, NCRs, CARs, etc. and copies the project file in each correspondence.

6.3.3 The Project Chemist interfaces with the laboratory to monitor and ensure the timely receipt of data. The due date of each data package is communicated to the laboratory. If the laboratory requests an extended turn-around-time for a given package, and this will not impact SAICs project deadlines for deliverables to their client, such an extension may be negotiated and formalized via a modification to the analytical subcontract.

6.3.4 The Project Chemist communicates laboratory subcontract requirements and other relevant information to data verification/ validation staff. Then, as data are received, the Project Chemist interfaces with data verification/ validation staff so as to maintain an overall knowledge of data quality, laboratory problems, etc. When necessary, the Project Chemist communicates with the laboratory to resolve problems with analytical data. An example of this would be the repeated poor tune of a given instrument, which causes qualification of data during validation.

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6.3.5 The Project Chemist approves laboratory invoices, imposing contract penalties (such as late deliverables) according to the analytical subcontract, and then routes invoices to the SAIC project manager for approval.

6.3.6 If funded, a site-visit to or performance audit of the analytical subcontract laboratory(ies) should be performed. This opportunity enhances communication of project needs, documents evaluation of project performance, and resolves data quality issues.

6.4 REPORTING PHASE

During the reporting phase, the Project Chemist performs a Data Quality Assessment (DQA) for the project.

6.4.1 The Project Chemist performs an assessment of project data quality, and provides data usability guidance to end users.

6.4.2 The Project Chemist assists the Project Manager in identifying and/ or designing appropriate reports necessary to meet the client's needs, focusing on appropriate use of project data.

6.4.3 Upon review of the data, the Project Chemist interfaces with the client and subcontract laboratory(ies) for the return and/ or disposal of residual sample portions (if necessary).

7.0 RECORDS

Documentation generated as a result of this procedure is submitted to the identified records system, in accordance with section 17 of the E&IBU QAP.

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8.0 ATTACHMENTS

8.1 Attachment I- Example Request for Containers

8.2 Attachment II- Example Laboratory Kick-off Meeting Agenda

Attachment I
Example Request for Containers

November 29, 1995

Mr. John Reynolds, Laboratory Project Manager
Quanterra Environmental Services
5815 Middlebrook Pike
Knoxville TN 37921

Dear John:

The purpose of this letter is to notify Quanterra phase II of the Nike Oxford Remedial Investigation is scheduled to begin on or around December 4, 1995.

This final phase of the project will involve 13 soil borings as well as the installation and sampling of three groundwater monitoring wells.

A total of 44 soil samples and duplicates, and 23 aqueous and field QC samples are expected to be collected. All samples will be analyzed for volatile organic compounds, semivolatile organic compounds, and RCRA metals. Two field blank samples will also be analyzed for TPH and Oil and Grease.

Attached please find a summary of supplies required to support this phase of the investigation. These materials are to be shipped to the following address for arrival on or before December 4, 1995.

SAIC
Attention: Martha Cramer/ Nike RI
4031 Colonel Glenn Highway
Suite 300
Beavercreek OH 45431-1600

Please note that substitution of containers is not acceptable.

Thank you for your support,

Sincerely,

SCIENCE APPLICATIONS INTERNATIONAL CORPORATION

Tami L. Barrett
Nike RI Project Chemist

cc:
SAIC Central Records Facility
Nike Project File
Will Kegley
Martha Cramer

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Attachment I- continued

Pre-Sampling Support Requirements for the SAIC Nike Remedial Investigation, Phase II

Item	Preservative/other requirements	Quantity
125 mL widemouth glass jar	Certificate of Analysis for VOAs	150
250 mL widemouth glass jar	Certificate of Analysis for SVOAs and Metals	95
40 mL VOA vial with Teflon septum	•Certificate of Analysis for VOAs in the container •pre-preserved with HCl •Certificate of Analysis for VOAs in the HCl	10
1 L Amber glass bottle	Certificate of Analysis for SVOAs	10
1 L poly bottle	•Certificate of Analysis for metals in container •2 mL ampules 70% HNO3 •Certificate of Analysis for metals in HNO3	10
1 L amber glass bottle	•Certificate of Analysis for Diesel Range Organics •1 mL ampules of HCl	2
1 L amber glass bottle	•Certificate of Analysis for Oil and Grease (or related parameters) in containers •2 mL ampules 48% H2SO4 •Certificate of Analysis for Oil and Grease (or related parameters) in H2SO4	2
Trip Blanks	•analyte-free •zero headspace •no bubbles •clearly labelled with container Lot number exposed	18 (x 2 vials each = 36)
Temperature Blanks	plastic containers filled with water	1/cooler

Attachment II
Example Laboratory Kick-off Meeting Agenda

Agenda for the SAIC Project Kick-off Meeting Analytical Laboratory Support for Nike/Oxford RI Thursday, August 3, 1995 10 o'clock a.m.

Quanterra Nike Project Team
John Reynolds, Project Manager
Bruce Wagner, Laboratory Manager
Chris Rigell, Quality Assurance Manager
Kerry Klemm, Sample Receiving Manager

SAIC Nike Laboratory Interface/ Date Management Project Team
Tami Barrett, Project Chemist
Teresa Yearwood, Data Coordinator
Dan Land, Data Base Administrator
Susan Abston, Field Operations Manager
Tammy Pickens, ADNCR Coordinator

I. Project Overview
Reference documents:

Nike Project Specific Laboratory Scope of Work
Nike Project Sampling and Analysis Plan
SAIC Analytical Data Nonconformance Report SOP
SAIC Corrective Action Report SOP

A. Introduction of Project Team
1. Contacts and addresses (See Attachment 1)

B. Project Description
1. Sample numbers and types (See Attachment 2)
2. Expected start and end date

II. Laboratory Pre-Sampling support

III. Laboratory Sample Receipt
A. Frequency and schedule of sample shipments
B. Sample Receipt and sample receipt reports (See Attachment 1)
C. SDGs and Turn around time (See Attachment 1)
D. Immediate reporting of problems (See Attachment 1)

IV. Laboratory Analysis
A. MS/MSD or MS/Dup
B. Analytical methods (See Attachment 3)
C. Analytical Quantitation Limits (See Attachment 3)
D. Monthly Progress Reports

V. Wrap-up
A. Identify follow-up actions required and assign responsibilities

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FTP-235	Soil Gas Sampling
FTP-370	Water Level Measurement
FTP-376	Aquifer Testing by Slug Test Method
FTP-400	Equipment Decontamination
FTP-525	Soil Sampling using an Auger
FTP-577	Water Sampling using a Dipper
FTP-600	Groundwater Sampling using a Bailer
FTP-625	Chain-of-Custody
FTP-650	Labeling, Packaging, and Shipping of Environmental Field Samples
FTP-750	Field Measurement: Operation of Organic Vapor Detectors
FTP-752	Field Measurement: Combustible Gas Detection
FTP-880	Field Measurement: pH, Temperature, Salinity, and Conductivity
FTP-910	Field Measurement: Turbidity
FTP-955	Field Measurement: Dissolved Oxygen
FTP-1215	Field Logbooks and Field Forms
TP-DM 300-2	Data Entry
TP-DM 300-6	Data Package Receipt and Verification
TP-DM 300-7	Data Validation
TP-DM 300-10	Analytical Laboratory Interface

APPENDIX B

TestAmerica Laboratory Quality Assurance Manual

Cover Page:

Quality Assurance Manual

TestAmerica Pittsburgh
301 Alpha Drive
Pittsburgh, PA 15238
Phone No. 412-963-7058
Fax No. 412-963-2468

www.testamericainc.com

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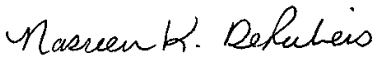
Quality Assurance Manual
Approval Signatures

02/04/09

Laboratory Director – Larry Matko — Date



01/28/09

Quality Assurance Manager - Nasreen K. DeRubeis — Date

01/29/09

Health and Safety Coordinator – Steve Jackson — Date

02/05/09

Technical Supervisor – **(Organics)** – Sharon Bacha — Date

02/05/09

Technical Supervisor – **(Metals)** – Bill Reinheimer — Date

02/03/09

Technical Supervisor - **(Wet Chemistry)** – Mike Wesoloski — Date

02/04/09

Director of Project Management – David Dunlap — Date

01/31/09

General Manager – Albert F. Vicinie

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SECTION 2

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REFERENCED CORPORATE SOPs AND POLICIES

SOP / Policy Reference	Title
CA-Q-S-001	Solvent and Acid Lot Testing and Approval
CA-Q-S-002	Acceptable Manual Integration Practices
CA-Q-S-004	Method Compliance & Data Authenticity Audits
CA-Q-S-006	Detection Limits
CW-Q-S-001	Corporate Document Control and Archiving
CW-Q-S-002	Writing a Standard Operating Procedure (SOPs)
CA-L-S-001	Internal Investigation of Potential Data Discrepancies and Determination for Data Recall
CA-L-S-002	Subcontracting Procedures
CA-L-P-001	Ethics Policy
CA-L-P-002	Contract Compliance Policy
CW-F-P-002	Authorization Matrix
CW-F-P-004	Procurement and Contracts Policy
CA-C-S-001	Work Sharing Process
CA-T-P-001	Qualified Products List
CW-F-S-007	Controlled Purchases Policy
CW-F-S-018	Vendor Selection
CA-Q-M-002	Corporate Quality Management Plan
CW-E-M-001	Corporate Environmental Health & Safety Manual

REFERENCED LABORATORY SOPs

SOP Reference	Title
PT-QA-001	Employee Orientation and Training (DOCs) (Sec. 17.3) & (Sec. 19.4.2)
PT-QA-002	Statistical Evaluation of Data and Development of Control Charts
PT-QA-005	Uncertainty Measurement
PT-QA-006	Procurement of Standards and Materials; Labeling and Traceability
PT-QA-007	Determination of Method Detection Limits (MDLs) (Sec. 19.7)
PT-QA-008	Temperature Monitoring of Refrigerated Areas and Ovens
PT-QA-010	Preparation and Management of Standard Operating Procedures (SOPs) and Other Controlled Documents (Sec. 3.4.1) & (Sec. 19.2)
PT-QA-012	Balance and Weight Calibration
PT-QA-013	Thermometer Calibration and Record Keeping
PT-QA-016	Nonconformance and Corrective Action System (Sec .10.1)
PT-QA-017	Pipette Calibration
PT-QA-019	Records Information Management
PT-QA-020	Report Production (Sec. 14.1.4)
PT-QA-021	Quality Control Requirements
PT-QA-024	Subsampling (22.5)
PT-QA-025	DoD QSM Version 3 Requirements
PT-QA-027	Sample Receiving and Chain of Custody (Sec. 23.2.1.3)
PT-QA-028	Bottle and Cooler Preparation
PT-IT-W-001	Servers Data Back-up and Computer Systems Security (Sec. 19.14.1)

SECTION 3

INTRODUCTION *(NELAC 5.1 - 5.3)*

3.1 INTRODUCTION AND COMPLIANCE REFERENCES

TestAmerica Pittsburgh'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 2003 National Environmental Laboratory Accreditation Conference (NELAC) standards and ISO/IEC Guide 17025 (1999). 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.

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

- EPA 600/4-88/039, *Methods for the Determination of Organic Compounds in Drinking Water,* EPA, Revised July 1991.
- EPA 600/R-95/131, *Methods for the Determination of Organic Compounds in Drinking Water,* Supplement III, EPA, August 1995.
- EPA 600/4-79-019, *Handbook for Analytical Quality Control in Water and Wastewater Laboratories,* EPA, March 1979.
- EPA SW-846, *Test Methods for the Evaluation of Solid Waste, 3rd Edition,* September 1986; Update I, July 1992; Update II, September 1994; and Update III, December 1996.
- Federal Register, 40 CFR Parts 136, 141, 172, 173, 178, 179 and 261.
- USEPA Contract Laboratory Program. *Statement of Work for Inorganics Analysis. Multi-Media, Multi-Concentration*. Document ILM04.0.
- USEPA Contract Laboratory Program. *Statement of Work for Organics Analysis. Multi-Media, Multi-Concentration.* Document Number OLMO3.1, August 1994.
- APHA, *Standard Methods for the Examination of Water and Wastewater,* 18th Edition, 19th, 20th and 21st Edition.
- *U.S. Department of Energy* Order 414.1B, *Quality Assurance*, Approved April 29, 2004.
- *U.S. Department of Energy*, *Quality Systems for Analytical Services*, Revision 2.1, November 2005.
- U.S. Department of Defense, *Quality Systems Manual for Environmental Laboratories*, Final Version 3, January 2006.
- U.S. Department of Defense, *Air Force Center for Environmental Excellence Quality Assurance Project Plan(QAPP),* Version 4.0.02, May 2006.
- Nuclear Regulatory Commission (NRC) quality assurance requirements.

- Marine Protection, Research, and Sanctuaries Act (MPRSA).
- 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,soils and tissue. 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 process, reviewing results, servicing clients and tracking samples through the laboratory. The technical and service requirements of all requests to provide analyses 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 in Tables 3-1-3-6. The approach of this manual is to define the minimum level of quality assurance and quality control necessary to meet 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/Manager and the Quality Assurance (QA) Manager. In some cases, QAPPs and DQOs may specify less stringent requirements. The Laboratory Director/Manager and the QA Manager must determine if it is in the lab's best interest to follow the less stringent requirements.

3.3.1 Specialty Analyses

3.3.1.1 Dredged Material Evaluations

TestAmerica Pittsburgh offers trace level testing of waters (site-waters and elutriates), sediments, and tissues in support of Dredged Material Evaluations for in-water (ocean and

inland waters) and upland (Confined Disposal Facilities (CDFs), beneficial use, etc.) disposal options. In-house capabilities for commonly requested sediment program parameters include:

- Organochlorine Pesticides
- Organophosphorus Pesticides
- PCBs (as Aroclors)
- Volatile Organics
- Semivolatile Organics
- Polynuclear Aromatic Hydrocarbons (PAHs)
- Metals
- Cyanide
- Total Sulfides
- Acid Volatile Sulfide (AVS) and Simultaneously Extracted Metals (SEM)
- Nitrogen, Ammonia
- Nitrogen, Nitrate + Nitrite
- Biochemical Oxygen Demand (BOD)
- Chemical Oxygen Demand (COD)
- Total Organic Carbon (combustion procedure for sediments)
- Total Solids/Moisture Content
- Total Volatile Solids
- Lipids

With teaming arrangements with other TestAmerica facilities, additional sediment program capabilities include:

- Polychlorinated Dibenzo-Dioxins and Furans (PCDDs/PCDFs)
- Butyl Tins (mono – tetra)
- Total Kjeldahl Nitrogen
- Total Phosphorus
- Grain Size
- Specific Gravity
- Atterberg Limits
- PCBs (as Congeners)

TestAmerica Pittsburgh also generates elutriate samples following appropriate U.S. Army Corps of Engineers procedures. These include:

- Standard Elutriate Test (SET) for in-water disposal evaluations, and
- Modified Elutriate Test (MET) or Effluent Elutriate Test (EET) for CDF disposal evaluations.
- Illinois Resuspension Tests (Supernatant and Elutriate Tests).
- Dredge Elutriate Test (DRET)

TestAmerica Pittsburgh currently supports dredge material evaluation projects following several state specific programs, as well as, under the following guidance documents:

- Ocean Testing Manual or OTM (USACE, 1991).
- New Jersey's Tidal Waters Technical Manual (NJDEP, 1997).
- Inland Testing Manual or ITM (USACE, 1998).
- Upland Testing Manual or UTM (USACE, 2003).

3.3.1.2 Tissue Analyses

TestAmerica Pittsburgh has extensive experience in supporting projects requiring tissue analyses. These include analyses of laboratory cultured reference species from bioaccumulation tests associated with dredged material evaluations to a variety of field collected species (aquatic and terrestrial). TestAmerica Pittsburgh has developed modifications to the standard solid methodologies (where possible) to allow for the use of smaller sample weights and achieve lower quantitation limits. In-house capabilities for commonly requested tissue parameters include:

- Organochlorine Pesticides
- PCBs (as Aroclors)
- Semivolatile Organics
- Polynuclear Aromatic Hydrocarbons (PAHs)
- Metals
- Lipids
- Moisture Content

With teaming arrangements with other TestAmerica facilities, additional tissue capabilities include:

- Polychlorinated Dibenzo-Dioxins and Furans (PCDDs/PCDFs)
- Butyl Tins (mono – tetra)
- PCBs (as Congeners

3.4 MANAGEMENT OF THE MANUAL

3.4.1 Review Process

This manual is reviewed annually 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. PT-QA-010).

Laboratory-specific QAM changes are approved and documented through the periodic and annual reviews as per SOP No. PT-QA-010, Preparation and Management of Standard Operating Procedures (SOPs) and Other Controlled Documents.

Table 3-1

Wet Chemistry Methods

Analytical Parameters	Matrix	Fields of Testing		
		CWA/NPDES	RCRA (SW846)	Other
Acidity	Water	SM 2310B (4a)	---	---
	Waste	---	---	---
Alkalinity	Water	2320B	---	---
	Waste	---	---	---
Biochemical Oxygen Demand (plus CBOD)	Water	EPA 405.1 5210B	---	---
Bromide	Water	EPA 300.0	SW 9056A	---
	Waste	---	SW 9056A	---
	Solid	---	SW 9056A	---
Chemical Oxygen Demand	Water	EPA 410.4	---	---
	Solid	EPA 410.4 (M)	---	---
Chloride	Water	EPA 300.0 SM 4500 CL E	SW 9056A	---
	Waste	---	SW 9056A	---
	Solid	---	SW 9056A	---
Chromium, Hexavalent	Water	SM 3500-Cr-B (SM 20)	SW 7196A/ 6800	---
	Waste	---	SW 3060A/7196A/6800	---
	Solid	---	SW 3060A/7196A	---
Color	Water	SM 2120B	---	---
	Waste	---	---	---
	Solid	---	---	---
Specific Conductance	Water	EPA 120.1	SW 9050A	---
	Waste	EPA 120.1	SW 9050A	---
Cyanide (Total)	Water	EPA 335.4	SW 9012A	ILM04.0/ILM04.1
	Waste	EPA 335.4	SW 9012A	ILM04.0/ILM04.1
	Solid	---	SW 9012A	ILM04.0/ILM04.1
Cyanide (Available)	Water	EPA 1677	---	---

Table 3-1

Wet Chemistry Methods

Analytical Parameters	Matrix	Fields of Testing		
		CWA/NPDES	**RCRA (SW846)**	**Other**
	Waste	EPA 1677	9013 Extraction	---
	Solid	EPA 1677	9013 Extraction	---
Fluoride	Water	EPA 300.0 SM 4500 F C	SW 9056A	---
	Waste	EPA 300.0 (M) SM 4500 F C (M)	SW 9056A	---
	Solid	--	SW 9056A	---
Ignitability (Flashpoint)	Water	---	SW 1010A/ 1020B	---
	Waste	---	SW 7.1.2 SW 1010A/ 1020B	---
Hardness	Water	SM2340 B & C	---	---
Moisture	Solid	---	SW 160.3 (M) SM 2540 G	CLP
Nitrogen, Ammonia	Water	EPA 350.1	---	---
	Waste	EPA 350.1 (M)	---	---
	Solid	EPA 350.1 (M)	---	---
Nitrite (NO_2)	Water	EPA 300.0 EPA 353.2	SW 9056A	---
	Waste	---	SW 9056A	---
	Solid	EPA 300.0 (M) EPA 353.2 (M)	SW 9056A	---
Nitrate (NO_3)	Water	EPA 300.0	SW 9056A	---
	Waste	---	SW 9056A	---
	Solid	EPA 300.0 (M)	SW 9056A	---
Nitrate plus Nitrite	Water	EPA 353.2	SW 9056A	---
	Waste	---	SW 9056A	
	Solid	EPA 353.2 (M)	SW 9056A	---

Table 3-1

Wet Chemistry Methods

Analytical Parameters	Matrix	Fields of Testing		
		CWA/NPDES	RCRA (SW846)	Other
Oil and Grease & NPM	Water	EPA 1664A	SW 9070A	---
HEM / HEM-SGT	Waste	EPA 1664A	SW 9070A	---
	Solid	---	SW 9071B	---
Ortho-phosphate O-PO_4	Water	EPA 300.0	SW 9056A	---
	Waste	EPA 300.0 (M)	SW 9056A	---
	Solid	--	SW 9056A	---
Paint Filter Liquids Test	Water	---	---	---
	Waste	---	SW 9095B	---
	Solid	---	---	---
pH	Water	SM 4500-H^+B	SW 9040C	---
	Waste	---	SW 9045D	---
	Solid	---	SW 9045D	---
Phenolics	Water	EPA 420.1 EPA 420.4	SW 9065 SW 9066	---
	Waste	---	SW 9065 SW 9066	---
	Solid	---	SW 9065 SW 9066	---
Sulfate (SO_4)	Water	EPA 300.0	SW 9056A	---
	Waste	EPA 300.0 (M)	SW 9056A	---
	Solid	--	SW 9056A	---
Sulfide	Water	SM 4500 S^{-2} F	SW 9034	---
	Solid	---	SW 9030B/9034	---
Total Organic and Inorganic Carbon (TOC & TIC)	Water	SM 5310 B	SW 9060A	---

Table 3-1

Wet Chemistry Methods

Analytical Parameters	Matrix	Fields of Testing		
		CWA/NPDES	RCRA (SW846)	Other
	Waste	---	---	---
	Solid	---	Walkley-Black	Lloyd Khan
Total Petroleum Hydro-carbons	Water	EPA 1664 (SGT-HEM)	9070A	---
	Waste	EPA 1664 (SGT-HEM)	9071B	---
	Solid	EPA 1664 (SGT-HEM)	9071B	---
Total Solids	Water	SM 2540 B	---	---
	Waste	SM 2540 B	---	---
	Solid	---	---	SM 2540 G (%)
Total Dissolved Solids (Residue, Filterable)	Water	SM 2540 C	---	---
Total Suspended Solids (Non-filterable)	Water	SM 2540 D	---	---
Total Volatile Solids	Solid	EPA 160.4	---	SM 2540 G (%)
Volatile Suspended Solids	Water	EPA 160.4	---	SM 2540 E
Settleable Solids	Water	SM 2540 F	---	---

Key to Table
M Indicates a DI leach procedure is performed prior to analysis.

Table 3-2

Methods for Mercury by Cold Vapor Atomic Absorption

Analytical Parameters	Matrix	Fields of Testing		
		CWA/NPDES	RCRA (SW846)	Other
Mercury	Water	EPA 245.1	EPA 7470A	ILM04.0/ILM04.1
	TCLP Leachate	---	EPA 7470A	---
	Waste	---	EPA 7471A	ILM04.0/ILM04.1
	Solid	---	EPA 7471A	ILM04.0/ILM04.1

Table 3-3

Methods for Metals by ICP & ICPMS

Analytical Parameters	Matrix	Fields of Testing		
		CWA/NPDES	RCRA (SW846)	Other
Aluminum	Water	EPA 200.7/200.8	EPA 6010B/6020	ILM04.0/ILM04.1/ILM05.2
	Waste	---	EPA 6010B/6020	ILM04.0/ILM04.1/ILM05.2
	Solid	---	EPA 6010B/6020	ILM04.0/ILM04.1/ILM05.2
Antimony	Water	EPA 200.7/200.8	EPA 6010B/6020	ILM04.0/ILM04.1/ILM05.2
	Waste	---	EPA 6010B/6020	ILM04.0/ILM04.1/ILM05.2
	Solid	---	EPA 6010B/6020	ILM04.0/ILM04.1/ILM05.2
Arsenic	Water	EPA 200.7/200.8	EPA 6010B/6020	ILM04.0/ILM04.1/ILM05.2
	Waste	---	EPA 6010B/6020	ILM04.0/ILM04.1/ILM05.2
	Solid	---	EPA 6010B/6020	ILM04.0/ILM04.1/ILM05.2
Barium	Water	EPA 200.7/200.8	EPA 6010B/6020	ILM04.0/ILM04.1/ILM05.2

Table 3-3

Methods for Metals by ICP & ICPMS

Analytical Parameters	Matrix	Fields of Testing		
		CWA/NPDES	RCRA (SW846)	Other
	Waste	---	EPA 6010B/6020	ILM04.0/ILM04.1/ILM05.2
	Solid	---	EPA 6010B/6020	ILM04.0/ILM04.1/ILM05.2
Beryllium	Water	EPA 200.7/200.8	EPA 6010B/6020	ILM04.0/ILM04.1/ILM05.2
	Waste	---	EPA 6010B/6020	ILM04.0/ILM04.1/ILM05.2
	Solid	---	EPA 6010B/6020	ILM04.0/ILM04.1/ILM05.2
Boron	Water	EPA 200.7/200.8	EPA 6010B/6020	ILM04.0/ILM04.1/ILM05.2
	Waste	---	EPA 6010B/6020	ILM04.0/ILM04.1/ILM05.2
	Solid	---	EPA 6010B/6020	ILM04.0/ILM04.1/ILM05.2
Calcium	Water	EPA 200.7/200.8	EPA 6010B/6020	ILM04.0/ILM04.1/ILM05.2
	Waste	---	EPA 6010B/6020	ILM04.0/ILM04.1/ILM05.2
	Solid	---	EPA 6010B/6020	ILM04.0/ILM04.1/ILM05.2
Cadmium	Water	EPA 200.7/200.8	EPA 6010B/6020	ILM04.0/ILM04.1/ILM05.2
	Waste	---	EPA 6010B/6020	ILM04.0/ILM04.1/ILM05.2
	Solid	---	EPA 6010B/6020	ILM04.0/ILM04.1/ILM05.2
Cobalt	Water	EPA 200.7/200.8	EPA 6010B/6020	ILM04.0/ILM04.1/ILM05.2
	Waste	---	EPA 6010B/6020	ILM04.0/ILM04.1/ILM05.2
	Solid	---	EPA 6010B/6020	ILM04.0/ILM04.1/ILM05.2

Table 3-3

Methods for Metals by ICP & ICPMS

Analytical Parameters	Matrix	Fields of Testing		
		CWA/NPDES	RCRA (SW846)	Other
Chromium	Water	EPA 200.7/200.8	EPA 6010B/6020	ILM04.0/ILM04.1/ILM05.2
	Waste	---	EPA 6010B/6020	ILM04.0/ILM04.1/ILM05.2
	Solid	---	EPA 6010B/6020	ILM04.0/ILM04.1/ILM05.2
Hexavalent Chromium	Water	---	EPA 6800	---
	Waste	---	---	---
	Solid	---	EPA 6800	---
Copper	Water	EPA 200.7/200.8	EPA 6010B/6020	ILM04.0/ILM04.1/ILM05.2
	Waste	---	EPA 6010B/6020	ILM04.0/ILM04.1/ILM05.2
	Solid	---	EPA 6010B/6020	ILM04.0/ILM04.1/ILM05.2
Cobalt	Water	EPA 200.7/200.8	EPA 6010B/6020	ILM04.0/ILM04.1/ILM05.2
	Waste	---	EPA 6010B/6020	ILM04.0/ILM04.1/ILM05.2
	Solid	---	EPA 6010B/6020	ILM04.0/ILM04.1/ILM05.2
Iron	Water	EPA 200.7/200.8	EPA 6010B/6020	ILM04.0/ILM04.1/ILM05.2
	Waste	---	EPA 6010B/6020	ILM04.0/ILM04.1/ILM05.2
	Solid	---	EPA 6010B/6020	ILM04.0/ILM04.1/ILM05.2
Lead	Water	EPA 200.7/200.8	EPA 6010B/6020	ILM04.0/ILM04.1/ILM05.2
	Waste	---	EPA 6010B/6020	ILM04.0/ILM04.1/ILM05.2
	Solid	---	EPA 6010B/6020	ILM04.0/ILM04.1/ILM05.2
Lithium	Water	EPA 200.7	EPA 6010B	---
	Waste	---	EPA 6010B	---
	Solid	---	EPA 6010B	---

Table 3-3

Methods for Metals by ICP & ICPMS

Analytical Parameters	Matrix	Fields of Testing		
		CWA/NPDES	RCRA (SW846)	Other
Magnesium	Water	EPA 200.7/200.8	EPA 6010B/6020	ILM04.0/ILM04.1/ILM05.2
	Waste	---	EPA 6010B/6020	ILM04.0/ILM04.1/ILM05.2
	Solid	---	EPA 6010B/6020	ILM04.0/ILM04.1/ILM05.2
Manganese	Water	EPA 200.7/200.8	EPA 6010B/6020	ILM04.0/ILM04.1/ILM05.2
	Waste	---	EPA 6010B/6020	ILM04.0/ILM04.1/ILM05.2
	Solid	---	EPA 6010B/6020	ILM04.0/ILM04.1/ILM05.2
Molybdenum	Water	EPA 200.7/200.8	EPA 6010B/6020	ILM04.0/ILM04.1/ILM05.2
	Waste	---	EPA 6010B/6020	ILM04.0/ILM04.1/ILM05.2
	Solid	---	EPA 6010B/6020	ILM04.0/ILM04.1/ILM05.2
Nickel	Water	EPA 200.7/200.8	EPA 6010B/6020	ILM04.0/ILM04.1/ILM05.2
	Waste	---	EPA 6010B/6020	ILM04.0/ILM04.1/ILM05.2
	Solid	---	EPA 6010B/6020	ILM04.0/ILM04.1/ILM05.2
Potassium	Water	EPA 200.7/200.8	EPA 6010B/6020	ILM04.0/ILM04.1/ILM05.2
	Waste	---	EPA 6010B/6020	ILM04.0/ILM04.1/ILM05.2
	Solid	---	EPA 6010B/6020	ILM04.0/ILM04.1/ILM05.2
Selenium	Water	EPA 200.7/200.8	EPA 6010B/6020	ILM04.0/ILM04.1/ILM05.2
	Waste	---	EPA 6010B/6020	ILM04.0/ILM04.1/ILM05.2
	Solid	---	EPA 6010B/6020	ILM04.0/ILM04.1/ILM05.2
Silicon	Water	EPA 200.7	EPA 6010B	---

Table 3-3

Methods for Metals by ICP & ICPMS

Analytical Parameters	Matrix	Fields of Testing		
		CWA/NPDES	RCRA (SW846)	Other
	Waste	---	EPA 6010B	---
	Solid	---	EPA 6010B	---
Silver	Water	EPA 200.7/200.8	EPA 6010B/6020	ILM04.0/ILM04.1/ILM05.2
	Waste	---	EPA 6010B/6020	ILM04.0/ILM04.1/ILM05.2
	Solid	---	EPA 6010B/6020	ILM04.0/ILM04.1/ILM05.2
Sodium	Water	EPA 200.7/200.8	EPA 6010B/6020	ILM04.0/ILM04.1/ILM05.2
	Waste	---	EPA 6010B/6020	ILM04.0/ILM04.1/ILM05.2
	Solid	---	EPA 6010B/6020	ILM04.0/ILM04.1/ILM05.2
Strontium	Water	EPA 200.7/200.8	EPA 6010B/6020	ILM04.0/ILM04.1/ILM05.2
	Waste	---	EPA 6010B/6020	ILM04.0/ILM04.1/ILM05.2
	Solid	---	EPA 6010B/6020	ILM04.0/ILM04.1/ILM05.2
Tin	Water	EPA 200.7/200.8	EPA 6010B/6020	ILM04.0/ILM04.1/ILM05.2
	Waste	---	EPA 6010B/6020	ILM04.0/ILM04.1/ILM05.2
	Solid	---	EPA 6010B/6020	ILM04.0/ILM04.1/ILM05.2
Thallium	Water	EPA 200.7/200.8	EPA 6010B/6020	ILM04.0/ILM04.1/ILM05.2
	Waste	---	EPA 6010B/6020	ILM04.0/ILM04.1/ILM05.2
	Solid	---	EPA 6010B/6020	ILM04.0/ILM04.1/ILM05.2
Titanium	Water	EPA 200.7/200.8	EPA 6010B/6020	ILM04.0/ILM04.1/ILM05.2
	Waste	---	EPA 6010B/6020	ILM04.0/ILM04.1/ILM05.2

Table 3-3

Methods for Metals by ICP & ICPMS

Analytical Parameters	Matrix	Fields of Testing		
		CWA/NPDES	RCRA (SW846)	Other
	Solid	---	EPA 6010B/6020	ILM04.0/ILM04.1/ILM05.2
Vanadium	Water	EPA 200.7/200.8	EPA 6010B/6020	ILM04.0/ILM04.1/ILM05.2
	Waste	---	EPA 6010B/6020	ILM04.0/ILM04.1/ILM05.2
	Solid	---	EPA 6010B/6020	ILM04.0/ILM04.1/ILM05.2
Zinc	Water	EPA 200.7/200.8	EPA 6010B/6020	ILM04.0/ILM04.1/ILM05.2
	Waste	---	EPA 6010B/6020	ILM04.0/ILM04.1/ILM05.2
	Solid	---	EPA 6010B/6020	ILM04.0/ILM04.1/ILM05.2

Table 3-4

Metals Sample Preparation Methods

Analytical Parameters	Matrix	Fields of Testing		
		CWA/NPDES	RCRA (SW846)	Other
Toxicity Characteristic Leaching Procedure (TCLP)	Water	---	EPA 1311	---
	Waste	---	EPA 1311	---
	Solid	---	EPA 1311	---
ICP Metals	Water	EPA 200.7	EPA 3005A EPA 3010A	---
	TCLP Leachate	---	EPA 3010A	---

Table 3-4

Metals Sample Preparation Methods

Analytical Parameters	Matrix	Fields of Testing		
		CWA/NPDES	**RCRA (SW846)**	**Other**
	Waste	---	EPA 3050B	---
	Solid	EPA 200.7	EPA 3050B	---
CVAA	Water	EPA 245.1	EPA 7470A	---
	TCLP Leachate	---	EPA 7470A	---
	Waste	---	EPA 7471A	---
	Solid	---	EPA 7471A	
ICPMS	Water	200.8	EPA 3005A EPA 3010A	---
	TCLP Leachate	---	EPA 3010A	---
	Waste	---	EPA 3050B	---
	Solid	---	EPA 3050B/3060A (Cr VI – EPA 6800)	---

Table 3-5

Organic Sample Preparation Methods

Analytical Parameters	Matrix	Fields of Testing		
		CWA/NPDES	**RCRA (SW846)**	**Other**
Volatiles by GC/MS	Water	EPA 624	EPA 5030B	OLM04.2
	TCLP Leachate	---	EPA 5030B	---
	Waste	---	EPA 5030B EPA 5035	OLM04.2
	Solid	---	EPA 5035	OLM04.2
Semivolatiles by GC/MS	Water	EPA 625	EPA 3510C EPA 3520C	OLM04.2
	TCLP Leachate	---	EPA 3510C EPA 3520C	---
	Waste	---	EPA 3550B EPA 3580A	OLM04.2

Table 3-5

Organic Sample Preparation Methods

Analytical Parameters	Matrix	Fields of Testing		
		CWA/NPDES	RCRA (SW846)	Other
	Solid	---	EPA 3550B EPA 3580A	OLM04.2
PAHs by GC/MS/SIM (other analytes are available)	Water	---	EPA 3510C EPA 3520C	---
	Waste	---	EPA 3550B EPA 3580A	---
	Solid	---	EPA 3550B EPA 3580A	---
Pesticides/ PCBs by GC	Water	EPA 608	EPA 3510C EPA 3520C	OLM04.2
	TCLP Leachate	---	EPA 3510C EPA 3520C	---
	Waste	---	EPA 3550B EPA 3580A	OLM04.2
	Solid	---	EPA 3550B	OLM04.2
Pesticides (Organophos-phorus) by GC	Water	---	EPA 3510C EPA 3520C	---
	Waste	---	EPA 3550B EPA 3580A	---
	Solid	---	EPA 3550B	---
PAHs by HPLC	Water	EPA 610	EPA 3510C EPA 3520C	---
	Waste	---	EPA 3550B EPA 3580A	---
	Solid	---	EPA 3550B	---
Herbicides by GC	Water	---	EPA 8151A	---
	TCLP Leachate	---	EPA 8151A	---
	Waste	---	EPA 8151A	---
	Solid	---	EPA 8151A	---

Table 3-6

Organic Analysis Methods

Analytical Parameters		Fields of Testing		
	Matrix	**CWA/NPDES**	**RCRA (SW846)**	**Other**
Volatiles By GC/MS	Water	EPA 624	EPA 8260B	OLM04.2/
	TCLP Leachate	---	EPA 8260B	---
	Waste	---	EPA 8260B	OLM04.2
	Solid	---	EPA 8260B	OLM04.2
Semivolatiles By GC/MS	Water	EPA 625	EPA 8270C	OLM04.2/
	TCLP Leachate	---	EPA 8270C	---
	Waste	---	EPA 8270C	OLM04.2
	Solid	---	EPA 8270C	OLM04.2
PAHs by GC/MS/SIM (other analytes are available)	Water	---	EPA 8270C SIM	---
	Waste	---	EPA 8270C SIM	---
	Solid	---	EPA 8270C SIM	---
Pesticides/ PCBs by GC	Water	EPA 608	Pesticides EPA 8081A PCBs EPA 8082	OLM04.2/
	TCLP Leachate	---	Pesticides EPA 8081A PCBs EPA 8082	---
	Waste	---	Pesticides EPA 8081A EPA PCBs 8082	OLM04.2
	Solid	---	Pesticides EPA 8081A PCBs EPA 8082	OLM04.2
Pesticides (Organophos-phorus) by GC	Water	---	EPA 8141A	---
	Waste	---	EPA 8141A	---
	Solid	---	EPA 8141A	---
PAHs by HPLC	Water	EPA 610	EPA 8310	---
	Waste	---	EPA 8310	---
	Solid	---	EPA 8310	---

Table 3-6

Organic Analysis Methods

Analytical Parameters	Matrix	Fields of Testing		
		CWA/NPDES	RCRA (SW846)	Other
Phenoxyacid Herbicides by GC	Water	---	EPA 8151A	---
	TCLP Leachate	---	EPA 8151A	---
	Waste	---	EPA 8151A	---
	Solid	---	EPA 8151A	---
EDB and DBCP	Water	---	EPA 8011	---
	TCLP Leachate	---	---	---
	Waste	---	---	---
	Solid	---	---	---

SECTION 4

ORGANIZATION AND MANAGEMENT *(NELAC 5.4.1)*

4.1 OVERVIEW

TestAmerica Pittsburgh 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. TestAmerica Pittsburgh has day-to-day independent operational authority overseen by corporate officers (e.g., President, Chief Operating Officer, Corporate Quality Assurance, etc.). The TestAmerica Pittsburgh laboratory operational and support staff work under the direction of the Laboratory Director. The organizational structure for both Corporate & TestAmerica Pittsburgh 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 Quality Assurance Program

The responsibility for quality lies 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 Pittsburgh laboratory.

4.2.2 General Manager (GM)

Each GM reports directly to a COO. Each GM has full responsibility for the overall administrative and operational management of their respective laboratories. The GM's responsibilities include allocation of personnel and resources, long-term planning, setting goals, and achieving the financial, business, and quality objectives of TestAmerica. The GM ensures timely compliance with corporate management directives, policies, and management systems reviews. The GM is 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. The GM serves as the Technical Director for NY-DOH certification.

4.2.3 Laboratory Director / Manager

Pittsburgh's Laboratory Director/Manager is responsible for the overall quality, safety, financial, technical, human resource and service performance of the whole laboratory and reports to their respective GM. The Laboratory Director/Manager provides the resources necessary to

implement and maintain an effective and comprehensive Quality Assurance and Data Integrity Program. The Laboratory Director also serves as the Technical Director.

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 Director 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, the Technical Director(s), Director or Project Management and the Operations Manager as direct reports.
- 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. Interfaces with management on solving day-to-day technical issues.
- 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.
- The Technical Director meets the requirements specified in the Section 4.1.1.1 of the NELAC standards. See Team Leaders for operations specific Technical Supervisors

4.2.4 Quality Assurance (QA) Manager

The QA Manager has responsibility and authority to ensure the continuous implementation of the quality system based on ISO 17025. The QA Manager reports directly to the Laboratory Director and has access to Corporate QA for advice and resources. 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 directs the activities of the QA officers to accomplish specific responsibilities, which include, but are not limited to:

- Maintains, approves, and updates the QAM.
- Has joint signature authority, with the Laboratory Director and Technical Supervisors for approval of quality documents.
- Directs controlled distribution laboratory quality documents.
- Provides Quality System training to all new personnel.
- Reviews and approves documentation of analyst training records.
- Serves as a focal point for QA and QC issues, reviews corrective actions and recommends resolution for recurring nonconformances within the laboratory.
- Monitoring and communicating regulatory changes that may affect the laboratory to management.
- Monitoring and evaluating laboratory certifications; scheduling proficiency testing samples. Maintaining certifications
- Monitors data quality measures via statistical methods to verify that the laboratory routinely meets stated quality goals.
- Hosts external audits conducted by outside agencies.
- Responsible for approving quality control reference data changes in the LIMS.
- Oversees the selection, review, and approval of analytical subcontractors.
- Prepares monthly QA Reports to management describing significant quality events to Laboratory Director and/or Corporate QA.
- Has the final authority to accept or reject data and to stop work in progress in the event that procedures or practices compromise the validity and integrity of analytical data.
- Coordinating, writing, and reviewing preparation of all test methods SOPs, with regard to quality, integrity, regulatory He/she insures that the SOPs are properly managed and adhered to at the bench
- 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.

- 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.
- 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 are temporarily suspended following the procedures outlined in Section 13.
- Coordinating of document control of SOPs, MDLs and control limits.
- Follow-up with audits to ensure client QAPP requirements are met.
- Development of suggestions and recommendations to improve quality systems.
- Research of current state and federal requirements and guidelines.

4.2.5 Quality Assurance Specialist

The QA Scientist is responsible for QA documentation and involvement in the following activities:

- Assist the QA Manager in performing the annual internal laboratory audits, compiling the evaluation, and coordinating the development of an action plan to address any deficiency identified.
- Facilitate external audits, coordinating with the QA Manager and Laboratory Staff to address any deficiencies noted at the time of the audit and subsequently presented in the final audit report.
- Assist the QA Manager in the preparation of new SOP's and in the maintenance of existing SOPs, coordinating annual reviews and updates.
- Manages the performance testing (PT) studies, coordinates follow up studies for failed analytes and works with QA Manager and Laboratory Staff to complete needed corrective action reports.
- Personnel training records review and maintenance.
- Document control maintenance.
- Assists the Quality Manager and Project Management Group in the review of program plans for consistency with organizational and contractual requirements. Summarize and convey to appropriate personnel anomalies or inconsistencies observed in the review process.
- Manages certifications and accreditations.
- Monitors for compliance the following QA Metrics: Temperature Monitoring of refrigeration units and incubators; thermometer calibrations; balance calibrations; eppendorf/pipette calibrations; and proper standard/reagent storage.
- Periodic checks on the proper use and review of instrument logs.

- Initiate Analyst/Data audits and the Mint-miner data file review process for organic instrumentation. Maintain tracking of reviews.
- Assist in the technical review of data packages which require QA review.

4.2.6 LIMS Administrator/IT Team Leader

The LIMS Administrator reports directly to the Laboratory Director. In the pursuit of his/her duties, he/she:

- Establishes and maintains the laboratory information system (LIMS) for tracking all samples in the laboratory.
- Develops expertise in the requirements described in Good Automated Laboratory Practices (GALP)-EPA 2185, 1995 Edition, in order to ensure compliance.
- Develops, programs and tests software modifications/changes.
- Coordinates testing to ensure that all LIMS software accurately performs its intended functions. Testing is performed and documented after installation or when modifications/ changes are made.
- Maintains historical files of software, software operating procedures (manuals), software changes/modifications (Change Log) and software version numbers.
- Maintains log of repairs and service performed on LIMS hardware.
- Develops and verifies security practices to assure the integrity of LIMS data. Identifies threats, potential threats, and future threats.
- Maintains awareness of any environmental conditions of the facility housing the LIMS that may compromise LIMS raw data and informs management.

4.2.7 Operations Manager

The Operations Manager manages and directs the analytical production sections of the laboratory. He/She reports directly to the Laboratory Director. He/She assists the Technical Director in determining the most efficient instrument utilization. More specifically, he/she:

- Supervises daily activities of the Operational Groups.
- Schedules analytical operations.
- Supervises QC activities performed as a part of routine analytical operations.
- Implements data review procedures.
- Supervises the preparation and maintenance of laboratory records.
- Supervises maintenance of instruments and scheduling of repairs.
- Works with the Project Managers and Group/Team Leaders to assure the requirements of projects are met in a timely manner.
- Responsible for meeting laboratory quality requirements.
- Evaluates the level of internal/external non-conformances for all departments.
- Continuously evaluates production capacity and improves capacity utilization.
- Continuously evaluates turnaround time and addresses any problems that may hinder meeting the required and committed turnaround time from the various departments.
- Develops and improves the training of all analysts in cooperation with the Technical Director and QA Manager and in compliance with regulatory requirements.
- Works with the Preventive Maintenance Coordinator to ensure that scheduled instrument maintenance is completed.
- Is responsible for efficient utilization of supplies.
- Constantly monitors and modifies the processing of samples through the departments.
- Fully supports the quality system and, if called upon in the absence of the QA Manager, serves as his/her substitute in the interim.

4.2.8 Director of Project Management

The Director of Project Management reports to the Laboratory Director and serves as the interface between the laboratory's technical departments and the laboratory's clients. The staff consists of the Project Management 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 in daily status meeting with agreed-upon due dates.
- Responsible for discussing with client any project-related problems, 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.
- Inform clients of data package-related problems and resolve service issues.
- Coordinate requests for sample containers and other services (data packages).

4.2.9 Project Manager

- Reports directly to the Director of Project Management.
- Monitors analytical and QA project requirements for a specified project.
- Acts as a liaison between the client and the laboratory staff.
- Prepares Quality Assurance Summary (QAS) or equivalent summary form and communicates project-specific requirements to all parties involved.
- Assists the laboratory staff with interpretation of work plans, contracts, and QAPP requirements.
- Reviews project data packages for completeness and compliance to client needs.
- Has signature authority for final reports.
- Keeps the laboratory and client informed of project status.
- Together with the QA Manager, approves customer requested variances to methods and to standard laboratory protocols.
- Monitors, reviews, and evaluates the progress and performance of projects.
- Reports client inquiries involving data quality issues or data acceptability to the facility QA Manager and to the operations staff.
- Prepares reissue requests for project data.
- Responsible for meeting quality requirements.

4.2.10 Report Production Manager

Reports directly to the Laboratory Director.

- Supervises daily activities of the Report Production Groups.
- Works with the Operations Manager and/or Group/Team Leaders to ensure that projects are reported in a timely manner.

4.2.11 Report Production Staff

Reports directly to the Report Production Manager.

- Accurately generates and compiles analytical reports and associated deliverables for delivery to the client.
- Responsible for meeting quality requirements.
- Produce as needed reports that meet the NELAC requirements.

4.2.12 Customer Service Manager (CSM)

Reports directly to the Laboratory Director

- Has signature authority for contracts for laboratory services, as detailed in TestAmerica policy, and for laboratory reports.
- Defines customer requirements through project definition.
- Assesses and assures customer satisfaction.
- Provides feedback to management on changing customer needs.
- Brings together resources necessary to ensure customer satisfaction.

4.2.13 Organics Department Manager

Manages the GC and GCMS groups. Reports directly to the Operations Manager and/or Laboratory Director.

- Ensure that analysts in their department adhere to applicable SOPs and the QA Manual. He/she performs 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. Responsible for review and approval of SOPs for their section.
- With regard to analysts, participates in the selection, training, 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 Technical Director, Operations Manager, and/or QA Manager. Each is responsible ensuring 100% implementation of the data review and documentation, non-conformance and corrective action issues, the timely and accurate completion of performance evaluation samples and MDLs, for his/her department.
- Ensure all logbooks are maintained, current, and properly labeled or archived.
- Report all non-conformance conditions to the QA Manager, Technical Director, Operations Manager, and/or Laboratory Director.
- 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.
- Provide written responses to external and internal audit issues.

4.2.14 Team Leader/Supervisor or Technical Supervisor

Reports directly to the Operations Manager and/or Laboratory Director.

- Ensure that analysts in their department adhere to applicable SOPs and the QA Manual. He/she performs 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. Responsible for review and approval of SOPs for their section.
- With regard to analysts, participates in the selection, training, 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 Technical Director, Operations Manager, and/or QA Manager. Each is responsible ensuring 100% implementation of the data review and documentation, non-conformance and corrective action issues, the timely and accurate completion of performance evaluation samples and MDLs, for his/her department.
- Ensure all logbooks are maintained, current, and properly labeled or archived.
- Report all non-conformance conditions to the QA Manager, Technical Director, Operations Manager, and/or Laboratory Director.
- 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.
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- Develop, implement, and enhance calibration programs.
- Provide written responses to external and internal audit issues.

4.2.15 Laboratory Analyst

Laboratory analysts are responsible for conducting analysis and performing all tasks assigned to them by the team 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.
- Ensures sample and data integrity by adhering to internal chain-of-custody procedures.
- Document standard and sample preparation, instrument calibration and maintenance, data calculations, sample matrix effects, and any observed non-conformance on bench sheets, lab notebooks, run logs, 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. Performs data processing using available tools/software.
- 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.

4.2.16 Sample Custodian/Sample Receiving Team Leader

Ensures implementation of proper sample receipt procedures, including maintenance of chain-of-custody.

- Reports nonconformances associated with condition-upon-receipt of samples.
- Logs samples into the LIMS.
- Ensures that all samples are stored in the proper environment.
- Assists Environmental Health and Safety staff with sample disposal.
- Responsible for meeting quality requirements.

4.2.17 Field Service Technician

The Field Service Technicians report to the Field Services Project Manager. The responsibilities of the Field Service Technicians are outlined below:

- Perform sample collection and sample pick-up
- Ensures sample containers are prepared for sampling
- Performs field tests and measurements and operates and maintains equipment used for those purposes.

4.2.18 Health and Safety Coordinator

The Health and Safety Coordinator reports to the Laboratory Director and ensures that systems are maintained for the safe operation of the laboratory. The Safety Officer 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 Material Safety Data Sheet (MSDS) 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.

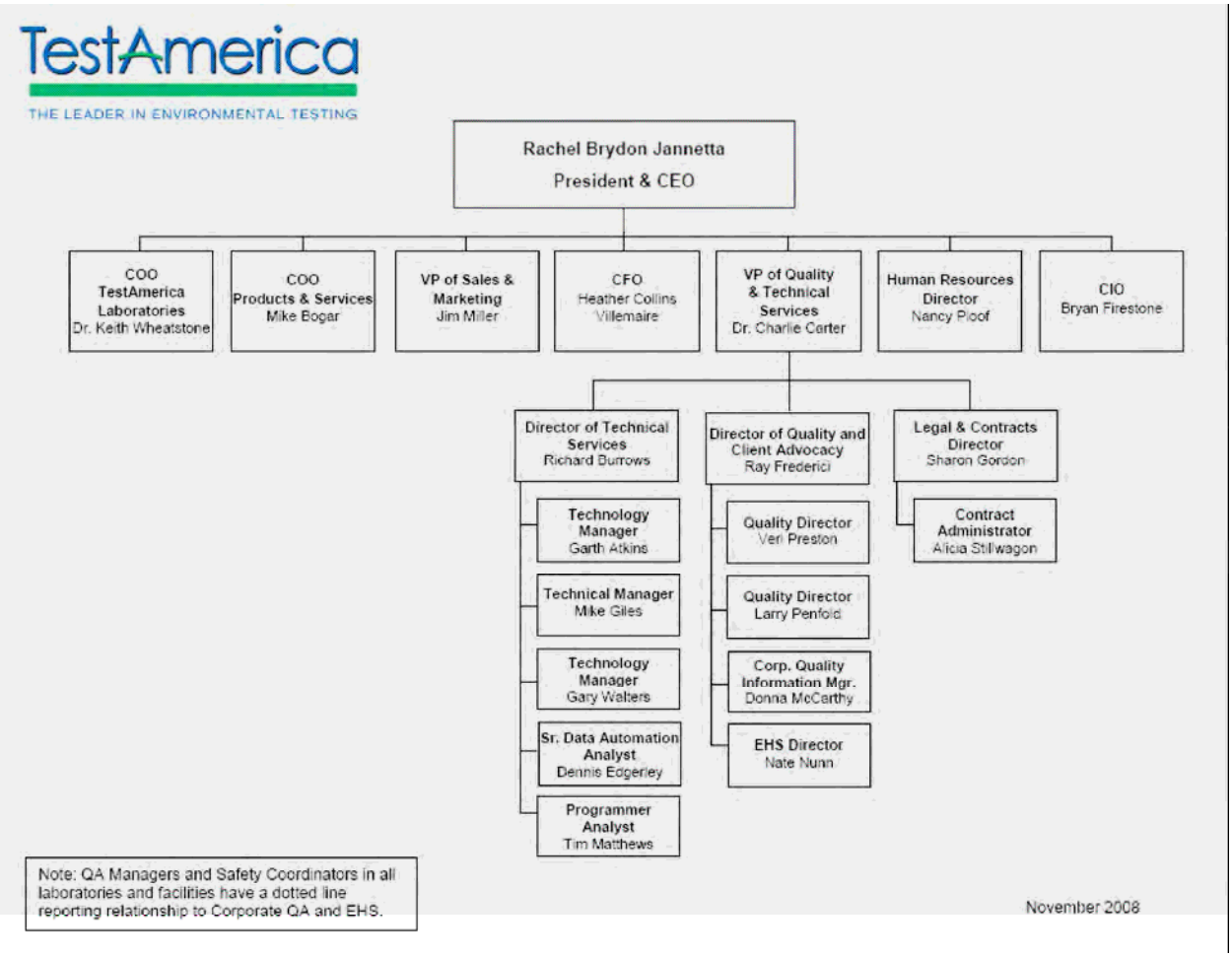
4.3 DEPUTIES

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

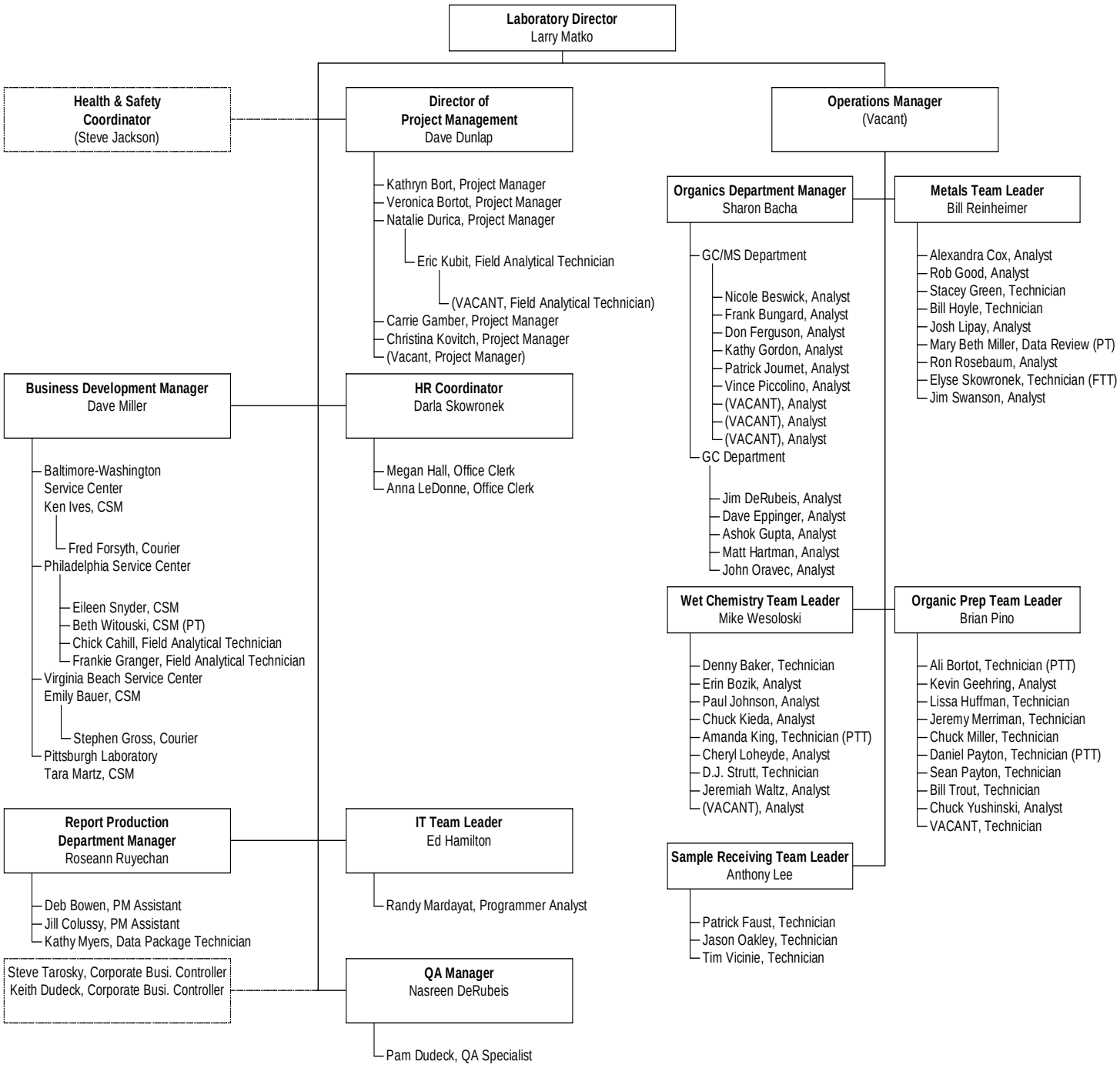
Key Personnel	Deputy	Comment
Laboratory Director: Larry Matko	Director of Project Management: Dave Dunlap	
Quality Assurance Manager: Nasreen DeRubeis	Quality Assurance Specialist: Pam Dudeck	
Director of Project Management: Dave Dunlap	Designated Project Manager	
Organics Manager: Sharon Bacha	Designated GC and GCMS Analyst	A designated senior Analyst in GC and GCMS groups
Metals Supervisor: Bill Reinheimer	Designated Senior Metals Analyst	
Wet Chemistry Supervisor: Mike Wesoloski	Designated Senior Wet Chemistry Analyst	
Organic Prep Team Leader: Brian Pino	Larry Matko	
IT Team Leader/LIMS Administrator; Ed Hamilton	IT Analyst: Randy Mardayat	
Report Production Supervisor: Roseann Ruyechan	Designated person in the group or Lab Director	
Sample Receiving Team Leader: Anthony Lee	Lab Director or Designated person in the group	

Figure 4-1.

Corporate and Laboratory Organization Charts



Pittsburgh Laboratory Organizational Chart



SECTION 5

QUALITY SYSTEM *(NELAC 5.4.2)*

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.

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. CA-L-P-001) and Employee Ethics Statements.
- ~~An~~ 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. CA-L-S-001.)
- Procedures and guidance for recalling data if necessary (Corporate SOP No. CA-L-S-001).
- 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
- Corporate Quality Policy Memorandums
- 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 Policy Memorandum
- 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's 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 can prepare upon request a Quality Control Limit Summary from the LIMS that summarize the precision and accuracy acceptability limits for analyses performed at TestAmerica Pittsburgh. This summary includes an effective date, is updated each time new limits are generated and is located in the LIMS. Current limits are controlled through the LIMS. The limits in effect for a given date are archived in the LIMS with the associated sample data. 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 Section 24.

5.6 STATISTICAL QUALITY CONTROL

Statistically-derived precision and accuracy limits are required by selected methods (such as SW-846) and programs [such as the Ohio Voluntary Action Plan (VAP)]. 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 area supervisor 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. These limits are maintained in the LIMS as part of the analytical historical record. If a method defines the QC limits, the method limits are used. For further details refer to SOP No. PT-QA-002.

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.

Surrogate recoveries are determined for a specific time period as defined above. The resulting ranges are entered in LIMS.

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 generation and use of QC Charts (Control Charts) are described in the laboratory SOP PT-QA-002.

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 *(NELAC 5.4.3)*

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. PT-QA-010.

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 and Nonconformance Memos (NCMs). 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, the number of pages of the item, 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 manager submits an electronic or paper 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 the official document on file. The official document is 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. For DoD program, the related documents are reviewed every year and revised as appropriate.

6.3 PROCEDURES FOR DOCUMENT CONTROL POLICY

For changes to the QA Manual, refer to SOP No. PT-QA-010. 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 sops on 'pitsvro1' (X:) by lab area.

For changes to SOPs and QA manual, refer to SOP No. CW-Q-S-002, Writing a Standard Operating Procedure SOP and laboratory SOP PT-QA-010. The SOP identified above also defines the process of changes to SOPs.

Controlled documents are marked as such, and posted to the intranet (QA Web page) by the QA department. Controlled distribution is achieved electronically. Details of the numbering system, required format, and controlled distribution of documents are described in SOP No. PT-QA-010, "Preparation and Management of Standard Operating Procedures (SOPs) .

Forms, worksheets, work instructions and information are organized by department by the QA office. Electronic versions are kept on a hard drive in the QA department; hard copies can be printed out as needed. Most forms used in the laboratory are tracked by a database which can be accessed by the QA department and the IT group. The procedure for the care of these documents is in SOP No. PT-QA-010, "Preparation and Management of Standard Operating Procedures (SOPs) and Other Controlled Documents".

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. PT-QA-019.

SECTION 7

SERVICE TO THE CLIENT *(NELAC 5.4.7)*

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 regulatory and client 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 lab'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 National Account Director, 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):

- Legal & Contracts Director if applicable
- Customer Service Manager
- The Laboratory Project Management
- The Laboratory Director/Operations Manager
- Laboratory Quality Assurance Manager if applicable
- PM or CSM reviews the formal laboratory quote. The Laboratory Director makes final acceptance for their facility.

The National Account Director, Legal Contracts Director, or local account representative 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 Legal & Contracts Director maintains copies of all signed contracts. In Pittsburgh laboratory copies of contracts are maintained in the laboratory network public drive (N:\Weekly\Quotes_Scanned) by the sales/marketing personnel.

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. Contracts review documentation is forwarded to the Human Resources Coordinator and is maintained in the network public drive.

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

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 or electronic mail of conversations with the client.

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, the laboratory assigns a PM 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 or to the supervisory staff during production 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 operations 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 Department 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 25).

Note: ISO 17025/NELAC 2003 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.

Laboratory or designee Director 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 *(NELAC 5.4.5)*

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 (CA-L-S-002) 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 NELAC/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-NELAC accredited work where required.

Project Managers (PMs), Customer Service Managers (CSM), or Regional Account Executives (RAE) for the Export Lab are responsible for obtaining client approval prior to outsourcing any samples. The laboratory will advise the client of a subcontract or work sharing arrangement in writing and when possible approval from the client shall be retained in the project folder.

Note: In addition to the client, some regulating agencies, such as the US Army Corps of Engineers and the USDA, require notification prior to placing such work**.**

For DOD projects the subcontractor laboratories used must have an established and documented laboratory quality system that complies with DoD QSM requirements. The subcontractor laboratories are evaluated following the procedures outlined below and as seen in Figure 8-1. The subcontractor laboratory must receive project-specific approval from the DoD client before any samples are analyzed.

The QSM has 5 specific requirements for subcontracting:

1. Subcontractor laboratories must have an established laboratory quality system that complies with the QSM.
2. Subcontractor laboratories must be approved by the specific DoD Component laboratory approval process.
3. Subcontractor laboratories must demonstrate the ability to generate acceptable results from the analysis of PT samples, subject to availability, using each applicable method, in the specified matrix, and provide appropriate documentation to the DoD client.
4. Subcontractor laboratories must receive project-specific approval from the DoD client before any samples are analyzed.
5. Subcontractor laboratories are subject to project-specific, on-site assessments by the DoD client or their designated representatives

8.2 QUALIFYING AND MONITORING SUBCONTRACTORS

Whenever a PM or Regional Account Executive (RAE) or Customer Service Manager (CSM 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:

- The first priority is to attempt to place the work in a qualified TestAmerica laboratory;
- Firms specified by the client for the task (Documentation that a subcontractor was designated by the client must be maintained with the project file. This documentation can be as simple as placing a copy of an e-mail from the client in the project folder);
- Firms listed as pre-qualified and currently under a subcontract with TestAmerica: A listing of all approved subcontracting laboratories and supporting documentation is available on the TestAmerica intranet site. Verify necessary accreditation, where applicable, (e.g., on the subcontractors NELAC, A2LA accreditation or State Certification).
- Firms identified in accordance with the company's Small Business Subcontracting program as small, women-owned, veteran-owned and/or minority-owned businesses;
- NELAC or A2LA accredited laboratories.
- In addition, the firm must hold the appropriate certification to perform the work required.

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).

When the potential sub-contract laboratory has not been previously approved, Account Executives, CSMs or PMs may nominate a laboratory as a subcontractor based on need. The decision to nominate a laboratory must be approved by the Laboratory Director/Manager. The Laboratory Director/Manager requests that the QA Manager begin the process of approving the subcontract laboratory as outlined in Corporate SOP No. CA-L-S-002, Subcontracting Procedures. 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).

8.2.1 Once the appropriate accreditation and legal information is received by the laboratory, it is evaluated for acceptability (where applicable) and forwarded to Corporate Contracts for formal contracting with the laboratory. They will add the lab to the approved list on the intranet site along with the associate documentation and notify the finance group for JD Edwards.

8.2.2 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 subcontractor is on our approved list and can only be recommended to the extent that we would use them.

8.2.3 The status and performance of qualified subcontractors will be monitored periodically by the Corporate Contracts and/or Quality Departments. Any problems identified will be brought to the attention of TestAmerica's Corporate Finance or 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. The QA Manager 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 Lab Directors/Managers, QA Managers and Sales Personnel.

8.3 OVERSIGHT AND REPORTING

The PM or CSM must request that the selected subcontractor be presented with a subcontract, if one is not already executed between the laboratory and the subcontractor. The subcontract must include terms which flow down the requirements of our clients, either in the subcontract itself or through the mechanism of work orders relating to individual projects. A standard subcontract and the Lab Subcontractor Vendor Package (posted on the intranet) can be used to accomplish this, and the Legal & Contracts Director can tailor the document or assist with negotiations, if needed. The PM (or RAE or CSM) responsible for the project must advise and obtain client consent to the subcontract as appropriate, and provide the scope of work to ensure that the proper requirements are made a part of the subcontract and are made known to the subcontractor.

Prior to 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 on the

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

The Sample Control department is responsible for ensuring compliance with QA requirements and applicable shipping regulations when shipping samples to a subcontracted laboratory.

All subcontracted samples must be accompanied by a Chain of Custody (COC). A copy of the original COC sent by the client must be included with all samples subbed within TestAmerica.

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-NELAC accredited work must be identified in the subcontractor's report as appropriate. If NELAC 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 Laboratory Director may waive the full qualification of a subcontractor process temporarily to meet emergency needs. In the event this provision is utilized, the QA Manager will be required to verify certifications. The comprehensive approval process must then be initiated within 30 calendar days of subcontracting.

SECTION 9

PURCHASING SERVICES AND SUPPLIES *(NELAC 5.4.6)*

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, 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 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.

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 should complete the Purchase Requisition Form (Figure 9-1) 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. If an item is not in the consignment system, the analyst must obtain approval from the area team leader/supervisor and Laboratory Director prior to placing the order. All the orders are submitted to the Laboratory Receptionist or Team Leaders/designated laboratory area personnel by completing the Purchase Requisition Form (Figure 9-1). The Receptionist or Team Leaders/designated laboratory area personnel will enter the orders into the JD Edwards system (JDE). The Receptionist also places the orders for rush items, office supplies and obtains purchase orders for instrument/equipment repairs and maintenance. The laboratory Director will approve or deny the order in the JDE. Every order is given a purchase order number in the JDE. The actual order to the vendor is placed through the purchasing department in the TestAmerica North Canton Laboratory.

9.3.2 Receiving

It is the responsibility of the Sample Receiving department to receive the shipment. It is the responsibility of the analyst who ordered the materials to date the material when 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. The analyst dates and initials the packing slip and forwards it to the Receptionist for filing Material Safety Data Sheets (MSDSs) are available online through the Company's intranet website. Anyone may review these for relevant information on the safe handling and emergency precautions of on-site chemicals.

9.3.3 Specifications

All 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, it may be assumed that it is not significant in that procedure and, therefore, any grade reagent may 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 unless noted otherwise by the manufacturer or by the reference source method. Chemicals should not be used past the manufacturer's or SOPs expiration date unless 'verified' (refer to item 3 listed below).

- An expiration date can not be extended if the dry chemical is discolored or appears otherwise physically degraded, the dry chemical must be discarded.

- Expiration dates can be extended if the dry chemical 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 is used for the preparation of standards, the expiration dates can be extended 6 months if the dry chemical is compared to an unexpired independent source in performing the method and the performance of the dry chemical is found to be satisfactory. The comparison must show that the dry chemical meets CCV limits. The comparison studies are maintained with each lab department and copy forwarded to QA office.

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. The minimum total pressure must be 500 psig or the tank must be replaced. 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- mmho/cm (or specific resistivity of greater than 1.0 megaohm-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 Department Managers/Supervisors 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 VOA vials must be certified clean and the certificates must be maintained. If uncertified VOA vials are 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 Director and/or the Laboratory Director/Manager. 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 be

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 Department Managers. The service providers that perform the services are approved by the Laboratory Director.

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 Vendor Selection (SOP No. CW-F-S-018) and 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 Laboratory Director are consulted with vendor and product selection that have an impact on quality.

Figure 9-1.

Example - Purchase Requisition Form

Date:	**For Purchasing Use Only**
Vendor Name:	**Order Date:**
Exact Date Needed:	**Account Number:**
Requested By:	**Order Number:**
Department Name/Number:	**P.O. Number:**

Item	Quantity	Unit of Measure	Catalog No.	Description	Unit Cost	Total Cost
1.						
2.						
3.						
4.						
5.						
6.						
7.						
8.						

Authorized Signature Date

SECTION 10

COMPLAINTS *(NELAC 5.4.8)*

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 Customer Complaint System, SOP No. PT-QA-016. This is a database created to track, followup and close out customer complaints and corrective actions. It is the laboratory's goal to provide a satisfactory resolution to complaints in a timely and professional manner.

10.2 EXTERNAL COMPLAINTS

An employee that receives a complaint initiates the complaint resolution process by first documenting the complaint in the database, according to (SOP No. PT-QA-016).

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 *(NELAC 5.4.9)*

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 advice. The supervisor may elect to discuss it with the Laboratory Director or QA Manager or have a PM 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 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 Laboratory 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 NELAC (or the analytical method) requirements and the reason. Data being reported to a non-NELAC state would need to note the change made to how the method is normally run.

11.2 RESPONSIBILITIES AND AUTHORITIES

TestAmerica's Corporate SOP entitled *Internal Investigation of Potential Data Discrepancies and Determination for Data Recall* (SOP No. CA-L-S-001), outlines the general procedures for the reporting and investigation of data discrepancies and alleged incidents of misconduct or violations of TestAmerica's data integrity policies as well as the policies and procedures related to the determination of the potential need to recall data.

Under certain circumstances, the Laboratory Director/Manager, a Lab Supervisor, 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 is documented on a Nonconformance Memo (NCM) and 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/Manager, the QA Manager, and the Department Managers. The reporting of issues involving alleged violations of the company's Data Integrity or Manual Integration procedures must be conveyed to an Ethics and Compliance Officer (ECO), Director of Quality & Client Advocacy 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/Manager, QA Manager, ECOs, Corporate Quality, the COO, General Managers 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.

TestAmerica's Corporate Data Investigation & Recall Procedure (SOP No. CA-L-S-001) distinguishes between situations when it would be appropriate for laboratory management to make the decision on the need for client notification (written or verbal) and data recall (report revision) and when the decision must be made with the assistance of the ECO's and Corporate Management. 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. CA-L-S-001.

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. On a monthly basis, 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/Manager.

The Laboratory Director/Manager 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/Manager 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/Manager, Technical Director, QA Manager, Supervisor) 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 *(NELAC 5.4.10)*

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) (Figure 12-1), Corrective Action Reports (CAR) (Figure 12-2) or using the Customer Complaint database (Figure 12-3).

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

12.2.2 Corrective Action Report (CAR) and the Complaint Database (Figure 12-3) - is used to document the following types of corrective actions:

- Questionable trends that are found in the monthly review of NCMs.
- Issues found while reviewing NCMs that warrant further investigation.
- Failed or unacceptable PT results.
- Corrective actions that cross multiple departments in the laboratory.
- Systematic reporting / calculation errors.

- Complaints received from clients are documented in the complaint database.

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, CAR or the documentation in the complaint database must be initiated. Someone is assigned to investigate the issue and the event is investigated for root 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 root cause is not readily obvious, the Supervisor, Laboratory Director/Manager, 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 Monitoring of the Corrective Actions

- The Department Manager/Supervisor 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. Department Managers are accountable to the Laboratory Director/Manager to ensure final acceptable resolution is achieved and documented appropriately.
- Each NCM is entered into a database for tracking purposes and a monthly summary of all NCMs is reviewed to aid in ensuring that the appropriate corrective actions have taken effect. CARs are also compiled and reviewed monthly. Corrective actions or complaints that result in corrective action are also reviewed monthly.
- The QA Manager reviews NCMs and CARs monthly 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.

12.3.4 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 specific method SOPs.

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 - Nonconformance Memo

Nonconformance Memo – Clouseau System

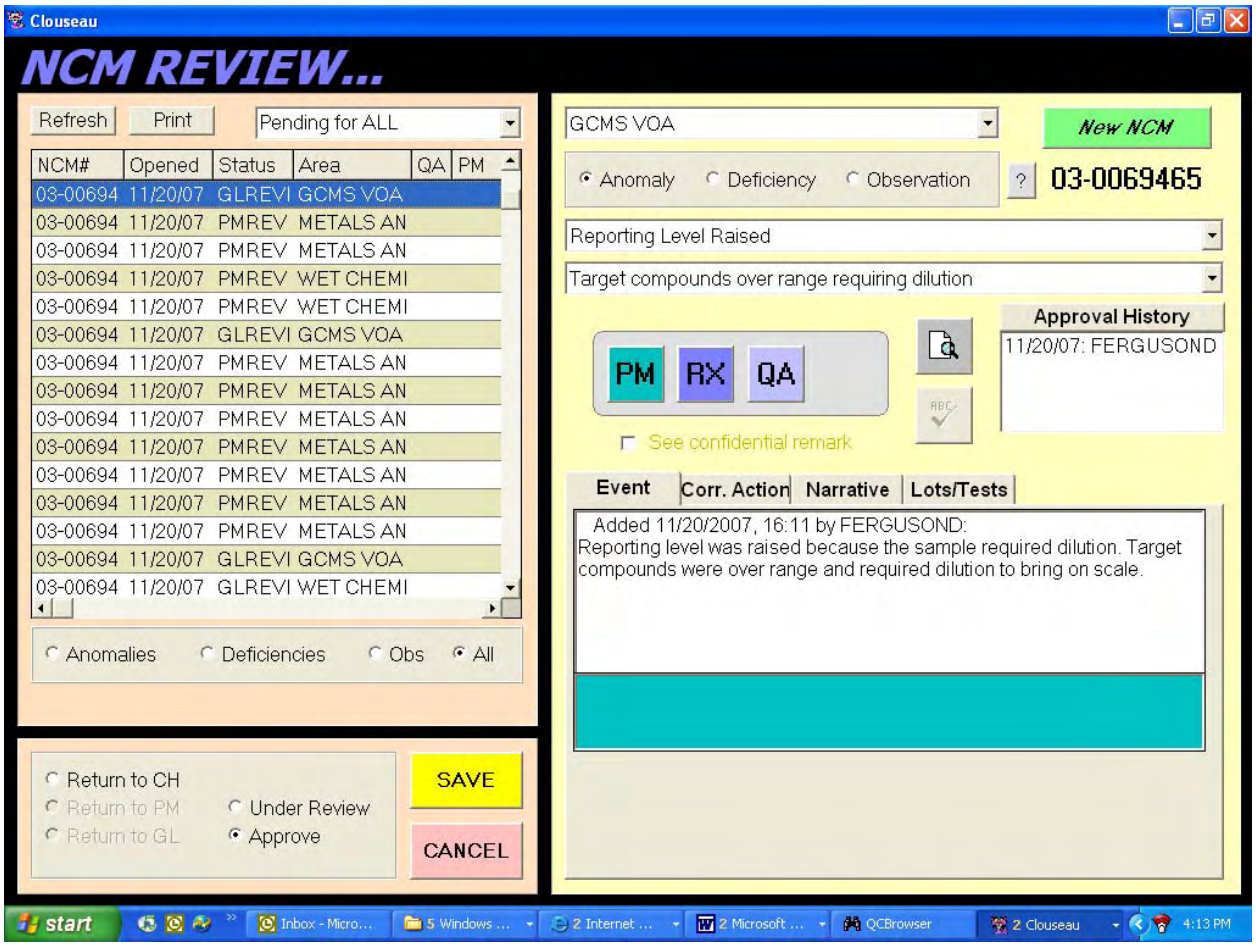


Figure 12-2.

Example – Corrective Action Report

Pittsburgh Proficiency Testing Corrective Action Report

Date:

Lead Responsible Person preparing Plan and Response:

Lot Number:

PT Program requiring response:

Results Requiring Corrective Actions:

Parameter	Method	Result Reported	Assigned Value	Acceptable Range

Explanation of Failure/Determination of Root Cause:

Outline of Corrective Action Plan based upon data review:

Potential Sources of error investigated:

Corrective Action recommended for implementation:

Verification of effectiveness of appropriate corrective actions:

Figure 12-3.

Example – Customer Complaint System - Corrective Action Report

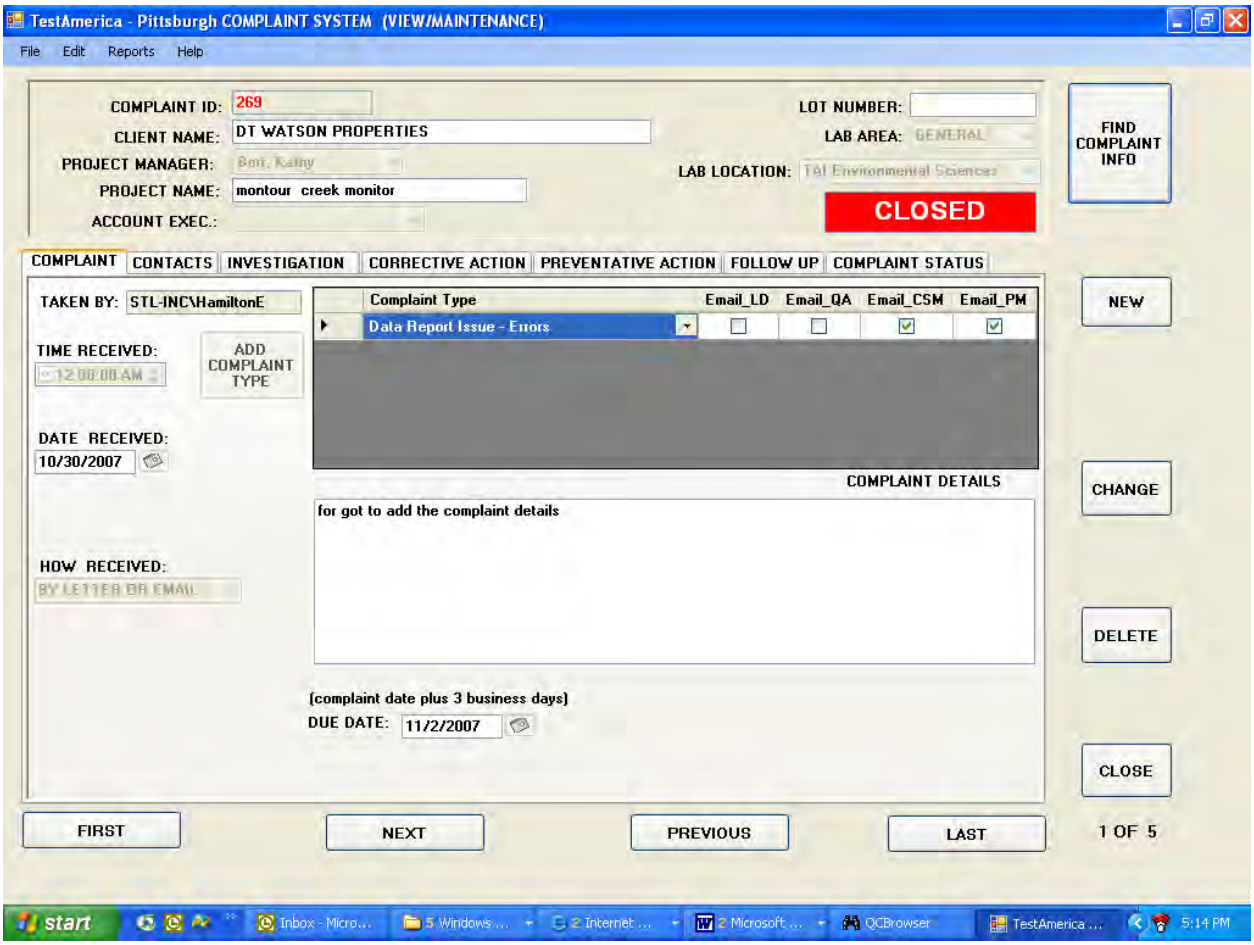


Table 12-1.

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, Supervisor)*	- 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, Supervisor)*	- % 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 LIMS.	- 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.
Laboratory Control Sample (LCS) *(Analyst, Data Reviewer)*	- % Recovery within limits specified inLIMS,	- Batch must be re-prepared and re-analyzed. **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.

QC Activity *(Individual Responsible for Initiation/Assessment)*	Acceptance Criteria	Recommended Corrective Action
Method Blank (MB) *(Analyst, Data Reviewer)*	< Reporting Limit [1] For DoD requirements no analytes detected at greater than and equal to ½ RL. For common lab contaminants, no analytes detected at greater than and equal to RL (refer to SOP PT-QA-025).	- Reanalyze blank. - If still positive, determine source of contamination. If necessary, reprocess (i.e. digest or extract) entire sample batch. Report blank results.
Proficiency Testing (PT) Samples *(QA Manager, Department Manager/Supervisor)*	- 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, Department Manager/Supervisor, Laboratory Director/Manager)*	- Defined in Quality System documentation such as SOPs, QAM, etc..	- Non-conformances must be investigated through CAR system and necessary corrections must be made.
Reporting / Calculation Errors (Depends on issue – possible individuals include: Analysts, Data Reviewers, Project Managers, Department Manager/ Supervisor, QA Manager, Corporate QA, Corporate Management)	- SOP CA-L-S-001, Internal Investigation of Potential Data Discrepancies and Determination for Data Recall.	- Corrective action is determined by type of error. Follow the procedures in SOP CA-L-S-001 .
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).

QC Activity *(Individual Responsible for Initiation/Assessment)*	Acceptance Criteria	Recommended Corrective Action
QA Monthly Report (Refer to Section 16 for an example) (QA Manager, Lab Director/Manager, Department Supervisors/Managers)	- 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, Department Supervisor/Manager)	- 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 reporting limit unless there is a client specific requirement. 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.

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SECTION 13

PREVENTIVE ACTION *(NELAC 5.4.11)*

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 continuous process improvement activity 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, customer service and satisfaction can be improved through continuous improvements to laboratory systems.

Opportunities for improvement may be discovered during management reviews, the QA Metrics Report, internal or external audits, proficiency testing performance, client complaints, staff observation, etc..

The monthly QA Metrics Report shows performance indicators in all areas of the 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. These metrics are used to help evaluate quality system performance on an ongoing basis and provide a tool for identifying areas for improvement.

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 provides a valuable mechanism for identifying preventive action opportunities.

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

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

13.1.2 Any Preventive Actions undertaken or attempted shall be taken into account during the Annual Management Review (Section 16). A highly detailed recap is not required; a simple recount of success and failure within the preventive action program will provide management a measure 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 various tracking indicators, 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 indicators monitored under this collective 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 Supervisors, etc..

These items are maintained on TestAmerica's Intranet (Proposal Library) or on our internal database (TotalAccess) which uploads to our company internet site.

SECTION 14

CONTROL OF RECORDS *(NELAC 5.4.12)*

The laboratory maintains a record 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.

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. Quality records are maintained by the Quality Assurance (QA) department electronically in laboratory's designated network drive which is backed up as part of the regular network 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 report production group and HR Coordinator as outlined in SOP No. PT-QA-019.

Table 14-1. Record Index[1]

	Record Types [1]:	**Retention Time:**
Technical Records	- Raw Data - Logbooks[2] - Standards - Certificates - Analytical Records - Lab Reports	5 Years from analytical report issue*
Official Documents	- Quality Assurance Manual (QAM) - Work Instructions - Policies - SOPs - Manuals	5 Years from document retirement date*
QA Records	- Internal & External Audits/Responses - Certifications - Corrective/Preventive Actions - Management Reviews - Method & Software Validation / Verification Data - Data Investigation	5 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)

	Record Types [1]:	Retention Time:
Project Records	- Sample Receipt & COC Documentation - Contracts and Amendments - Correspondence - QAPP -SAP - Telephone Logbooks - Lab Reports	5 Years from analytical report issue*
Administrative Records	Finance and Accounting	10 years
	EH&S Manual, Permits, Disposal Records	7 years
	Employee Handbook	Indefinitely
	Personnel files, Employee Signature & Initials, Administrative Training Records (e.g., Ethics)	7 Years (HR Personnel Files must be maintained indefinitely)
	Administrative Policies Technical Training Records	7 years

[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 or an offsite location that provides a suitable environment to prevent damage or deterioration and to prevent loss at the laboratory or the Business Records Management Facility. Depending on the type of report requested, the onsite retention of laboratory data records varies. For projects with LIMS report (R02), the raw data generated by the laboratory is maintained on-site for three months. After this period the laboratory data is destroyed because all this data is maintained electronically and can be reproduced. The chain of custodies, level I, II, and III reviews, mercury data, cooler receipt form, client summary of analysis, invoices, any correspondences if available in the project file are maintained and archived for a minimum of 5 and maximum of 7 years. For full data packages, all the laboratory data is scanned as reported and stored electronically on CDs which are maintained in the laboratory reporting area file cabinet. Also backup CD archive is made and stored in a fireproof safe. The data package hard copy is stored on-site for a minimum of three months**.** 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**.** Records archived off-site are stored in a secure location where a record is maintained of any entry into the storage facility. Whether off-site storage is used, logs are maintained to note removal and return of records. t 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. Special Record Retention Requirements

Program	[1]Retention Requirement
Drinking Water – All States	10 years (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

[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 SOP No. PT-QA-019, Records Information Management and SOP No. PT-QA-020, Report Production.

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 (Records stored off site should be accessible within 2 days of a request for such records). 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. All analytical work contains the initials (at least) of the personnel involved. The laboratory's copy of the chain of custody is stored with the invoice in the main file folder. Details of this procedure is described in SOP No. PT-QA-019. The chain of custody would indicate the name of the sampler. If any sampling notes are provided with the chain of

custody, they are kept with main folder.

- 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 are described in SOP No. PT-QA-019. Instrument data is stored sequentially by instrument. Run logs are maintained for each instrument; a copy of each day's run long 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 electronic standard logbooks.

- 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. The procedure for this verification can be found in SOP No. PT-QA-019.

- 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**.**

14.3 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

14.5.1 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.

14.5.2 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.

14.5.3 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**.**

14.5.4 The laboratory has a record management system for control of instrument/run logbooks, balance logs, maintenance logs and bench sheets where applicable. Laboratory notebooks are issued on a per analysis basis, and are numbered sequentially. All sample data are recorded in LIMS. Bench sheets are filed with each client data by project. Standards are maintained in the electronic standards log**.** Records are considered archived when noted as

such in the records management system.

14.5.5 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.

14.5.6 Records Disposal

14.5.6.1 Records are removed from the archive and destroyed after 5 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 and SOP No. PT-QA-019).

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

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

SECTION 15

AUDITS *(NELAC 5.4.13)*

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 Audits, SOP No. CA-Q-S-004. The types and frequency of routine internal audits are shown in Table 16-1. 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	QA Department or Designee	All areas of the laboratory annually
QA Technical Audits - Evaluate raw data versus final reports - Analyst integrity - Data authenticity	QA Department or Designee	All methods within a 2-year period, with at least 15% of methods every quarter
SOP Method Compliance	Technical Director	- All SOPs within a 2-year period - All new analysts or new analyst/methods within 3 months of IDOC
Special	QA Department or Designee	Surveillance or spot checks performed as needed
Performance Testing	Analysts with QA oversight	Two successful per year for each NELAC 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, the laboratory's Data Integrity and Ethics Policies, NELAC 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. The audit is divided into modules for each operating or support area of the lab, and each module is comprehensive for a given area. The area audits may be done 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 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, MintMiner is used to identify unusual manipulations of the data deserving closer scrutiny. QA technical audits will include all methods within a two-year period.

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 Director at least every two years. 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: Water Pollution Program, Water Supply Program, Hazardous Waste Program, client supplied PTs and Lab internal PTs.

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. 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 2003 NELAC standards.

15.3 AUDIT FINDINGS

Audit findings are documented using the corrective action process, and database or spreadsheet. 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 set and agreed to by operations management and the QA Manager.

Developing and implementing corrective actions to findings is the responsibility of the Department Manager where the finding originated. Findings that are not corrected by specified due dates are reported monthly to management in the QA monthly report. 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 *(NELAC 5.4.14)*

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/Manager, Operation Manager, their Quality Director as well as the General Manager. 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/Manager, 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/Manager, , QA Manager, General Manager and Senior Customer Service 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 quality goals & objectives. Corporate Operations and Corporate QA personnel is be included in this meeting at the discretion of the Laboratory Director/Manager. 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 review (Corporate Work Instruction No. CA-Q-WI-020) 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 Data Investigation/Recall SOP shall be followed (SOP No. CA-L-S-001). 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 COO, VP of Client & Technical Services, General Managers and Quality Directors receive a monthly report from the Director of Quality & Client Advocacy summarizing any current data integrity or data recall investigations. The General Manager's are also made aware of progress on these issues for their specific labs.

SECTION 17

PERSONNEL *(NELAC 5.5.2)*

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, pipette 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 Directors/Department 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 Director – **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 Director - 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 Department 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). This information is maintained in the employee's secured personnel file.

Further details of the laboratory's training program are described in the Laboratory Training SOP (PT-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, 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. CA-L-P-001) 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 *(NELAC 5.5.3)*

18.1 OVERVIEW

The laboratory is a 33,000 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, 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 effect 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:

- Volatile organic chemical analysis areas, including sample preparation.

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 *(NELAC 5.5.4)*

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 No. PT-QA-010, Preparation and Management of Standard Operating Procedures (SOPs) and Other Controlled Documents .
- 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, and Appendix A-C; 40 CFR Part 136, USEPA Office of Water. Revised as of July 1, 1995, Appendix A to Part 136 - Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater (EPA 600 Series)*
- *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 Analysis, ILM04.1, USEPA Contract Laboratory Program Multi-media, Multi-concentration.*
- *Statement of Work for Organics Analysis, OLM04.2, USEPA Contract Laboratory Program, Multi-media, Multi-concentration.*
- *Statement of Work for Organic Analysis, Multi-Media, Multi-Concentration, OLMO4.1, USEPA Contract Laboratory Program, September 1998.*
- *Standard Methods for the Examination of Water and Wastewater, 18th/19th /20th 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.*
- *Annual Book of ASTM Standards, American Society for Testing & Materials (ASTM), Philadelphia, PA.*
- *Code of Federal Regulations (CFR) 40, Parts 136, 141, 172, 173, 178, 179 and 261*

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.

19.4.2.1 A demonstration of capability (DOC, Lab SOP # PT-QA-001) is performed whenever there is a change in instrument type (e.g., new instrumentation), method or personnel.

19.4.2.2 The initial demonstration of capability must be thoroughly documented and approved by the Technical Director or Lab Director and QA Manager prior to independently analyzing client samples. All associated documentation must be retained in accordance with the laboratories archiving procedures.

19.4.2.3 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

Initial Demonstration and Capability (IDOC) procedure is described in Pittsburgh SOP No. PT-QA-010.

19.4.3.1 The spiking standard used must be prepared independently from those used in instrument calibration. The LCS is used to document IDOCs for all applicable methods.

19.4.3.2 The analyte(s) shall be diluted in a volume of clean matrix sufficient to prepare four aliquots (4 LCS) at the concentration specified by a method or the laboratory SOP.

19.4.3.3 At least four laboratory control samples from different batches 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.

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 is not zero. 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 (refer to 19.7.10). 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. *[To allow for some flexibility, this low level standard may be analyzed every batch or every week or some other frequency rather than doing the study all at once. In addition, a larger number of data points may be used if the appropriate t-value multiplier is used]*

Refer to the Corporate SOP No. CA-Q-S-006 or the laboratory's SOP No. PT-QA-007 for details on the laboratory's MDL process and DoD requirements.

19.8 INSTRUMENT DETECTION LIMITS (IDL)

19.8.1 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.

19.8.2 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.

19.8.3 If IDL is > than the MDL, it may be used as the reported MDL. For ICP IDLs determined shall be less than or equal to the MDL as per DoD QSM, Version 3, Appendix DoD-B, Table B-6. DoD requirements are detailed in SOP No. PT-QA-025.

19.9 VERIFICATION OF DETECTION AND REPORTING LIMITS

19.9.1 Once an MDL is established, it must be verified, on each instrument, by analyzing a quality control sample/MDL Verification sample (prepared as a sample) at approximately 2-3 times the calculated MDL. See Pittsburgh SOP No. PT-QA-007. The analytes must be qualitatively identified. This verification does not apply to methods that are not readily spiked (e.g. pH, turbidity, etc.). If the MDL verification (MDLV) is Non-Detect it must be repeated at a concentration 2X higher. If the 2nd MDLV fails, subsequent MDLVs are prepared at 2X increments until a passing MDLV is achieved. The final MDL is then established at the concentration of the lowest passing MDLV. 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. In lieu of performing an annual MDL study with 7 replicates, quarterly MDL checks can be performed. For DoD MDLs are verified

quarterly on each instrument if an annual MDL study per instrument is not determined, see SOP PT-QA-007

19.9.2 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 the reporting limit and annually thereafter. The annual requirement is waved 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. Uncertainty determination is further described in SOP No. PT-QA-005.

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 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 supercede 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.

- 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/Manager 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 Quantims which is a custom in-house developed LIMS system that has been highly customized to meet the needs of the Pittsburgh laboratory. It is referred to as LIMS for the remainder of this section. The LIMS utilizes RPG language and runs on an IBM AS400 database 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.

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, and encryption of 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, including 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 on the server and every night backed up 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 Lab area supervisor/QA Manager at the facility. The QA Manager controls all worksheets following the procedures in Section 6.

19.14.4 Review / Verification Procedures

Data review procedures comprise a set of computerized and manual checks applied at appropriate levels of the measurement process. Technical data review procedures are out lined in Pittsburgh SOP No. PT-QA-018 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 laboratory uses the Corporate SOP No. CA-Q-S-002, Acceptable Manual Integration Practices, discussing Manual Integrations to ensure the authenticity of the data. The general review concepts are discussed below, more specific information can be found in the SOPs.

19.14.4.1 The data review process at the laboratory starts at the Sample Receiving level. Sample Receiving personnel review chain-of-custody forms and input the sample information and required analyses into a computer LIMS. The Sample Receiving personnel review the transaction of the chain-of-custody forms and the inputted information. The Project Managers perform final review of the chain-of-custody forms and inputted information.

19.14.4.2 The next level of data review occurs with the Analysts. As results are generated, analysts review their work to ensure that the results generated meet QC requirements and relevant EPA methodologies. The Analysts transfer the data into the LIMS and

add data qualifiers if applicable. To ensure data compliance, a different analyst performs a second level of review. Second level review is accomplished by checking reported results against raw data and evaluating the results for accuracy. During the second level review, blank runs, QA/QC check results, continuing calibration results, laboratory control samples, sample data, qualifiers and spike information are evaluated. Approximately 15% of all sample data from manual methods and from automated methods, all GC/MS spectra and all manual integrations are reviewed. Manual integrations are also electronically reviewed utilizing auditing software to help ensure compliance to ethics and manual integration policies. 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

19.14.4.3 Unacceptable analytical results may require reanalysis of the samples. Any problems are brought to the attention of the Laboratory Director, Project Manager, Quality Assurance Director/Manager, Technical Manager, or Supervisor for further investigation. Corrective action is initiated whenever necessary.

19.14.4.4 The results are then entered or directly transferred into the computer database and a hard copy (or .pdf) is printed for the client.

19.14.4.5 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.

19.14.4.6 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.

19.14.4.7 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) as the guideline.

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 to 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 principals 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

TestAmerica

Pittsburgh Lab Analyst Demonstration of Capability

Certification Statement

Loheyde, Cheryl

Date: 21-Nov-07

420.4 - Total Phenolics(420.4, Semiautomated Colorimetric)
SOP: PT-WC-038, Rev.5
Matrix: Water

STL - Pittsburgh laboratory
301 Alpha Drive
Pittsburgh, PA 15238
(412) 963-7058

We, the undersigned, CERTIFY that:

1. The analyst identified above, using the cited test method with the specifications in the cited SOP, which is in use at this facility for the analysis of samples under the STL Quality Assurance Plan, has met the Initial or Ongoing Demonstration of Capability.
2. The test method was performed by the analyst identified on this certification following the STL SOP.
3. A copy of the laboratory-specific SOP is available for all personnel on-site.
4. The data associated with the initial/ongoing demonstration of capability are true, accurate, complete and self-explanatory (*). These data are attached to this certification statement.
5. All raw data (including a copy of this certification form) necessary to reconstruct and validate these analyses have been retained at the facility, and that the associated information is well organized and available for review by authorized inspectors.

Comments/Observations:

Loheyde, Cheryl		
Analyst's Name	Signature	Date
Larry Matko		
Technical Director's Name	Signature	Date
Nasreen DeRubeis		
QA Manager's Name	Signature	Date

* *True: Consistent with supporting data.*
Accurate: Based on good laboratory practices consistent with sound scientific principles/practices..
Complete: Includes the results of all supporting performance testing.
Self-explanatory: Data properly labeled and stored so that the results are traceable and require no additional explan

11/21/2007 *Page 1 of 2*

TestAmerica

Pittsburgh Lab Analyst Demonstration of Capability

Certification Statement

Loheyde, Cheryl

Date: 21-Nov-07

420.4 - Total Phenolics(420.4, Semiautomated Colorimetric)
SOP: PT-WC-038, Rev.5
Matrix: Water

LCS analyzed on 9/6/2007 in a Water matrix (Batch No. 7249019).

	Result	Spike	Recovery	StDev	RSD	LCL	UCL	
Phenolics, Total Recoverable	.187 mg/L	.200 mg/L	93.5	10.12	9.95	75	125	ok

LCS analyzed on 8/27/2007 in a Water matrix (Batch No. 7235483).

	Result	Spike	Recovery	StDev	RSD	LCL	UCL	
Phenolics, Total Recoverable	.233 mg/L	.200 mg/L	116.5	10.12	9.95	75	125	ok

LCS analyzed on 8/29/2007 in a Water matrix (Batch No. 7240390).

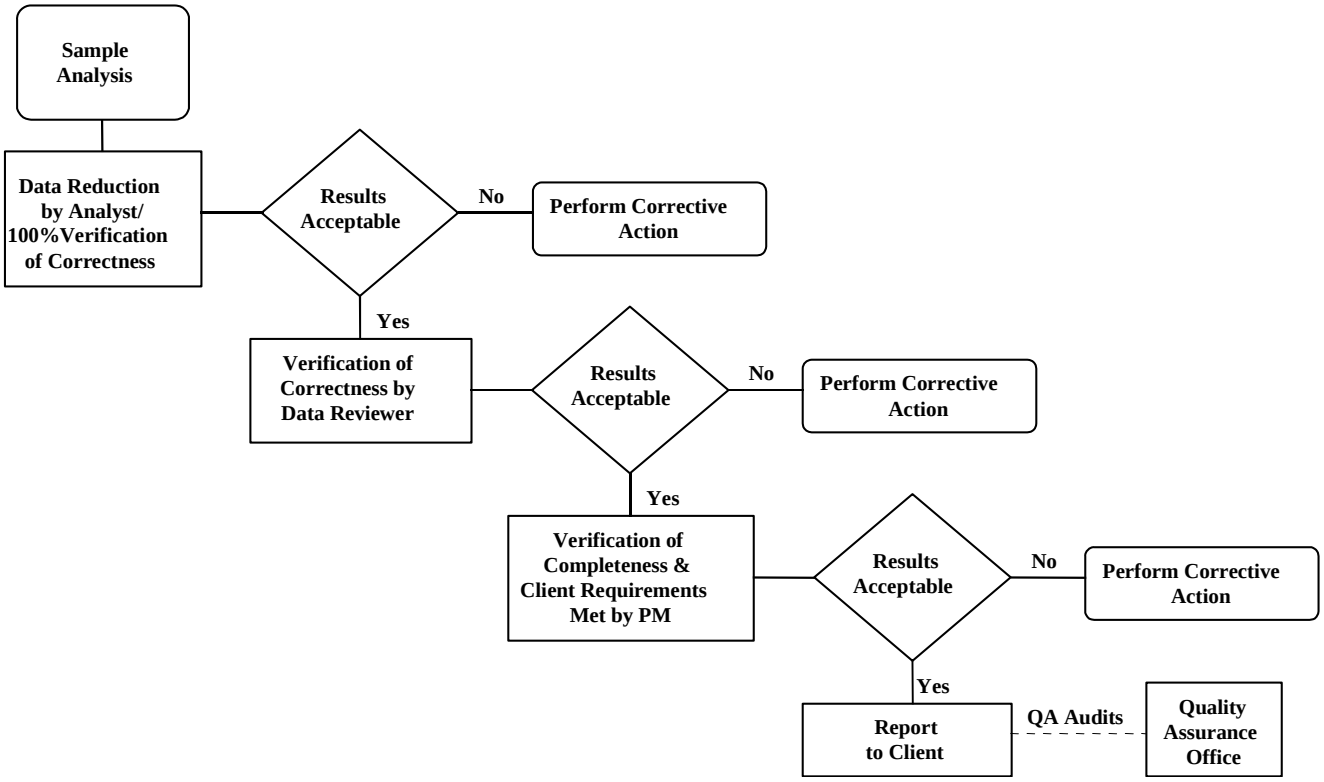
	Result	Spike	Recovery	StDev	RSD	LCL	UCL	
Phenolics, Total Recoverable	.198 mg/L	.200 mg/L	99	10.12	9.95	75	125	ok

LCS analyzed on 9/13/2007 in a Water matrix (Batch No. 7254345).

	Result	Spike	Recovery	StDev	RSD	LCL	UCL	
Phenolics, Total Recoverable	.196 mg/L	.200 mg/L	98	10.12	9.95	75	125	ok

Figure 19-2

Work Flow



SECTION 20

EQUIPMENT (AND CALIBRATIONS) *(NELAC 5.5.5)*

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. Manufacturers instructions for equipment use are readily accessible to all appropriate laboratory personnel.

20.2 PREVENTIVE MAINTENANCE

20.2.1 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.

20.2.2 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.

20.2.3 Table 20-2 through 20-14 lists examples of scheduled routine maintenance. It is the responsibility of each Department 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.)

20.2.4 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.

20.2.4.1 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.

20.2.4.2 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.

20.2.4.3 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.

20.2.5 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.

20.2.6 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.

20.2.7 If an instrument is sent out for service or transferred to another facility, it must be recalibrated and verified (including new initial MDL study) 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. Refer to SOP No. PT-QA-012 for balance and weight calibration.

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. IR thermometers, digital probes and thermocouples are calibrated quarterly.

The 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 thermometer calibration SOP No. PT-QA-013.

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. (Sample storage is monitored 7 days a week for DoD labs).

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 or electronically. Refer to SOP No. PT-QA-008 for temperature monitoring.

20.3.5 Autopipettors, Dilutors, and Syringes

Mechanical volumetric dispensing devices including burettes (except Class A Glassware) are given unique identification numbers and the delivery volumes are verified gravimetrically, at a minimum, on a quarterly basis. Glass micro-syringes are considered the same as Class A glassware.

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. Pipette calibration is described in Pittsburgh SOP No. PT-QA-017.

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 autoclave is used for mercury digestion of samples. The autoclave cycle time, temperature and pressure is documented on the mercury digestion sheet.

20.3.7 Field Sampling Devices (Isco Auto Samplers)

Each Auto Sampler (ISCO) is assigned a unique identification number in order to keep track of the calibration. This number is also recorded on the sampling documentation.

The Auto Sampler is calibrated semiannually by setting the sample volume to 100ml and recording the volume received. The results are filed in a logbook/binder. The Auto Sampler is programmed to run three (3) cycles and each of the three cycles is measured into a graduated cylinder to verify 100ml are received.

If the RSD (Relative Standard Deviation) between the 3 cycles is greater than 10%, the procedure is repeated and if the result is still greater than 10%, then the Auto Sampler is taken out of service until it is repaired and calibration verification criteria can be met. The results of this check are kept in a logbook/binder.

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 (the annual requirement does not apply to Isotope dilution).

20.4.1 CALIBRATION STANDARDS

20.4.1.1 Calibration standards are prepared using the procedures indicated in the Reagents and Standards section of the determinative method SOP.

20.4.1.2 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.

20.4.1.3 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).

20.4.1.4 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 would be considered a second source. This verification occurs immediately after the calibration curve has been analyzed, and before the analysis of any samples.

20.4.2 Calibration Verification

The calibration relationship established during the initial calibration must be verified at least daily as specified in the laboratory method SOPs in accordance with the referenced analytical methods and NELAC (2003) standard, Section 5.5.5.10. 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.

Note: The process of calibration verification referred to 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.

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 (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).

20.4.2.1 Verification of 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.

20.4.2.2 Verification of a Non-Linear Calibration

Calibration verification of a non-linear calibration is performed using the percent drift or percent recovery calculations.

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.

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

Instrumentation/Equipment List

Instrument Type	Manufacturer	Model Number	Serial Number	Year Put into Service	Condition When Received
GC w/ Dual ECD	Hewlett-Packard Lab ID: GC1	6890	US00024872	1998	
GC w/ Dual ECD with EPC	Hewlett-Packard Lab ID: GC2	5890A	3235A48356	1991	
GC w/ Dual ECD	Hewlett-Packard Lab ID: GC3	5890II	2618A07923	2005	Used
GC w/ Dual ECD	Hewlett-Packard Lab ID: GC4	5890E	3118A35332	1989	
GC w/ Dual NPD	Hewlett-Packard Lab ID: GC5	6890A	US00025516	1998	
GC w/ Dual FPD	Hewlett-Packard Lab ID: GC6	6890N	US10145113	2001	
GC w/ Dual ECD	Hewlett-Packard Lab ID: GC8	6890	US00023401	1998	
GC w/ Dual ECD	Hewlett-Packard Lab ID: GC10	6890N	US10145114	2001	
GC w/ Dual ECD	Hewlett-Packard Lab ID: GC12	6890N	US10237038	2002	
GC w/ Dual ECD	Hewlett-Packard Lab ID: GC14	6890	US00026141	2005	Used
GC w/ Dual ECD	Hewlett-Packard Lab ID: GC15	6890N	US10403014	2006	Used
GC w/ Dual ECD	Hewlett-Packard Lab ID: old GC3	5890II	2950A27000	2001	
HPLC (UV and Fluorescence)	Hewlett-Packard Lab ID: GC7	1100	US53600346	1998	
Balance	Mettler Lab ID: 119696	AE200	119696		
Hydrogen Generator	Parker Balston			2005	
Hydrogen Generator	Parker Balston	H2-800	H2800104C	2006	
Nitrogen Generator	Parker Balston			2005	
GC/MS	Hewlett-Packard Lab ID: HP3	6890 (GC) 5973 (MSD)	US00009844 (GC) US72020964 (MSD)	1997	New
Concentrator	OI Analytical	Eclipse	D617466100P	2006	New
GC/MS	Hewlett-Packard	6890 (GC)	US00010799 (GC)	1998	New

Instrument Type	Manufacturer	Model Number	Serial Number	Year Put into Service	Condition When Received
	Lab ID: HP4	5973 (MSD)	US72821085 (MSD)		
Concentrator	OI Analytical	Eclipse	D616466032P	2006	New
GC/MS	Hewlett-Packard Lab ID: HP5	6890 (GC) 5973 (MSD)	US00023292 (GC) US82322212 (MSD)	1998	New
Concentrator	OI Analytical	Eclipse	D616466026P	2006	New
GC/MS	Hewlett-Packard Lab ID: HP6	6890 (GC) 5973 (MSD)	US00030465 (GC) US92522786 (MSD)	1999	New
Concentrator	OI Analytical	Eclipse	B414466952P	2006	New
GC/MS	Hewlett-Packard Lab ID: HP7	6890 (GC) 5973 (MSD)	US00028345 (GC) US91411730 (MSD)	2005	Used
Concentrator	OI Analytical	Eclipse	D617466098P	2006	New
GC/MS	Hewlett-Packard Lab ID: HP8	6890 FID	US00001295 (GC) 3526I01420 (Headspace)	2001	New
Oven	Fisher Scientific Lab ID: VOA Glassware Oven	625G	503N0042	2005	New
Balance	Sartorius Lab ID: 40019078	B120S	40019078		
GC/MS	Hewlett-Packard Lab ID: 71	6890 (GC) 5973 (MSD)	US00029391 (GC) US91422511 (MSD)	1999	New
GC/MS	Hewlett-Packard Lab ID: 722	6890 (GC) 5973 (MSD)	US00029396 (GC) US91922512 (MSD)	1999	New
GC/MS	Hewlett-Packard Lab ID: 731	6890 (GC) 5973 (MSD)	US00031329 (GC) US93112052 (MSD)	2000	New
GC/MS	Hewlett-Packard Lab ID: 732	6890N (GC) 5973 (MSD)	CN10426047 (GC) US41746674 (MSD)	2004	New
GC/MS	Hewlett-Packard Lab ID: 733	6890 (GC) 5972 (MSD)	US91411735 (MSD) US00028233 (GC)	2005	Used
GC/MS	Hewlett-Packard Lab ID: APEX	6890 (GC) 5973 (MSD)	US 71410457 (MSD) US00007984 (GC)	2002	Used
GC/MS	Hewlett-Packard Lab ID: MSD7	6890 (GC) 5972 (MSD)	US80210935 (MSD) DE00020249 (GC)	2002	Used
ICP	Thermo Fisher Lab ID: TRACEICP	61E Trace	209390	1993	New
ICP	Thermo Fisher Lab ID: 6500	6500	ICP-20074812	2008	New
ICP/MS	Thermo Electron Lab ID: ICPMS	X-Series ICPMS	X0225	2003	New
ICP/MS	Thermo Electron Lab ID: ICPMS2	X Series ICPMS	X0344	2006	Used
Mercury Analyzer	Leeman Labs Lab ID: HGHYDRA	Hydra	3009	2003	New
Mercury Analyzer	Leeman Labs Lab ID: PS200HG	PS 200 II	HG9007	1999	New

Instrument Type	Manufacturer	Model Number	Serial Number	Year Put into Service	Condition When Received
Autoclave	Consolidated Stills & Sterilizers Lab ID: Hg Autoclave	L-Y	1392	1992	
Waterbath	Fisher Scientific Lab ID: Hg Waterbath	Isotemp 228	011N0286	2004	New
Metals Digestion Block	Environmental Express Lab ID: H_2O #1	Hot Block		2003	New
Metals Digestion Block	Environmental Express Lab ID: H_2O #2	Hot Block		2003	New
Metals Digestion Block	Environmental Express Lab ID: H_2O #3	Hot Block		2000	New
Metals Digestion Block	Environmental Express Lab ID: H_2O #4	Hot Block		2003	New
Metals Digestion Block	Environmental Express Lab ID: H_2O #5	Hot Block		2003	New
Metals Digestion Block	Environmental Express Lab ID: H_2O #6	Hot Block		2000	New
Metals Digestion Block	Environmental Express Lab ID: Soil #1	Hot Block		2003	New
Metals Digestion Block	Environmental Express Lab ID: Soil #2	Hot Block		2003	New
Metals Digestion Block	Environmental Express Lab ID: Soil #3	Hot Block		2003	New
Metals Digestion Block	Environmental Express Lab ID: Soil #4	Hot Block		2003	New
Metals Digestion Block	Environmental Express Lab ID: Soil #5	Hot Block		2003	New
Metals Digestion Block	Environmental Express Lab ID: Soil #6	Hot Block		2003	New
Balance	AND Lab ID: P1856709	EK-610I	P1856709	2008	New

Instrument Type	Manufacturer	Model Number	Serial Number	Year Put into Service	Condition When Received
Balance	AND Lab ID: P1856710	EK-610I	P1856710	2008	New
Ion Chromatograph	Dionex	IC 25	00040396	2000	New
Ion Chromatograph	Dionex	ICS 2000	08050561	2008	New
Autoanalyzer	OI Analytical (Test: 350.1)	Alpkem Flow Solution IV	928893438	1998	New
Autoanalyzer	OI Analytical (Test: 353.2)	Alpkem Flow Solution IV	928893439	1998	New
UV/VIS	Milton Roy	Genesys5	3V08239002	2003	Used
UV/VIS	Milton Roy	SPEC-21D	3155215007	1994	New
UV/VIS	Thermo Electron Corp. (Test: 3060A/7196A)	GENESYS 10 335900-000	2D5K278001	2007	New
Midi Distillation Blocks	Westco Scientific	Easy Dist		2000	New
Midi Distillation Blocks	Westco Scientific	Easy Dist		2000	New
Midi Distillation Blocks	Westco Scientific	Easy Dist		2001	New
Midi Distillation Blocks	Westco Scientific	Easy Dist		2005	New
pH meter	Fisher Scientific	AR25	AR93315378	2004	New
pH meter	Fisher Scientific	AR25	AR93312320	1990	New
pH meter	Fisher Scientific	AR25	AR 81202030	2003	New
pH meter	Fisher Scientific	XL25	94003394	2007	New
Autotitrator	Man-Tech Associates (Test: pH, Specific Conductance, Alkalinity, Hardness, Fluoride, and Acidity	PC-Titration Plus	MS0A3-329	2003	New
MultiMeter	Myron L Co.	Ultrameter 6P	616555		New
Oven	Thermolyne	6000			New
Oven	Blue M Electric Co. Lab ID: Oven #2	OV-18A	OV1-15300		New
Oven	Fisher Scientific Lab ID: OV02	Isotemp 630G	001O0035		New
Oven	Precision Scientific Lab ID: OV08	18EG	10AV-9		New
Oven	Fisher Lab ID: ZHE Oven	Isotemp Oven Model 301			

Instrument Type	Manufacturer	Model Number	Serial Number	Year Put into Service	Condition When Received
COD Reactor	HACH	DRB200	1131194	2005	New
COD Reactor	HACH	45600	020300022933	2002	New
TOC Analyzer	OI Analytical Lab ID: 1010	1010	5108710555	2001	New
TOC Analyzer	OI Analytical Lab ID: 1030	Aurora 1030	E717730273	2007	New
TOC (Lloyd Khan Method) Analyzer	Thermo Electron Corp.	Flash EA 112 MAS 200R NC Soil Analyzer	20057159-20057135	2006	New
Autoanalyzer	Thermo Clinical Labsystems Lab ID: KONELAB-1 (Tests:9012/420.2/420.4/9066/SM 4500 CL E/410.4)	Aqua 200	A0619933	2005	New
Method 1677 Autoanalyzer	OI Analytical FS3000	A0001604	135804017	2001	New
Method 1677 Autoanalyzer	OI Analytical FS3000	A0001604	120804293	2007	Used
BOD Meter	YSI	52	03L0794	2004	New
BOD Meter	YSI	50B	91K033593	2003	New
Flashpoint Tester	Rapid Tester Lab ID: SETA-1	RT-00001	024149	2002	New
Flashpoint Tester	Petrotest Pensky Martin	PMA-4	0741043006	2004	New
Flashpoint Tester	Fisher Scientific	K-16200	2501		
Turbidimeter	HF Scientific Inc.	Micro 100	105034		
Speed Vap II	Horizon	Speed Vap # 9000	01-0333	2001	New
Speed Vap II	Horizon	Speed Vap # 9000	01-0332	2001	New
Hotplate	Thermolyne Lab ID: #2	Cimarec 3	611941237080		Used
Hotplate	Thermolyne Lab ID: #3	Cimarec 3	1073390872643		Used
Hotplate	Thermolyne Lab ID: #1	Cimarec 3	1073010868586	2005	New
Waterbath	Thermo Electron Corp.	Precision 2872	202471	2007	New
Centrifuge	Damon/IEC Division Lab ID: CENT-3	CU-5000	33473227		
Balance	Mettler Lab ID: 1126472457	PB602	1126472457	2005	New
Balance	Sartorius Lab ID: 37110039	A210P	37110039	2003	New

Instrument Type	Manufacturer	Model Number	Serial Number	Year Put into Service	Condition When Received
Balance	Mettler Lab ID: G76383	AE240	G76383		
Balance	Fisher Lab ID: 25606	S-400	25606		
Balance	Mettler Lab ID: AB204S	AB204S	1126020829	2005	New
Balance	A & D Lab ID: GR-200	GR-200	14224939	2007	New
Sonicator	Fisher Scientific	550 Sonic Dismembrator	F2099	1985	
Concentrator	Meyer	N-Evap 112	5376		
Concentrator	Meyer	N-Evap 115	9217		
Concentrator	Horizon Lab ID: 1	Dry Vap	227253	2006	New
Concentrator	Horizon Lab ID: 2	Dry Vap	227254	2006	New
Concentrator	Horizon Lab ID: 3	Dry Vap	227255	2006	New
Concentrator	Horizon Lab ID: 4	Dry Vap	227256	2006	New
Gel Permeation Chromatograph	J2 Scientific	Autoinject 110	084/12298	2001	
Soxtherm Extractor	Gerhardt Lab ID: 1	SE-3A/S306A	4012404	2002	New
Soxtherm Extractor	Gerhardt Lab ID: 7	SE-3A/S306A	4012399	2002	New
Soxtherm Extractor	Gerhardt Lab ID: 6	SE-3A/S306A	4012398	2002	New
Soxtherm Extractor	Gerhardt Lab ID: 5	SE-3A/S306A	4012403	2002	New
Soxtherm Extractor	Gerhardt Lab ID: 4	SE-3A/S306A	4012402	2002	New
Soxtherm Extractor	Gerhardt Lab ID: 2	SE-3A/S306A	4012401	2002	New
Soxtherm Extractor	Gerhardt Lab ID: 3	SE-3A/S306A	4012400	2002	New
Soxtherm Extractor	Gerhardt Lab ID: 8	SE-3A/S306A	4002039	2002	New
Soxtherm Extractor	Gerhardt Lab ID: 9	SE-3A/S306A	4020237	2007	Used
Electric Kiln	Cress	FTX-27P	46053	1992	
Electric Oven	Wilt Industries	A85		1999	
TCLP Tumbler	Associated Design & Manufacturing Co. Lab ID: T-8	6004-0590	1788		

Instrument Type	Manufacturer	Model Number	Serial Number	Year Put into Service	Condition When Received
ZHE Rotator	Associated Design & Manufacturing Co. Lab ID: Z1	3740-8-BRE	1223		
ZHE Rotator	Bodine (Associated Design) Lab ID: Z2	362RA9018			
ZHE Rotator	Bodine Electric Co. Lab ID: Z3/Z5	42R5BFC1-E3			
ZHE Rotator	Bodine (Associated Design) Lab ID: Z4	34R4BFC1-5R			
TCLP Tumbler	Environmental Express Lab ID: T6		3209-12-466		
TCLP Tumbler	Environmental Express Lab ID: T7		3209-12-467		
TCLP Tumbler	Environmental Express Lab ID: T9		3209-12-463		
TCLP Tumbler	Dayton (motor) Lab ID: T1	2Z794D			
TCLP Tumbler	Dayton (motor) Lab ID: T2	5K939E			
TCLP Tumbler	Dayton (motor) Lab ID: T3	5K939B			
TCLP Tumbler	Dayton (motor) Lab ID: T5	5K939B			
pH Meter	Accumet	AR25			
Balance	A & D Lab ID: 14628771	GF6000	14628771		
Balance	A & D Lab ID: 11684	GX4000	14536813		
Balance	Mettler Lab ID: 1120122641	PB8001S	1120122641		
Hot Plate	Thermodyne Lab ID: TCLP Hot Plate	2200			
Centrifuge	Beckman	J6-M	8749	2007	New
Centrifuge	Beckman	J6-M	8551	2007	New
Centrifuge	Thermo Electron Corp. Lab ID: Cent-1	K	71654833		
Centrifuge	Thermo Electron Corp	K	71654125		

Instrument Type	Manufacturer	Model Number	Serial Number	Year Put into Service	Condition When Received
	Lab ID: Cent-2				
Method 1664A UCT Cartridge	Enviro-Clean	ENUCNIOGXF	UCT #1	2009	New
Oil-Less Vacuum Pump for UCT Cartridge System	Rocker (110V, 60 Hz)	400	TGTJ094	2009	New

Tables 20-2 - 20-14. Schedule of Routine Maintenance

Table 20-2

Inductively Coupled Argon Plasma/Mass Spectrometry (ICP/MS) Instrument Maintenance Schedule

Daily	Weekly	Monthly	Quarterly	Annually	As Needed
Check sample waste container level.	Check peristaltic pump: proper roller pressure, sample introduction tubing, correct pump rotation, and condition of drain tubing.	Clean all filters and fans.	Replace oil in roughing pumps.	Replace oil in turbo-molecular pump.	Check electronic settings for optimum sensitivity: resolution, mass calibration, ion optics, CEM, deflector voltage.
Check quartz torch condition.	Check condition of sampler and skimmer cones.	Check recirculator water level.			
Measure quartz torch for proper alignment.	Check and drain oil mist eliminator on roughing pumps.				
Clean spray chamber and nebulizer.					
Check oil level of roughing pumps.					

Table 20-3

ICP Instrument Maintenance Schedule

Daily	Monthly or As Needed	Semi-annually	Annually
Check gases Check that argon tank pressure is 50-60 psi and that a spare tank is available. Check aspiration tubing	Clean plasma torch assembly to remove accumulated deposits.	Change vacuum pump oil.	Notify manufacturer service engineer for scheduled preventive maintenance service.
Check vacuum pump gage. (<10 millitorr)	Clean nebulizer and drain chamber; keep free flowing to maintain optimum performance.	Replace coolant water filter. (may require more or less frequently depending on the quality of water)	
Check that cooling water supply system is full and drain bottle is not full. Also that drain tubing is clear, tight fitting and has few bends.	Clean filters on back of power unit to remove dust.		
Check that nebulizer is not clogged.	Replace when needed: peristaltic pump tubing sample capillary tubing autosampler sipper probe		
Check that capillary tubing is clean and in good condition.	Check yttrium position.		

Table 20-3

ICP Instrument Maintenance Schedule

Daily	Monthly or As Needed	Semi-annually	Annually
	Check O-rings Clean/lubricate pump rollers.		
Check that peristaltic pump windings are secure.			
Check that high voltage switch is on.			
Check that exhaust screens are clean.			
Check that torch, glassware, aerosol injector tube, bonnet are clean.			

Table 20-4

Cold Vapor Atomic Absorption (Leeman PS 200) Instrument Maintenance Schedule

Daily	As Needed	Annually
Change drying tube	Change pump tubing	Change Hg lamp.
Check pump tubing/drain tubing	Check/change Hg lamp	
Check gas pressure	Clean optical cell	
Check aperture reading Check tubing	Lubricate pump	

Table 20-5

Gas Chromatograph Instrument Maintenance Schedule

Daily	As Needed	Quarterly/Semi-annually/Annually
Check for sufficient supply of carrier and detector gases. Check for correct column flow and/or inlet pressures.	Replace front portion of column packing or break off front portion of capillary columns. Replace column if this fails to restore column performance or when column performance (e.g. peak tailing, poor resolution, high backgrounds, etc.) indicates it is required.	Quarterly ELCD: change-roughing resin, clean cell assembly. Quarterly FID: clean detector
Check temperatures of injectors and detectors. Verify temperature programs.	Change glass wool plug in injection port and/or replace injection port liner when front portion of column packing is changed or front portion of capillary column is removed.	Semi-annually ECD: perform wipe test.
Check inlets, septa. Replace septum Clean injector port		Annually ELCD: change finishing resin, clean solvent filter. Annually FID: Replace flame tip ECD: detector cleaning and re-foiling, every five years or whenever loss of sensitivity, or erratic response or failing resolution is observed.
Check baseline level.	Perform gas purity check (if high baseline indicates that impure carrier gas may be in use).	
Check reactor temperature of electrolytic conductivity detector.	Replace or repair flow controller if constant gas flow cannot be maintained.	
	Replace fuse.	
Inspect chromatogram to verify symmetrical peak shape and adequate resolution between closely eluting peaks.	Reactivate external carrier gas dryers.	
	Detectors: clean when baseline indicates	

Table 20-5

Gas Chromatograph Instrument Maintenance Schedule

Daily	As Needed	Quarterly/Semi-annually/Annually
Clip column leader	contamination or when response is low. FID: clean/replace jet, replace igniter. NPD: clean/replace collector assembly. PID: clean lamp window monthly or replace as needed, replace seals. ELCD: check solvent flow weekly, change reaction tube, replace solvent, change reaction gas, clean/replace Teflon transfer line. ECD: follow manufacturers suggested maintenance schedule	
	Reactivate flow controller filter dryers when presence of moisture is suspected.	
	HP 7673 Autosampler: replace syringe, fill wash bottle, dispose of waste bottle contents.	
	Purge & trap devices: periodic leak checks quarterly, replace/condition traps (when poor response or disappearance of reactive or poorly trapped compounds), clean sample lines, valves (if they become contaminated), clean glassware. Clean sparger weekly. Check purge flow monthly. Bake trap as needed to correct for high background. Change trap annually, or as needed whenever loss of sensitivity, or erratic response or failing resolution is observed.	
	Purge & trap autosamplers: leak check system, clean sample lines, valves. PTA-30 autosampler also requires cleaning the syringes, frits, valves, and probe needles, adjustment of micro switches, replacement of Teflon valve, and lubrication of components.	

Table 20-6

Mass Spectrometer Instrument Maintenance Schedule

Daily	Weekly	As Needed	Quarterly	Semi-Annually	Annually
Check for sufficient gas supply. Check for correct column flow and/or inlet pressure.	Check mass calibration (PFTBA or FC-43)	Check level of oil in mechanical pumps and diffusion pump if vacuum is insufficient. Add oil if needed between service contract maintenance.	Check ion source and analyzer (clean, replace parts as needed)		Replace the exhaust filters on the mechanical rough pump every 1-2 years.
Check temperatures of injector, detector. Verify temperature programs.		Replace electron multiplier when the tuning voltage approaches the maximum and/or when sensitivity falls below required levels.	Check vacuum, relays, gas pressures and flows	Clean rods	
Check inlets, septa.		Clean Source, including all ceramics and lenses - the source cleaning is indicated by a variety of symptoms including inability of the analyst to tune the instrument to specifications, poor response,	Change oil in the mechanical rough pump. Relubricate the turbomolecular pump-bearing wick.		

Table 20-6

Mass Spectrometer Instrument Maintenance Schedule

Daily	Weekly	As Needed	Quarterly	Semi-Annually	Annually
		and high background contamination.			
Check baseline level.		Repair/replace jet separator.			
Check values of lens voltages, electron multiplier, and relative abundance and mass assignments of the calibration compounds.		Replace filaments when both filaments burn out or performance indicates need for replacement.			

Table 20-7

High Pressure Liquid Chromatograph Instrument Maintenance Schedule

Daily	As Needed
Check level of solution in reservoirs. If adding, verify that solvent is from the same source. If changing, rinse gas and delivery lines to prevent contamination of the new solvent.	Replace columns when peak shape and resolution indicate that chromatographic performance of column is below method requirements.
Check gas supply.	Oil autosampler slides when sample does not advance.
Flush with an appropriate solvent to remove all bubbles.	Rinse flow cell with 1N nitric acid if sensitivity low.
Pre-filter all samples.	Change pump seals when flow becomes inconsistent.
	Repack front end of column Backflush column.

Table 20-8

Wet Chemistry and Support Equipment Maintenance Schedule

Equipment	Daily	Monthly	Annually	As Needed
Sonicator	Daily when used: Inspect probe tips for inconsistencies (etching/pitting).		Tune sonicator assembly	Disassemble and clean sonicator probe tips. Replace probe tip.
Analytical/Top Loading Balance	Check using Class S or Class 1 verified weights once daily or before use Clean pan and weighing compartment		Manufacture r cleaning and calibration.	
Refrigerators/Walk-In Coolers	Temperatures checked and documented.			Refrigerant system and electronics serviced.
Ovens	Temperatures checked and documented.			Electronics serviced.
pH Meter	Inspect electrode. Verify electrodes are properly connected and filled. Inspect electrode proper levels of filling solutions. Make sure electrode is stored in buffer (pH 4.0).			Clean electrode. Refill reference electrode
Specific Digital Ion Analyzer	Daily when used: Calibrate with check standards. Inspect electrode daily, clean as needed. Inspect electrode proper levels of filling solutions daily, fill as needed. Clean probe, each use.			Electronics serviced.

Table 20-8

Wet Chemistry and Support Equipment Maintenance Schedule

Equipment	Daily	Monthly	Annually	As Needed
Turbidimeter	Daily when used: Adjust linearity on varying levels of NTU standards. Standardize with NTU standards. Inspect cells.	Clean instrument housing		Electronics serviced.
Dissolved Oxygen Meter	Daily when used: Calibrate with check standards. Check probe membrane for deterioration. Clean and replace membrane with electrode solution.			Electronics serviced.
Conductance Meter	Daily when used: Check probe and cables. Standardize with KCl. Inspect conductivity cell			Electronics serviced.
Chemical Oxygen Demand (COD) Reactor	Daily when used: Calibrate with check standards.			Electronics serviced.
Spectrophotometer	Check the zero %A adjustment. Clean sample compartment. Clean cuvettes.	Clean windows	Check instrument manual. Perform wavelength calibration. Replace lamp annually or	Dust the lamp and front of the front lens

Table 20-8

Wet Chemistry and Support Equipment Maintenance Schedule

Equipment	Daily	Monthly	Annually	As Needed
			when erratic response is observed. Clean and align optics.	
Digestion Block			Check temperature with NIST thermometer	
Flash Point Tester	Check tubing. Clean sample cup each use. Check gas. Clean flash assembly. Check stirrer		Check thermometer against NIST thermometer, when used.	
Zero Headspace Extractors	Verify rotation speed and record. Check for leakage			Vendor repair
TCLP Extractors	Verify rotation speed and record.			

Table 20-9

AlpChem Auto Analyzer Instrument Maintenance Schedule

As Needed	Daily	Monthly	Bi-monthly	Annually
Prepare fresh reagents.	Check detector and make sure there are no trapped bubbles in detector cell.	Replace tubing.	Lubricate pump roller.	Clean pump rollers with steel wool and lubricate.
	Check Valves			
	Check Reference source			
Replace pump tubing	Check peristaltic tubing and rollers. Check sampler	Clean pump, diluter, and XYZ Sampler.		
	Clean sample probe shaft.			

Table 20-10

Alpkem FS3000 (1677 Available Cyanide) Instrument Maintenance Schedule

As Needed	Daily	Monthly	Bi-monthly
Prepare fresh reagents.	Clean detector cell and make sure there are no trapped bubbles in lines.	Replace tubing.	Lubricate pump roller Replace Diffusion Membrane
Replace pump tubing	Check peristaltic tubing and rollers.		Clean Reference Electrode
			Replace Reference solution

Table 20-11

Konelab Instrument Maintenance Schedule

Daily	Weekly	Monthly
Run “Start Up”	Empty liquid waste	Restore adjustments from disk
Review water check	Clean wash wells and tubing to waste	Save database to CD
Empty waste bin	Check for chemical residue	Print – then delete messages
Fill diluent with fresh DI water	Clean off any chemical residue	Print – Water Check
Check waste container	Check syringe plunger Teflon tip	Run Dichromate test at 480nm
Run “Stand By”	Run Dichromate test at 480 nm	Clean and Lube incubator rod
Print or save results to file	Reboot computer	Clean and Lube fetcher rod
Clear daily files		
Clean incubator		

Table 20-12
Ion Chromatograph Instrument Maintenance Schedule

As Needed	Daily	Weekly	Monthly	Semi-annually
Clean micromembrane suppressor when decreases in sensitivity are observed.	Check plumbing/leaks.	Check pump heads for leaks.	Check all air and liquid lines for discoloration and crimping, if indicated.	Lubricate left hand piston.
Check fuses when power problems occur.		Check filter (inlet)	Check/change bed supports guard and analytical columns, if indicated.	Clean conductivity cell.
Reactivate or change column when peak shape and resolution deteriorate or when retention time shortening indicates that exchange sites have become deactivated.	Check pump pressure.			Check conductivity cell for calibration.
De-gas pump head	Check			

Table 20-12
Ion Chromatograph Instrument Maintenance Schedule

As Needed	Daily	Weekly	Monthly	Semi-annually
when flow is erratic.	conductivity meter.			

Table 20-13

Total Organic Carbon Analyzer Instrument Maintenance Schedule

Daily	As Needed	Weekly	Monthly	Semi-Annually
Check: Oxygen supply Persulfate supply Acid supply Carrier gas flow rate (~ 150 cc/min) IR millivolts for stability (after 30 min. warm-up) Reagent reservoirs	Check injection port septum after 50-200 runs. Tube end-fitting connections after 100 hours or use. Indicating drying tube. NDIR zero, after 100 hours of use. Sample pump, after 2000 hours for use. Digestion vessel/condensation chamber, after 2000 hours of use. Permeation tube, after 2000 hours of use. NDIR cell, after 2000 hours of use.	Check liquid-flow-rate-pump-tubing conditions on autosampler Check injection port septum	Clean digestion vessel Clean condenser column Do the leak test	Change pump tubing

Note: Refer to manufacturer's instructions for each equipment to identify and perform maintenance operations.

Table 20-14.

Periodic Calibration

Instrument	Type of Calibration/ Number of Standards	Frequency	Acceptance Limits	Corrective Action
Analytical Balance	Accuracy determined using NIST traceable weights. Minimum of 2 standards bracketing the weight of interest. Inspected and calibrated by an approved vendor annually.	Daily	± 0.1% or ± 0.5mg, whichever is larger unless method specific guidance exists.	Clean, check level, insure lack of drafts, and that unit is warmed up, recheck. If fails, call service.
Top Loading Balance	Accuracy determined using-NIST traceable weights. Minimum of 2 standards bracketing the weight of interest. Inspected and calibrated by an approved vendor annually.	Daily	± 0.5%	Clean. Replace.
Weights (NIST Traceable – non Class 1)	Accuracy determined against NIST Traceable Class 1 weights.	1 year	As per certificate.	Replace.
Weights (NIST Traceable – Class 1)	Accuracy determined by an approved vendor.	3 Years	As per certificate.	Replace.
NIST-Traceable Thermometer	Accuracy determined by an approved weights and measurement laboratory.	5 years	As per certificate.	Replace.

Instrument	Type of Calibration/ Number of Standards	Frequency	Acceptance Limits	Corrective Action
Thermometer	Against NIST-traceable thermometer	Yearly at appropriate temperature range for intended use	± 1.2°C	Replace
Minimum-Maximum Thermometers	Against NIST-traceable thermometer	Yearly	± 1.5°C	Replace
InfraRed Temperature Guns	Against NIST-traceable thermometer	Quarterly at appropriate temperature range for intended use.	± 1.5°C	Repair/replace
Digital Thermometer	Against NIST-traceable thermometer - at two temperatures that bracket target temperature(s); if only a single temperature is used, at the temperature of use	NELAC Annually - DoD requires Quarterly at appropriate temperature range for intended use.	± 1.5°C	Repair/replace
Dial-type Thermometers	Against NIST-traceable thermometer	Quarterly at appropriate temperature range for intended use.	± 1.5°C	Replace
Refrigerator	Temperature checked using NIST-traceable thermometer. Thermometer must be immersed in a liquid such as mineral oil or glycol.	Daily. If out of range, check again in two hours.	4.0 ± 2°C	Adjust. Repair. While waiting for repair, seal door, attach “Out of Service” sign, move items to functional unit. Notify Team Leader.
Freezer	Temperature checked using NIST-traceable thermometer	Daily. If out of range, check again in two hours.	(-10) to (-20)°C	Adjust. Repair. While waiting for repair, seal door, attach “Out of Service” sign, move items to functional unit. Notify Team Leader.

Instrument	Type of Calibration/ Number of Standards	Frequency	Acceptance Limits	Corrective Action
Oven	Temperature checked using NIST-traceable thermometer.	When in use.	Compliance with method specific requirements or within ± 5% of set temperature 104 ± 1°C (drying) 180 ± 2°C (TDS)	Adjust. Replace.
Incubator	Temperature checked using NIST-traceable thermometer.	When in use.	BOD: 20 ± 1.0°C	Adjust. Replace.
Water Bath	Temperature checked using NIST-traceable thermometer.	When in use.	± 2°C	Adjust. Replace.
Volumetric Dispensing Devices (Eppendorf ® pipette, automatic dilutor or dispensing devices)	One delivery by weight. Using DI water, dispense into tared vessel. Record weight with device ID number.	Quarterly	± 2% Calculate accuracy by dividing weight by stated volume times 100 for percent.	Adjust. Replace.
Glass Microliter Syringes	Accuracy verified every six months as per SOP.	Accuracy must be initially demonstrated if syringe was not received with a certificate attesting to established accuracy.	± 1%	Not applicable.
Conductivity Meter	Cell impedance calibrated with three KCl standards.	Each use.	$r \geq 0.99$	Recalibrate.
Deionized Water	Check in-line conductivity meter on system with conductivity meter in Wet Chem Department.	Daily	<10 µmhos/cm^2	Record on log. Report discrepancies to QA Manager.

SECTION 21

MEASUREMENT TRACEABILITY *(NELAC 5.5.6)*

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 (including glass microliter syringes that have a certificate of accuracy), quarterly accuracy checks are performed for all mechanical volumetric devices Wherever possible, subsidiary or peripheral equipment is checked against standard equipment or standards that are traceable to national or international standards. Class A Glassware should be routinely inspected for chips, acid etching or deformity. If the Class A glassware 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), APLAC (Asia-Pacific Laboratory Accreditation Cooperation), or EA (European Cooperation for Accreditation). A 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 standard materials are purchased from vendors accredited by A2LA, NVLAP, ISO 9001:2000 standard with an accompanying Certificate of Analysis that documents the standard 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.

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 QA public drive N:\QA\Facility_QA_Documents\Certificate_of_Analysis. 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 and SOP No. PT-QA-006, Procurement of Standard and Materials; Labeling and Traceability.

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.

21.4.1 All standards, reagents, and reference materials must be labeled in an unambiguous manner. Standards are logged into the laboratory's electronic standard log system, and are assigned a unique identification number. The following information is typically recorded in the electronic database within the electronic standards log (STD Log).

- 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 electronic standard log)
- Special Health/Safety warnings if applicable

21.4.3 In addition, the following information may be helpful:

- Date of receipt for commercially purchased items or date of preparation for laboratory prepared items
- 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)
- Concentration (if applicable)
- Initials of analyst preparing standard or opening container

All containers of prepared reagents must include a preparation date, 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 raw data.

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 *(NELAC 5.5.7)*

22.1 OVERVIEW

The laboratory provides sampling services for the following matrices:

- Groundwater Sampling
- Wastewater Sampling
- Potable Sampling
- Waste Sampling
- Soil and Sediment Sampling
- Flow Monitoring
- Field Parameter Analysis
- Cleaning and Decontamination of Field Equipment

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. Any certificates of cleanliness that are provided by the supplier are maintained at the laboratory. For detailed information regarding container/bottle order, refer to laboratory SOP PT-QA-028, Bottle and Cooler Preparation.

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 – AR Select (ACS) or equivalent
- Methanol – Purge and Trap grade
- Nitric Acid – AR Select (ACS) or equivalent
- Sodium Hydroxide – AR Select (ACS) or equivalent
- Sulfuric Acid – AR Select (ACS) or equivalent
- Hexane – Ultra Resi – Analyzed or equivalent

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. The first day of holding time ends twenty-four hours after sampling. 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. DOD work requires that all holding times be measured to the exact time of sampling – not the day. For DOD requirements, refer to SOP No. PT-QA-025.

22.4 SAMPLING CONTAINERS, PRESERVATION REQUIREMENTS, HOLDING TIMES

The preservation and holding time criteria specified in the SOPs are derived from the source documents for the methods. If method required holding times as specified in the SOPs 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 for subsampling are located SOP # PT-QA-024.

SECTION 23

HANDLING OF SAMPLES *(NELAC 5.5.8)*

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
- 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.

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. 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. Samples are only considered to be received by lab when personnel at the laboratory 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 the project folder.

23.1.2 Legal / Evidentiary Chain-of-Custody

If samples are identified for legal/evidentiary purposes, login will send the custody seal (Figure 23-4) with the cooler, retain the shipping record with the COC in the main file. Login will initiate an internal COC form named COC/Sample Request form (Figure 23-5) if the sample is needed prior to login. Once samples are logged in the analysts will generate an Internal COC form (Figure 23-6) from LIMS. The laboratory will maintain sample disposal records.

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 Condition Upon Receipt Variance Report (Figure 23-7). 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. This procedure is further described in SOP No. PT-QA-027, Sample Receiving and Chain-of-Custody.

23.2.1.1 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 and necessary QC;
- samples must be preserved according to the requirements of the requested analytical method ;
- sample holding times must be adhered to ;

- all samples submitted for water/solid Volatile Organic analyses must have a Trip Blank submitted at the same time;
- Efforts should be made to minimize any air bubbles in aqueous volatile samples. Air bubbles also the escape of volatile organics. This is especially important because air bubbles tend to form in iced samples. Volatile vials containing air bubbles larger than a pea will be treated as non-conformances;
- Samples that require chilling must be received at < 6 °C;
- If Matrix Spikes are required for the project, separate sample volumes must be available for the requested analyses;
- 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. A copy of the sample acceptance policy is provided to each client prior to shipment of samples.

23.2.1.2 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.

23.2.1.3 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.PT-QA-027.

23.3 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 suitable for the sample matrix. 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 cold room or refrigerator and place them on carts, analyze the sample, and return the remaining sample or empty container to the cold room or refrigerator from which it originally came. All unused portions of

samples, including empty sample containers, are returned to the secure sample control area. Raw samples requiring cold storage are kept in the cold room for approximately 30 to 60 days after reported. Volatile samples are stored in the VOA refrigerator. All sample extracts are kept in the refrigerators for approximately two to four weeks after analysis, which meets or exceeds most sample holding times. After this time the sample extracts are moved to cold room, where they are stored for an additional three to six months before they are disposed of. This holding period allows samples to be checked if a discrepancy or question arises. 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.

23.4 HAZARDOUS SAMPLES AND FOREIGN SOILS

To minimize exposure to personnel and to avoid potential accidents, hazardous, for any sample that is known to be hazardous at the time of receipt a cautionary email communication should be sent to all applicable laboratory personnel by the project manger or designee. All hazardous samples are disposed of appropriately through a hazardous waste disposal process. Foreign soil samples are sent out for incineration by an USDA-approved waste disposal facility. Analysts will notify Sample Control of any sample determined to be hazardous after completion of analysis by sending an email. 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.

23.5 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. 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.

23.6 SAMPLE DISPOSAL

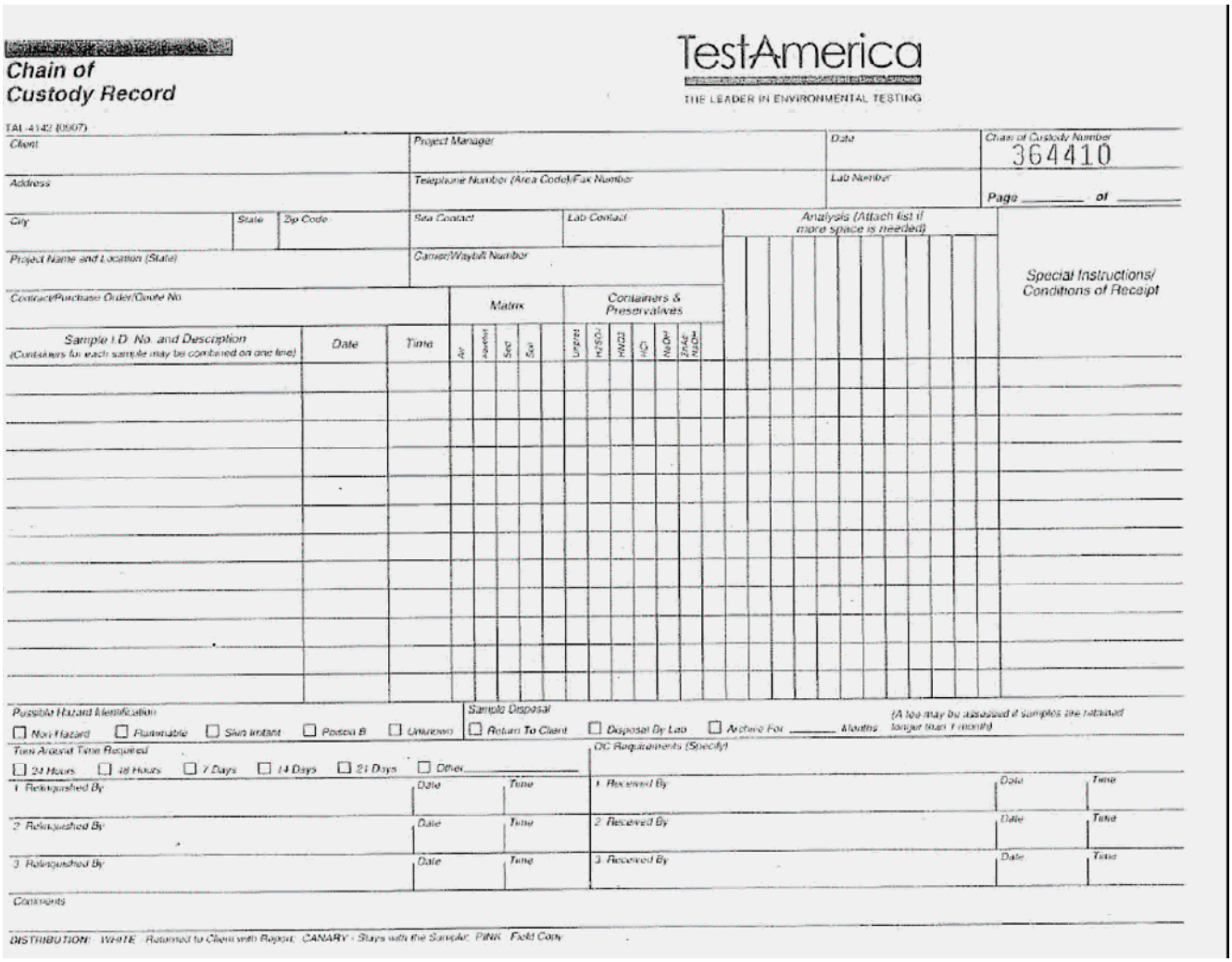
Samples should be retained for a minimum of 30 days after the project report is sent, however, provisions may be made for earlier disposal of samples once the holding time is exceeded. Some samples are required to be held for longer periods based on regulatory or client requirements (e.g., 60 days after 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 No. PT-HS-001 and Chemical Hygiene Plan). 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 (COC)



Chain of Custody Record

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

TAL-4142 (0907)

Client	Project Manager	Date	Chain of Custody Number 364410
Address	Telephone Number (Area Code)/Fax Number	Lab Number	Page ____ of ____
City / State / Zip Code	Site Contact	Lab Contact	Analysis (Attach list if more space is needed)
Project Name and Location (State)	Carrier/Waybill Number		Special Instructions/ Conditions of Receipt
Contract/Purchase Order/Quote No.	Matrix / Containers & Preservatives		

Sample I.D. No. and Description (Containers for each sample may be combined on one line)	Date	Time	Air	Aqueous	Sed.	Soil	Unpres.	H2SO4	HNO3	HCl	NaOH	ZnAc/ NaOH

Possible Hazard Identification
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

Sample Disposal
☐ Return To Client ☐ Disposal By Lab ☐ Archive For ____ Months (A fee may be assessed if samples are retained longer than 1 month)

Turn Around Time Required
☐ 24 Hours ☐ 48 Hours ☐ 7 Days ☐ 14 Days ☐ 21 Days ☐ Other ____

QC Requirements (Specify)

	Date	Time		Date	Time
1. Relinquished By			1. Received By		
2. Relinquished By			2. Received By		
3. Relinquished By			3. Received By		

Comments

DISTRIBUTION: WHITE - Returned to Client with Report; CANARY - Stays with the Sample; PINK - Field Copy

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.

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*
   - *Unique sample identification*
   - *Date, time and location of sampling*
   - *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.*
   - **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.

4) Samples must be preserved according to the requirements of the requested analytical method. 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).
   - Chemical preservation (pH) will be verified prior to analysis and 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.

5) *Matrix Spikes* are required for your project, separate sample volumes must be available for the requested analyses.

6) For Volatile Organic analyses: Efforts should be made to minimize any air bubbles in aqueous volatile samples. Air bubbles also the escape of volatile organics. This is especially important because air bubbles tend to form in iced samples. Volatile vials containing air bubbles larger than a pea will be treated as non-conformances.

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) 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. Samples analyzed in the laboratory will be qualified on the final report to indicate holding time exceedance.

9) The project manager will be notified if any sample is received in damaged condition. TestAmerica will request that a sample be resubmitted for analysis. The laboratory will notify the client upon sample receipt if the samples exhibit obvious signs of damage, contamination or inadequate preservation.

Figure 23-3.

Example: Cooler Receipt Form

Client: _____ Project: _____ Quote: _____

Cooler Rec'd & Opened for Temp. Check on: _____

Coolers Opened and Unpacked on: _____ By: _____

(Signature)

TestAmerica Pittsburgh Lot Number: _____

		Yes	No	NA
1.	Were custody seals on the outside of the cooler? _____	____	____	____
	If YES, how many and where? Quantity __ Location _____			
	Were signatures and date correct? _____	____	____	____
2.	Were custody papers included inside the cooler? _____	____	____	____
3.	Were custody papers properly filled out (ink, signed, match labels)? _____	____	____	____
4.	Did you sign the custody papers in the appropriate place? _____	____	____	____
5.	Was shippers packing slip attached to this form? _____	____	____	____
6.	Were packing materials used? _____	____	____	____
	If YES, what type? _____			
7.	Were the samples received within the acceptable temperature range? (Record temperatures on reverse side.) _____	____	____	____
8.	Were the samples appropriately preserved? _____	____	____	____
9.	Were all bottles sealed in separate plastic bags? _____	____	____	____
10.	Did all bottles arrive in good condition (unbroken)? _____	____	____	____
11.	Were all bottle labels complete (sample ID, preservatives, etc.)? _____	____	____	____
12.	Did all bottle labels and/or tags agree with custody papers? _____	____	____	____
13.	Were correct bottles used for tests indicated? _____	____	____	____
14.	Were all VOA vials checked for the presence of air bubbles? _____	____	____	____
15.	Was a sufficient amount of sample sent in each bottle? _____	____	____	____

16. Samples received by: FEDEX UPS CLIENT DROP-OFF OTHER DHL US CARGO

Explain any discrepancies: _____

Level 2 Review _____

Was contacted on _____ by _____ to resolve discrepancies.

Figure 23-3.

Example: Cooler Receipt Form

Sample ID	TMET PH<2	DMET PH<2	HG PH<2	NUT(1) PH<2	CN PH ≥12	OG TPHC PH<2	PHEN PH<2	SULF PH ≥12	TOC PH<2	TOX PH<2	VOA P/UP	hrdnss PH<2			

(1) "NUT" could include sample bottles for ammonia, chemical oxygen demand, nitrate/nitrite, TKN, or total phosphorus

Comments: _____

Cooler Number	Temperature*	Thermometer ID

*Acceptable Temperature Range: 4°C ± 2°C

Sample	Lot Number**

**Please use an asterisk if bottle lot number was covered by the label

Figure 23-4.

Example: Custody Seal

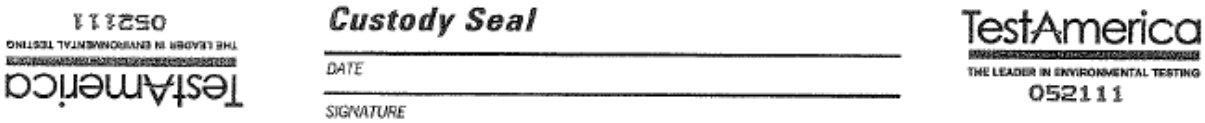


Figure 23-5.

Example: COC/Sample Request Form

COC/Sample Request

TestAmerica Pittsburgh
301 Alpha Drive
Pittsburgh, PA 15238
Phone: 412-963-7058
FAX: -412-963-2468

Project Name: Site:

Lot Number/Sample Number	Analysis	Matrix

	Raw Relinquished by				Raw Received by			
Raw Sample	Date	Time	Analyst	Location	Date	Time	Analyst	Location

Figure 23-6.

Example: Internal Chain-of-Custody (COC) Form

PSR024 11/30/07 13:16:17 MT SAMPLE CUSTODIAN REMOVAL REQUEST PAGE 001

REQUESTED BY: [redacted]

METHOD: SG Hydrocarbons, Polynuclear Aromatic (HPLC - 8310)

STORAGE LOCATION	WORK ORDER #	PICKED CNTR#	CONTROL #	CLIENT #	ANALYSIS	LOTID	SMP#	SFX	MATRIX DESCRIPTION	QTY RCVD	QTY REQD
14B,CLP1	KCXCV-1-AC	___ ___ ___	393655	508550	A-4F-SG	C7K270217	001		SOLID	2	1
14B,CLP1	KCXC0-1-AC	___ ___ ___	393656	508550	A-4F-SG	C7K270217	002		SOLID	2	1
14B,CLP1	KCXC1-1-AC	___ ___ ___	393657	508550	A-4F-SG	C7K270217	003		SOLID	2	1
14B,CLP1	KCXC3-1-AC	___ ___ ___	393658	508550	A-4F-SG	C7K270217	004		SOLID	2	1
14B,CLP1	KCXC7-1-AC	___ ___ ___	393659	508550	A-4F-SG	C7K270217	005		SOLID	2	1
14B,CLP1	KCXC8-1-AC	___ ___ ___	393660	508550	A-4F-SG	C7K270217	006		SOLID	2	1
14B,CLP1	KCXC9-1-AC	___ ___ ___	393661	508550	A-4F-SG	C7K270217	007		SOLID	2	1
14B,CLP1	KCXDA-1-AC	___ ___ ___	393662	508550	A-4F-SG	C7K270217	008		SOLID	2	1

RELINQUISHED BY	RECEIVED BY	DATE/TIME

***** END OF REPORT *****

Figure 23-7.

Example: Condition Upon Receipt Variance Report

Work Order No.: _____

Condition Upon Receipt Variance Report
TestAmerica Pittsburgh Laboratory

Client: _____ Date: _____
Project No.: _____ Initiated by: _____
Analysis Requested: _____ RFA/COC: _____
Client Sample Numbers Affected: _____

Condition/Variance (Check all that apply):

1. ☐ Not enough sample received for proper analysis. Received approx. _____
2. ☐ Sample received broken/leaking.
3. ☐ Sample received without proper preservative.
   ☐ Cooler temperature not within 4°C ± 2°C.
   Record temperature: _____
   ☐ pH _____
   ☐ other: _____
4. ☐ Sample received in improper container.
5. ☐ Sample received without proper paperwork.
6. ☐ Paperwork received without sample.
7. ☐ No sample ID on sample container.
8. ☐ Custody tape disturbed/broken/missing.
9. ☐ Sample splits performed by lab.
10. ☐ Volatile sample received with approximately _____ mm headspace.
11. ☐ Sample ID on container does not match on paperwork. Explain:
12. ☐ All coolers on airbill not received with
13. ☐ Other (explain below):

Notes: _____

Corrective Action:

☐ Client's Name: _____ Informed verbally on: _____ By: _____
☐ Client's Name: _____ Informed in writing on: _____ By: _____
☐ Sample(s) processed "as is" _____
☐ Sample(s) on hold until: _____ If released: _____
Sample Control Supervisor Review: _____ Date: _____
Project Management Review: _____ Date: _____
SIGNED ORIGINAL MUST BE RETAINED IN THE PROJECT FILE

TA PT\11-07\96-005\CURVR.DOC

SECTION 24

ASSURING THE QUALITY OF TEST RESULTS *(NELAC 5.5.9)*

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. 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, solvent extraction, sonication, acid digestion, filteration and distillation. 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. 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.).
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.

Table 24-1. Negative Controls

Control Type	Details
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.
Trip Blank [1]	are required to be submitted by the client with each shipment of samples requiring aqueous and solid volatiles analyses. 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. (NELAC)
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. Also further detail is provided in SOP No. PT-QA-021.

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)

24.4.1.1 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.

24.4.1.2 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.

24.4.1.3 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.).

24.4.1.4 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.

24.4.1.5 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 DoD requirements refer to SOP PT-QA-025.

24.4.1.5.1 For methods that have 1-10 target analytes, spike all components.

24.4.1.5.2 For methods that include 11-20 target analytes, spike at least 10 or 80%, whichever is greater.

24.4.1.5.3 For methods with more than 20 target analytes, spike at least 16 components.

24.4.1.5.4 Exception: Due to analyte incompatibility in pesticides, Toxaphene and Chlordane are only spiked at client request based on specific project needs.

24.4.1.5.5 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 24-2. 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.

Table 24-2. Sample Matrix Control

Control Type	Details	
	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)

24.6.1 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.

24.6.2 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.

24.6.3 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).

24.6.3.1 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).

24.6.3.2 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.

24.6.3.3 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.

24.6.3.4 The maximum acceptable recovery limit will be 150%.

24.6.3.5 The maximum acceptable RPD limit will be 35% for waters and 40% for soils. The minimum RPD limit is 10%.

24.6.3.6 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.

24.6.4 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. Refer to laboratory SOP No. PT-QA-02.

24.6.4.1 The Reference Data Summary generated from LIMS shows the precision and accuracy acceptability limits for analyses performed. This summary includes an effective date, is updated each time new limits are generated and is located in LIMS. Unless otherwise noted, limits are laboratory generated. The analysts are instructed to use the current limits in the laboratory (dated and approved by the Team Leader/Area Supervisor and QA Manager) and entered into the Laboratory Information Management System (LIMS). Further details are described in Pittsburgh SOP No. PT-QA-002.

24.6.5 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:

24.6.5.1 The analyte results are below the reporting limit and the LCS is above the upper control limit.

24.6.5.2 If the analytical results are above the relevant regulatory limit and the LCS is below the lower control limit.

24.6.5.3 Or, for NELAC and Department Of Defense (DOD) work (SOP No. PT-QA-025), 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.

24.6.5.3.1 Marginal exceedances are recovery exceedances between 3 SD and 4 SD from the mean recovery limit (NELAC).

24.6.5.3.2 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.

24.6.5.3.3 Though marginal excedences may be allowed, the data must still be qualified to indicate it is outside of the normal limits. For DoD requirements refer to SOP No. PT-QA-025.

24.6.6 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.

24.6.7 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 ADDITIONAL PROCEDURES TO ASSURE QUALITY CONTROL

24.7.1 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).

24.7.2 A discussion regarding MDLs, Limit of Detection (LOD) and Limit of Quantitation (LOQ) can be found in Section 19.

24.7.3 Use of formulae to reduce data is discussed in the method SOPs and in Section 20.

24.7.4 Selection of appropriate reagents and standards is included in Section 9 and 21.

24.7.5 A discussion on selectivity of the test is included in Section 5.

24.7.6 Constant and consistent test conditions are discussed in Section 18.

24.7.7 The laboratories sample acceptance policy is included in Section 23.

SECTION 25

REPORTING RESULTS *(NELAC 5.5.10)*

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) on the cover page with a "Result" column header on the sample result page.

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. Lot 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 # at the bottom of the page with page range # - ## on the right corner of the page. 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 and it is an integral part of the report.
- Any additional addendum 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 (eg. Sampling information)
- 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 (eg. 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 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 are included unless the client specifies they do not require reporting the QC.

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). The temperature is documented on the Cooler Receipt form and noted in the report case narrative.

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 is included in the sample summary page.

25.2.20 A signature and title of the person(s) accepting responsibility for the content of the report and date of issue. Signatories are appointed by the Lab Director.

25.2.21 When NELAC accreditation is required, the lab shall certify that the test results meet all requirements of NELAC or provide reasons and/or justification if they do not.

25.2.22 If applicable, 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., preliminary report). 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.

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.

25.2.28 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 MDL, 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 relevant calibration information. A Level II report is not included, unless specifically requested. No raw data is provided.
- 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. Initial reports may be provided to clients by facsimile. All faxed reports are followed by hardcopy. Procedures used to ensure client confidentiality are outlined in Section 25.5.

25.2.29 Electronic Data Deliverables (EDDs)

EDDs are routinely offered as part of TestAmerica's services. Pittsburgh offers a variety of EDD formats including Excel, CSV or as requested by the client.

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.

25.3 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.

25.3.1 Numeric results with values outside of the calibration range, either high or low are qualified as 'estimated'.

25.3.2 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 NELAC sample acceptance requirements such as improper container, holding time, or temperature.

25.3.3 Where applicable, a statement on the estimated uncertainty of measurements; information on uncertainty is needed when a client's instructions so require.

25.3.4 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 Technical Supervisors/Team Leaders or as assigned by the lab Director. 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.

25.4 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 # CA-L-S-002) and Pittsburgh SOP No. PT-QA-023.

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.

For DoD projects the subcontractor laboratories used must have an established and documented laboratory quality system that complies with DoD QSM requirements. The subcontractor laboratories will be evaluated according to SOP PT-QA-023, Selection and Evaluation of Subcontractor Laboratories. The subcontractor laboratory must receive project-specific approval from the DoD client before any samples are analyzed as per DoD QSM, Version 3.0, Section 4.5.

25.5 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.

25.5.1 Report deliverable formats are discussed with each new client. If a client requests that reports be faxed or e-mailed, the reports are faxed with a cover sheet or e-mailed with the following note that includes a confidentiality statement similar to the following:

This information contained in this message is intended only for the use of the addressee, and may be confidential and/or privileged. If the reader of this message is not the intended recipient, or the employee or agent responsible do deliver it to the intended recipient, you are herby notified that any dissemination, distribution or copying of this communication is strictly prohibited. If you have received this communication in error, please notify the sender immediately.

25.6 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.

25.7 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 on the data server, as is the original report. The revised report is stored in the data server under the sample number followed by "R" placed at the end of the file name indicating revision 1, R2 at the end of the file name would indicate revision 2, etc.

When the report is re-issued, a notation of "Revised "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.*

25.8 POLICIES ON CLIENT REQUESTS FOR AMENDMENTS

25.8.1 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.

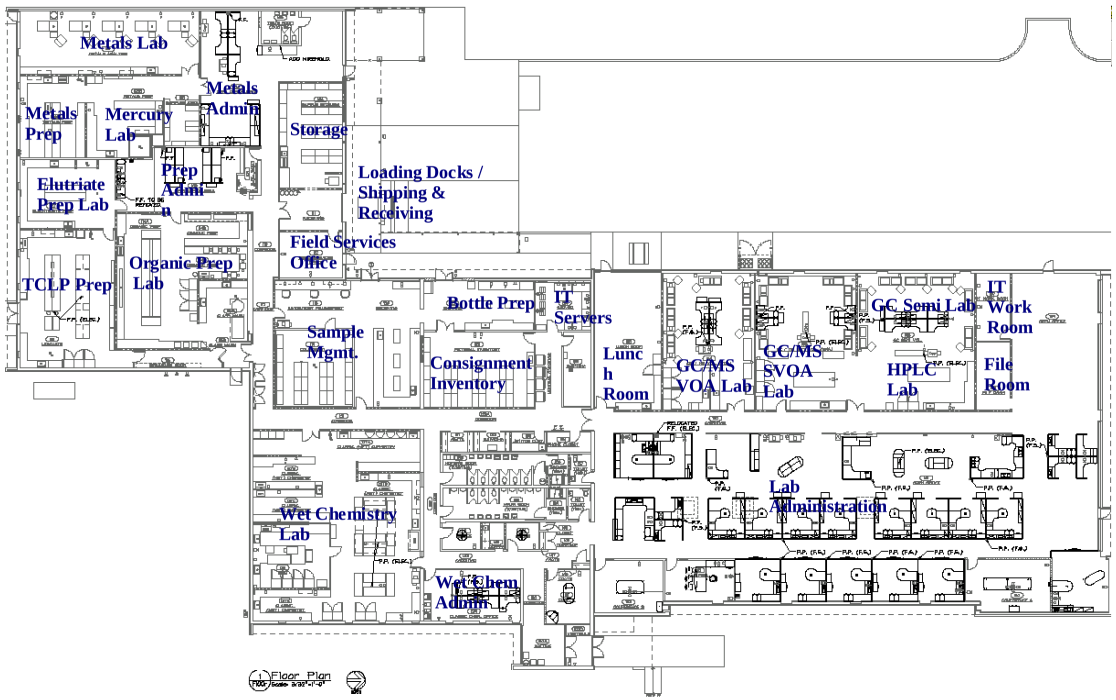
25.8.2 Multiple Reports

TestAmerica does not issue multiple reports for the same Lot number 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

Pittsburgh Lab Floor Plan



Key Areas
- GC/MS VOA (Volatiles)
- GC/MS SVOA (Semivolatiles)
- GC Semi Lab
- HPLC Lab
- Organic Prep Lab
- Wet / General Chemistry
- Metals & Mercury Lab
- Elutriate Lab
- TCLP Prep
- Bottle Prep
- Sample Control/ Sample Receiving
- Field Services

301 Alpha Drive, Pittsburgh PA 15238

Distributed To: Intranet
This is a Controlled Document. When Printed it Becomes Uncontrolled.

Appendix 2. Glossary/Acronyms

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. In the context of the National Environmental Laboratory Accreditation Program (NELAP), this process is a voluntary one. (NELAC)

Accrediting Authority:
The Territorial, State, or Federal Agency having responsibility and accountability for environmental laboratory accreditation and which grants accreditation (NELAC) [1.5.2.3]

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. (NELAC)

Batch:
Environmental samples which are prepared and/or analyzed together with the same process and personnel, using the same lot(s) of reagents. A preparation batch is composed of one to 20 environmental samples of the same matrix, meeting the above mentioned criteria and with a maximum time between the start of processing of the first and last sample in the batch to be 24 hours. An analytical batch is composed of prepared environmental samples (extracts, digestates or concentrates) and /or those samples not requiring preparation, which are analyzed together as a group using the same calibration curve or factor. An analytical batch can include samples originating from various environmental matrices and can exceed 20 samples. (NELAC Quality Systems Committee)

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)

Blind Sample:
A sample for analysis with a composition known to the submitter. The analyst/laboratory may know the identity of the sample but not its composition. It is used to test the analyst's or laboratory's proficiency in the execution of the measurement process.

Calibration:

To determine, by measurement or comparison with a standard, the correct value of each scale reading on a meter, instrument, or other device. The levels of the applied calibration standard should bracket the range of planned or expected sample measurements. (NELAC)

Calibration Curve:
The graphical relationship between the known values, such as concentrations, of a series of calibration standards and their instrument response. (NELAC)

Calibration Method:
A defined technical procedure for performing a calibration. (NELAC)

Calibration Standard:
A substance or reference material used to calibrate an instrument (QAMS)

Certified Reference Material (CRM):
A reference material one or more of whose property values are certified by a technically valid procedure, accompanied by or traceable to a certificate or other documentation which is issued by a certifying body. (ISO Guide 30–2.2)

Chain of Custody:
An unbroken trail of accountability that ensures the physical security of samples and includes the signatures of all who handle the samples. (NELAC) [5.12.4]

Clean Air Act:
The enabling legislation in 42 U>S>C> 7401 et seq., Public Law 91-604, 84 Stat. 1676 Pub. L. 95-95, 91 Stat., 685 and Pub. L. 95-190, 91 Stat., 1399, as amended, empowering EPA to promulgate air quality standards, monitor and enforce them. (NELAC)

Comprehensive Environmental Response, Compensation and Liability Act (CERCLA/SUPERFUND):
The enabling legislation in 42 U.S.C. 9601-9675 et seq., as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), 42 U.S.C. 9601 et seq., to eliminate the health and environmental threats posed by hazardous waste sites. (NELAC)

Clean Water Act:
The Clean Water Act is the primary federal law in the United States governing water pollution. Commonly abbreviated as the CWA, the act established the symbolic goals of eliminating releases to water of high amounts of toxic substances, eliminating additional water pollution by 1985, and ensuring that surface waters would meet standards necessary for human sports and recreation by 1983.

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. (NELAC)

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. NELAC 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
(NELAC)

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). (NELAC)

Data Reduction:
The process of transforming raw data by arithmetic or statistical calculations, standard curves, concentration factors, etc., and collation into a more useable form. (EPA-QAD)

Deficiency:
An unauthorized deviation from acceptable procedures or practices, or a defect in an item. (ASQC)

Detection Limit:
The lowest concentration or amount of the target analyte that can be identified, measured, and reported with confidence that the analyte concentration is not a false positive value. See Method Detection Limit. (NELAC)

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)

Environmental Detection Limit (EDL):

The smallest level at which a radionuclide in an environmental medium can be unambiguously distinguished for a given confidence interval using a particular combination of sampling and measurement procedures, sample size, analytical detection limit, and processing procedure. The EDL shall be specified for the 0.95 or greater confidence interval. The EDL shall be established initially and verified annually for each test method and sample matrix. (NELAC Radioanalysis Subcommittee)

Equipment Blank:
Sample of analyte-free media which has been used to rinse common sampling equipment to check effectiveness of decontamination procedures. (NELAC)

External Standard Calibration:
Calibrations for methods that do not utilize internal standards to compensate for changes in instrument conditions.

Federal Water Pollution Control Act (Clean Water Act, CWA):
The enabling legislation under 33 U.S.C. 1251 et seq., Public Law 92-50086 Stat 816, that empowers EPA to set discharge limitations, write discharge permits, monitor, and bring enforcement action for non-compliance. (NELAC)

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 Testing:
NELAC's approach to accrediting laboratories by program, method and analyte. Laboratories requesting accreditation for a program-method-analyte combination or for an up-dated/improved method are required to submit to only that portion of the accreditation process not previously addressed (see NELAC, section 1.9ff). (NELAC)

Holding Times (Maximum Allowable Holding Times):
The maximum times 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 and carried through the entire measurement process as a reference for evaluating and controlling the precision and bias of the applied analytical test method. (NELAC)

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)

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. 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), there

is no LCS. 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.

Note: NELAC standards allow a matrix spike to be used in place of this control as long as the acceptance criteria are as stringent as for the LCS. (NELAC)

Laboratory Duplicate:
Aliquots of a sample taken from the same container under laboratory conditions and processed and analyzed independently. (NELAC)

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 of Detection (LOD):
An estimate of the minimum amount of a substance that an analytical process can reliably detect. An LOD is analyte- and matrix-specific and may be laboratory dependent. (Analytical Chemistry, 55, p.2217, December 1983, modified) See also Method Detection Limit.

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 matrix or Saline/Estuarine source. 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: 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. (NELAC)

Matrix Spike (spiked sample or fortified sample):

Prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate 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 spikes shall be performed at a frequency of one in 20 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 selected sample(s) shall be rotated among client samples so that various matrix problems may be noted and/or addressed. Poor performance in a matrix spike may indicate a problem with the sample composition and shall be reported to the client whose sample was used for the spike. (QAMS)

Matrix Spike Duplicate (spiked sample or fortified sample duplicate):
A second replicate matrix spike is prepared in the laboratory and analyzed to obtain a measure of the precision of the recovery for each analyte.

Matrix spike duplicates or laboratory duplicates shall be analyzed at a minimum of 1 in 20 samples per matrix type per sample extraction or preparation method. The laboratory shall document their procedure to select the use of an appropriate type of duplicate. The selected sample(s) shall be rotated among client samples so that various matrix problems may be noted and/or addressed. Poor performance in the duplicates may indicate a problem with the sample composition and shall be reported to the client whose sample was used for the duplicate. (QAMS)

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. (NELAC)

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. (NELAC)

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. (NELAC)

Performance Based Measurement System (PBMS):
A set of processes wherein the data quality needs, mandates or limitations of a program or project are specified and serve as criteria for selecting appropriate test methods to meet those needs in a cost-effective manner. (NELAC)

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. (NELAC)

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. (NELAC)

Preservation:
Refrigeration and/or reagents added at the time of sample collection (or later) to maintain the chemical and/or biological integrity of the sample. (NELAC)

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. (NELAC) [2.1]

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. (NELAC)

Proficiency Test Sample (PT):
A sample, the composition of which is unknown to the analyst and is provided to test whether the analyst/laboratory can produce analytical results within specified acceptance criteria. (QAMS)

Quality Assurance:
An integrated system of activities involving planning, quality control, quality assessment, reporting and quality improvement to ensure that a product or service meets defined standards of quality with a stated level of confidence. (QAMS)

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 which purpose is to measure and control the quality of a product or service so that it meets the needs of users. (QAMS)

Quality Control Sample:
An uncontaminated sample matrix spiked with known amounts of analytes from a source independent from the calibration standards. 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. (EPA-QAD)

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. (NELAC)

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 (ANSI/ASQC-E-41994)

Quantitation Limits:
The maximum or minimum levels, concentrations, or quantities of a target variable (e.g., target analyte) that can be quantified with the confidence level required by the data user. (NELAC)

Range:
The difference between the minimum and the maximum of a set of values. (EPA-QAD)

Reagent Blank (method reagent blank):
A sample consisting of reagent(s), without the target analyte or sample matrix, introduced into the analytical procedure at the appropriate point and carried through all subsequent steps to determine the contribution of the reagents and of the involved analytical steps. (QAMS)

Reference Material:
A material or substance one or more properties of which are sufficiently well established to be used for the calibration of an apparatus, the assessment of a measurement method, or for assigning values to materials. (ISO Guide 30-2.1)

Reference Standard:
A standard, generally of the highest metrological quality available at a given location, from which measurements made at that location are derived. (VIM-6.0-8)

Replicate Analyses:
The measurements of the variable of interest performed identically on two or more sub-samples of the same sample within a short time interval. (NELAC)

Report Limit (RL):
The laboratory nominal Quantitation Limit (QL) or the level of sensitivity required by the client but not lower than the LOD.

Resource Conservation and Recovery Act (RCRA):
The enabling legislation under 42 USC 321 et seq. (1976), that gives EPA the authority to control hazardous waste from the “cradle-to-grave”, including its generation, transportation, treatment, storage, and disposal. (NELAC)

Safe Drinking Water Act (SDWA):
The enabling legislation, 42 USC 300f et seq. (1974), (Public Law 93-523), that requires the EPA to protect the quality of drinking water in the U.S. by setting maximum allowable contaminant levels, monitoring, and enforcing violations. (NELAC)

Sample Duplicate:
Two samples taken from and representative of the same population and carried through all steps of the sampling and analytical procedures in an identical manner. Duplicate samples are used to assess variance of the total method including sampling and analysis. (EPA-QAD)

Second Order Polynomial Curve (Quadratic): The 2nd 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 2nd 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:
(Analytical chemistry) the capability of a test method or instrument to respond to a target substance of constituent in the presence of non-target substances. (EPA-QAD)

Sensitivity:
The capability of a method or instrument to discriminate between measurement responses representing different levels (e.g., concentrations) of a variable of interest. (NELAC)

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.

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. 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, a representative number (at a minimum 10%) of the listed components may 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. (NELAC)

Standard:
The document describing the elements of laboratory accreditation that has been developed and established within the consensus principles of NELAC and meets the approval requirements of NELAC procedures and policies. (ASQC)

Standard Operating Procedures (SOPs):
A written document which details the method of an operation, analysis, or action whose techniques and procedures are thoroughly prescribed and which is accepted as the method for performing certain routine or repetitive tasks. (QAMS)

Standardized Reference Material (SRM):
A certified reference material produced by the U.S. National Institute of Standards and Technology or other equivalent organization and characterized for absolute content, independent of analytical method. (EPA-QAD)

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)

Toxic Substances Control Act (TSCA):
The enabling legislation in 15 USC 2601 et seq., (1976) that provides for testing, regulating, and screening all chemicals produced or imported into the United States for possible toxic effects prior to commercial manufacture. (NELAC)

Traceability:
The property of a result of a measurement whereby it can be related to appropriate standards, generally international or national standards, through an unbroken chain of comparisons. (VIM-6.12)

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:

BS – Blank Spike
BSD – Blank Spike Duplicate
CAR – Corrective Action Report
CCV – Continuing Calibration Verification
CF – Calibration Factor
CFR – Code of Federal Regulations
COC – Chain of Custody
CRS – Change Request Form
DOC – Demonstration of Capability
DQO – Data Quality Objectives
DU – Duplicate
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
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
MDL – Method Detection Limit
MS – Matrix Spike
MSD – Matrix Spike Duplicate
MSDS - Material Safety Data Sheet
NELAC - National Environmental Laboratory Accreditation Conference
NELAP - National Environmental Laboratory Accreditation Program
PT – Performance Testing
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

Pittsburgh maintains certifications, accreditations, certifications, and validations with numerous state and national entities. Programs vary but may include on-site audits, reciprocal agreements with another entity, 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:

Organization	Certificate Number Or Laboratory ID Number
Arkansas	88-0690
California	04224CA
Connecticut	PH-0688
Florida	E871008-04
Illinois	002064
Kansas	E-10350
Louisiana	04041
NFESC	None
New Hampshire	203008
New Jersey	PA005
New York	11182
North Carolina	434
Pennsylvania	02-00416
South Carolina	89014002
Utah	STLP
USDA	P330-07-00101
USDA	P-Soil -01
West Virginia	142
Wisconsin	998027800

The certificates and parameter lists (which may differ) for each organization may be found on the corporate web site, the laboratory's public server and in the QA web page.